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

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Burke County, North Dakota

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Exhibit 1 - Wind project application
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Table of Contents

1.0 INTRODUCTION 1-1

1.1 Project History 1-1

1.2 Compliance with the Energy Conversion and Transmission Facility Siting Act 1-2

1.3 Siting Flexibility 1-6

1.4 Project Summary 1-6

1.4.1 Project Area 1-6

1.4.2 Project Area Selection 1-8

1.4.3 Project Area Wind Characteristics 1-8

1.4.4 Projected Wind Energy Production 1-9

1.5 Project Schedule 1-9

1.6 Project Ownership 1-9

2.0 NEED FOR FACILITY 2-1

2.1 Need Analysis 2-1

2.2 Alternatives 2-1

2.3 Ten-Year Plan 2-1

3.0 SITE SELECTION CRITERIA 3-1

3.1 Exclusion Areas 3-1

3.2 Avoidance Areas 3-2

3.3 Selection Criteria 3-3

3.4 Policy Criteria 3-5

3.5 Setbacks 3-6

3.6 Design and Construction Limitations 3-7

3.7 Economic Considerations 3-7

3.8 County Criteria 3-8

4.0 ENGINEERING AND OPERATIONAL DESIGN ANALYSIS 4-1

4.1 Project Layout 4-1

4.2 Wind Turbines 4-1

4.2.1 Turbine 4-1

4.2.2 Rotor 4-1

4.2.3 Turbine Tower 4-2

4.2.4 Lightning Protection 4-2

4.3 Associated Facilities 4-2

4.4 Description of Electrical System 4-2

4.5 Project Construction 4-3

4.5.1 Construction Management 4-3
4.5.2 Foundation Design 4-4
4.5.3 Civil Works 4-4
4.5.4 Commissioning 4-5
4.5.5 Project Operation and Maintenance 4-5
4.5.6 Maintenance Schedule 4-5
4.5.7 General Maintenance Duties 4-6
4.6 Decommissioning and Restoration 4-6

5.0 ENVIRONMENTAL ANALYSIS 5-1
5.1 Socioeconomics 5-1
5.1.1 Description of Resources 5-1
5.1.2 Impacts 5-1
5.1.3 Mitigative Measures 5-2
5.2 Land Use and Vegetation 5-2
5.2.1 Description of Resources 5-2
5.2.2 Impacts 5-4
5.2.3 Mitigative Measures 5-4
5.3 Public Services 5-5
5.3.1 Description of Resources 5-5
5.3.2 Impacts 5-6
5.3.3 Mitigative Measures 5-7
5.4 Human Health and Safety 5-8
5.4.1 Description of Resources 5-8
5.4.2 Impacts 5-10
5.4.3 Mitigative Measures 5-11
5.5 Sound 5-12
5.5.1 Description of Resources 5-12
5.5.2 Impacts 5-12
5.5.3 Mitigative Measures 5-13
5.6 Cultural Resources 5-13
5.6.1 Description of Resources 5-13
5.6.2 Impacts 5-16
5.6.3 Mitigative Measures 5-16
5.7 Recreational Resources 5-16
5.7.1 Description of Resources 5-16
5.7.2 Impacts 5-17
5.7.3 Mitigative Measures 5-17
5.8 Effects on Land-Based Economies 5-17
5.8.1 Description of Resources 5-17
5.8.2 Impacts 5-17
5.8.3 Mitigative Measures 5-18
5.9 Soils 5-18

5.9.1 Description of Resources 5-18
5.9.2 Impacts 5-18
5.9.3 Mitigative Measures 5-18
5.10 Geologic and Groundwater Resources 5-18
5.10.1 Description of Resources 5-18
5.10.2 Impacts 5-19
5.10.3 Mitigative Measures 5-19
5.11 Surface Water and Floodplain Resources 5-19
5.11.1 Description of Resources 5-19
5.11.2 Impacts 5-20
5.11.3 Mitigative Measures 5-20
5.12 Wetlands 5-20
5.12.1 Description of Resources 5-20
5.12.2 Impacts 5-21
5.12.3 Mitigative Measures 5-21
5.13 Wildlife 5-21
5.13.1 Description of Resources 5-21
5.13.2 Impacts 5-23
5.13.3 Mitigative Measures 5-24
5.14 Federally-Protected Species 5-24
5.14.1 Description of Resources 5-24
5.14.2 Impacts 5-29
5.14.3 Mitigative Measures 5-30
5.15 Summary of Impacts 5-31

6.0 PUBLIC AND AGENCY COORDINATION 6-1

7.0 POTENTIAL PERMITS/APPROVALS 7-1

8.0 FACTORS CONSIDERED 8-1
8.1 Public Health and Welfare, Natural Resources, and the Environment 8-1
8.2 Technologies to Minimize Adverse Environmental Effects 8-1
8.3 Beneficial Uses of Waste Energy 8-1
8.4 Unavoidable Adverse Environmental Effects 8-1
8.5 Alternatives to Proposed Site 8-1
8.6 Irreversible and Irretrievable Commitment of Natural Resources 8-1
8.7 Direct and Indirect Economic Impacts 8-1
8.8 Existing Development Plans of the State, Local, Government and Private Entities at or in the Vicinity of the Site 8-2
8.9 Effect of Site on Scenic Areas and Cultural Resources 8-2
8.10 Effect of Site on Biological Resources 8-2

8.11 Agency Comments 8-2

9.0 QUALIFICATIONS OF CONTRIBUTORS 9-1

10.0 LITERATURE CITED..... 10-1

11.0 ACRONYMS AND ABBREVIATIONS..... 11-1

LIST OF TABLES

Illustration 1-1 Northern Divide Wind Projects compared to Previous Projects
Table 1-1 Certificate Completion Checklist
Table 1-2 Project Area Public Land Survey System Subdivisions
Table 1-3 Project Impact Assumptions
Table 1-4 Total Project Impacts
Table 3-1 Exclusion Areas
Table 3-2 Avoidance Areas
Table 3-3 Selection Criteria
Table 3-4 Policy Criteria
Table 3-5 Setback Distance as Designated by the Commission
Table 3-6 Setback Distance as Designated by Burke County Zoning Regulations
Table 3-7 Northern Divide Wind Internal Setbacks
Table 5-1 Land Use Classification Per Turbine
Table 5-2 Land Use Classification within the Project Area
Table 5-3 Existing Daily Traffic Levels
Table 5-4 Public/Private Airports
Table 5-5 Ecoregion Classification Per Turbine
Table 5-6 Summary of Impacts and Mitigation
Table 6-1 Summary of Agency Responses
Table 7-1 Potential Permits and Approvals Required for Construction and Operation
Table 9-1 Qualifications of Contributors

LIST OF FIGURES

Figure 1-1 Project Location and Site Plan (Street Map)
Figure 1-2 Project Location and Site Plan (Aerial)
Figure 1-3 Project Location and Site Plan (Topographic)
Figure 1-4 Project Area and Project Transmission Line
Figure 1-5 Participating Landowners
Figure 3-1 Exclusion and Avoidance Areas
Figure 4-1 Wind Turbine Design Features
Figure 4-2 Path of Energy Diagram
Figure 4-3 Typical Wind Energy Center Layout
Figure 5-1 Land Use Classification
Figure 5-2 Public Lands, Easements, & Agreements
Figure 5-3 Photos of Typical Landscape

Figure 5-4 National Wetlands Inventory and Surface Waters

LIST OF APPENDICES

Appendix A Excerpt of NextEra Energy, Inc.'s 2019 Corporate Responsibility Report

Appendix B Studies and Assessments

B1. National Telecommunications and Information Administration Notification Letter

B2. U.S. Department of Defense Preliminary Screening Tool

B3. Acoustic Assessment

B4. Shadow Flicker Assessment

B5. 2020 Grouse Lek and Raptor Nest Strategy

B6. Dakota Skipper Habitat Assessment

B7. Whooping Crane Habitat Review

B8. Avian Use Report

B9. Northern Long-Eared Bat Habitat Assessment

Appendix C Agency Notification Letters and Correspondence

Appendix D Project Mapbook

1.0 INTRODUCTION

Northern Divide Wind, LLC[1] (Northern Divide Wind), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC (NextEra), respectfully submits this application to the North Dakota Public Service Commission (Commission) for a Certificate of Site Compatibility (Certificate) to construct the 200-megwatt (MW) Northern Divide Wind Energy Center (Project). The Project consists of up to 74 turbines, four alternative turbine locations, access roads, underground electrical collection and communication systems, an Aircraft Detection Lighting System (ADLS), a collection substation, an operations and maintenance (O&M) building, one permanent meteorological evaluation (MET) tower, two temporary power performance MET towers, and temporary works spaces for a construction laydown area and a batch plant (**Figure 1-1**). The Project Area encompasses approximately 10,912 acres (17.05 square miles) in Burke County, North Dakota (**Figures 1-1** through **1-3**). The Project expects to use up to 66 GE (General Electric) 2.72-MW wind turbines (GE 2.72) and up to eight GE 2.32 MW wind turbines (GE 2.32) and will have a nameplate capacity of approximately 200 MW.

Northern Divide Wind executed a 30-year power purchase agreement (PPA) with Basin Electric Power Cooperative (Basin Electric), which will purchase the Project's electrical output. The Project will meet area demand for electricity from ongoing oil and gas activities in the Bakken and from the region's homes and businesses. The Project's generated power will interconnect to the electrical grid through a planned 41-mile-long 345-kV transmission line (Project Transmission Line) (**Figure 1-4**) that will convey approximately 200 MW to the existing Basin Electric Tande Substation (Tande Substation). Per Commission regulations, the Project Transmission Line requires a separate application for a Certificate of Corridor Compatibility and Route Permit, which Northern Divide Wind is filling concurrently with the Project application.

Interconnection of the Project is currently being studied under the Southwest Power Pool (SPP) Definitive Planning Phase 2016-002 study group. This consists of a single SPP interconnection request (GEN-2016-151) for 200 MW into Basin Electric's Tande Substation. Northern Divide Wind expects to execute the generator interconnection agreement with SPP and Basin Electric in the first quarter of 2020.

NextEra, through its subsidiaries and affiliates, develops renewable projects throughout the United States and Canada. NextEra is one of the world's leading generators of wind energy, operating more than 15,000 MW of emissions-free wind energy in North America. In North Dakota, NextEra affiliates own and/or operate 14 wind facilities (that generate approximately 1,250 MW) with another 200 MW wind energy project currently under construction. NextEra designs, constructs, and operates its facilities in an environmentally sound and responsible manner. NextEra's 2019 Corporate Responsibility Report in **Appendix A** describes NextEra's environmental accountability, management, and stewardship policies that are intended to:

- Design, construct, operate, and maintain its 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 Project History

In 2017, Burke Wind, LLC (Burke Wind) proposed a wind energy center in Burke County and filed an application for a Certificate of Site Compatibility with the Commission in Case No. PU-18-344 (Previous

[1] On August 29, 2019, NextEra changed the name of Burke Wind, LLC to Northern Divide Wind, LLC, the applicant in this docket. References to Northern Divide Wind herein reflect this update. Corporate paperwork, including documentation of the name change, is being filed with the Commission.

Project) (**Illustration 1-1**). During development of the Project, Northern Divide Wind utilized information and data obtained from the Previous Project, including study results (**Appendix B**) and feedback from the Commission, North Dakota Game and Fish Department (NDGFD), U.S. Fish and Wildlife Service (USFWS), and other stakeholders. Incorporating this feedback, Northern Divide Wind made extensive revisions to reconfigure the Project to address prior concerns. The Project has minimal adverse effects on the environment and the welfare of North Dakota citizens, is compatible with environmental preservation and the efficient use of resources, and minimizes adverse human and environmental impact, while ensuring that energy needs are met and fulfilled in an orderly and timely fashion. Northern Divide Wind took the following steps in developing the Project based on recommendations from NDGFD and USFWS (see NDGFD correspondence in **Appendix C**):

- Shifted the Project Area to a predominantly (64%) agricultural landscape with minimal (7%) native, unbroken grassland. The Previous Project was 21% native, unbroken grassland;
- Relocated 44 Previous Project turbines and eliminated three of the 81 Previous Project turbines including the 11 eastern-most turbines, which the NDGFD opined were the most critical to relocate;
- Reduced the Project Area by approximately 52% compared to the Previous Project Area (10,912 acres vs. 22,933 acres);
- Sited all turbines in tilled cropland. The Previous Project had 62 of the 81 turbines sited in cropland;
- Sited all turbines outside of high (>20 pairs per square mile) pintail duck density areas, as recommended by the NDGFD and USFWS. The Previous Project had 31 of 81 turbines sited in high pintail duck density areas;
- Sited 20 of 78 turbines outside of the Northern Missouri Coteau ecoregion, as mapped by Bryce *et al.* 1996). In the Previous Project design, only three of 81 turbines were located outside this ecoregion (**Figure 1-3**);
- NextEra committed to the NDGFD and USFWS to avoid further development of wind generation projects in the Northern Missouri Coteau;
- Committed to the NDGFD and USFWS to avoid all direct impacts to all wetlands, regardless of their U.S. Army Corps of Engineers (USACE) jurisdictional status; and
- Committed to the NDGFD and USFWS to make voluntary offsets for indirect avian displacement.

1.2 Compliance with the Energy Conversion and Transmission Facility Siting Act

The North Dakota Energy Conversion and Transmission Facility Siting Act requires that a Certificate application demonstrates that the proposed energy conversion facility meets criteria set forth in North Dakota Century Code (N.D.C.C.) Chapter 49-22 and North Dakota Administrative Code (N.D. Admin. Code) Article 69-06. The applicant must site an energy conversion facility in an orderly manner compatible with environmental preservation and the efficient use of resources (N.D.C.C. Section 49-22-02).

This application demonstrates that the Project complies with N.D. Admin. Code Section 69-06-08-01 exclusion and avoidance areas and selection and policy criteria. **Table 1-1** outlines the requisite information to fulfill the Certificate criteria and the corresponding section in this application.

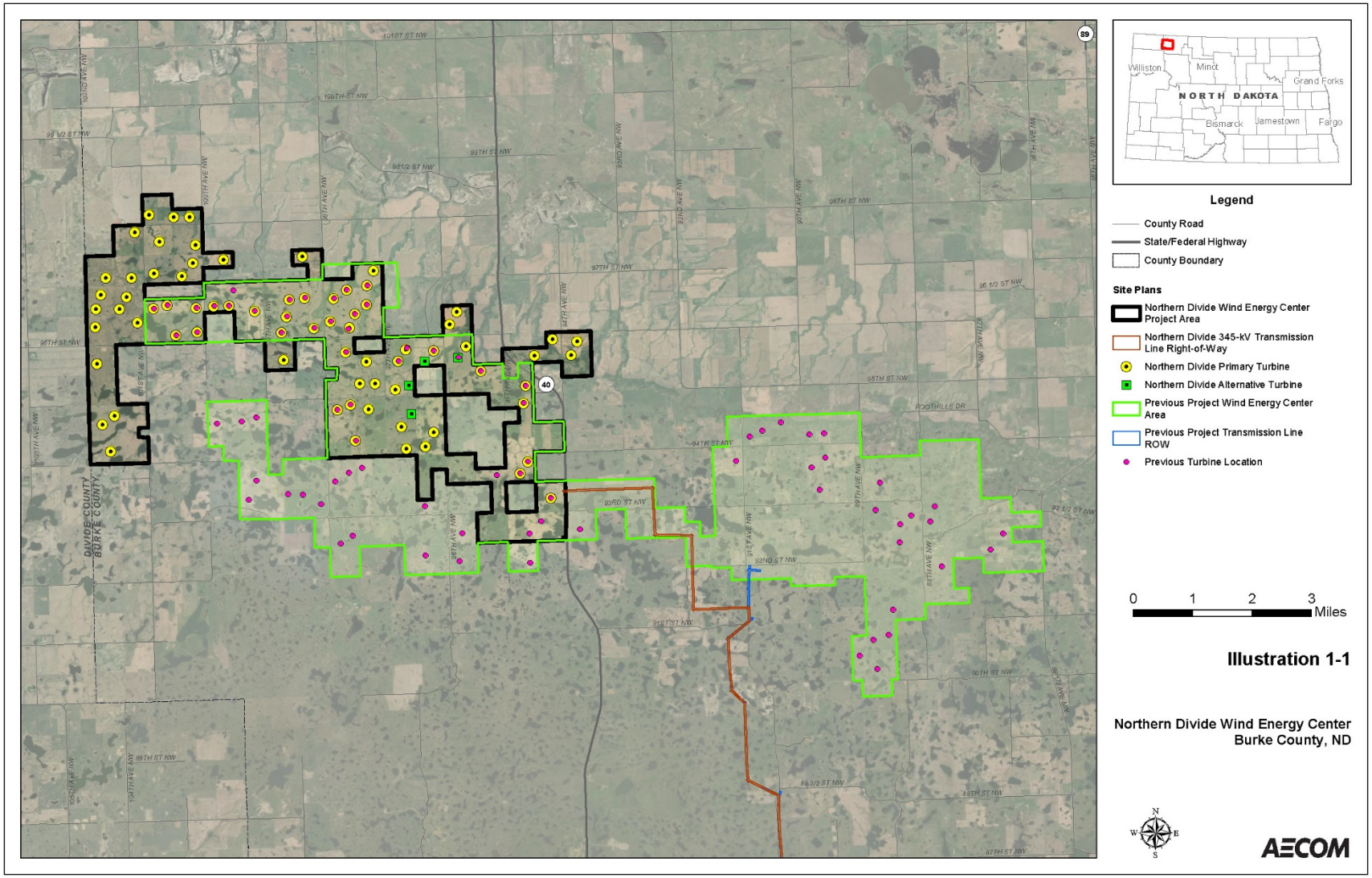


Illustration 1-1 Northern Divide Wind Projects compared to Previous Projects

Table 1-1 Energy Conversion Facility Certificate of Site Compatibility Criteria Checklist

State Authority	Description	Section Addressed
N.D. Admin. Code 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 will occupy	1.3.1, Table 1-4
	(6) The anticipated time schedule for: (a) Obtaining the certificate of site compatibility (b) Completing land acquisition (c) Starting construction (d) Completing construction (e) Testing operations (f) Commencing commercial production (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 B
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 N.D.C.C. Section 49-22-09.	1.3.1, 3.0, 8.0; Figures 1-2, 1-3, and 1-4, Appendix D
f.	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 A
g.	A map identifying the criteria that provides the basis for the specific location of the proposed facility within the study area.	Figures 1-1 and 3-1, Appendix D
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.	3.1, 3.2, 3.3, 3.4, 3., 3.6,3.7, Tables 3-1 through 3-4, Figure 3-1, Appendix D
i.	A discussion of the mitigative measures that the applicant will take to minimize adverse impacts which result from the location, construction, and operation of the proposed facility.	5.1.3. 5.2.3, 5.3.3, 5.4.3, 5.5.3, 5.6.3, 5.7.3, 5.8.3, 5.9.3, 5.10.3, 5.11.3, 5.12.3, 5.13.3, 5.14.3, 5.15
j.	The qualifications of each person involved in the facility site location study.	9.0
k.	A map of the study area showing the location of the proposed facility and the criteria evaluated.	Figures 1-1 and 3-1, Appendix D
l.	An eight and one-half-inch by eleven-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.	5.2.1, 8.8, 8.11

State Authority	Description	Section Addressed
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 1-1 through 7-7, Appendix D
N.D.C.C. 49-22-08	**Application for a certificate - Notice of filing - Amendment - Designation of a site or corridor.**	
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.	1.3.1, 4.0, Table 1-4
b.	A summary of any studies which have been made of the environmental impact of the facility.	1.3, 5.2, 5.12, 5.13, Table 1-3, Table 1-4, Appendix B
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 1-2, 1-3, and 1-4, Appendix D
e.	An identification of the location of the preferred corridor for any transmission facility.	1.1, 4.3
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.	1.1, 1.3.3, 3.1, 3.2, 3.3, 3.4, 3.5, 8.0, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8,11
g.	A description of mitigative measures that will be taken to minimize all foreseen adverse impacts resulting from the location, construction, and operation of the proposed facility.	5.1.3. 5.2.3, 5.3.3, 5.4.3, 5.5.3, 5.6.3, 5.7.3, 5.8.3, 5.9.3, 5.10.3, 5.11.3, 5.12.3, 5.13.3, 5.14.3, 5.15
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.	8.0
i.	Such other information as the applicant may consider relevant or the commission may require.	Appendix B
N.D.C.C. 49-22-09	**Factors to be considered in evaluating applications and designation of sites, corridors, and routes.**	**8.0**
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.	8.1
2.	The effects of new energy conversion and transmission technologies and systems designed to minimize adverse environmental effects.	8.2
3.	The potential for beneficial uses of waste energy from a proposed energy conversion facility.	8.3
4.	Adverse direct and indirect environmental effects which cannot be avoided should the proposed site or route be designated.	8.4
5.	Alternatives to the proposed site, corridor, or route which are developed during the hearing process and which minimize adverse effects.	8.5
6.	Irreversible and irretrievable commitments of natural resources should the proposed site, corridor, or route be designated.	8.6
7.	The direct and indirect economic impacts of the proposed facility.	8.7
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.	8.8
9.	The effect of the proposed site or route on existing scenic areas, historic sites and structures, and paleontological or archaeological sites.	8.9
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.	8.10
11.	Problems raised by federal agencies, other state agencies, and local entities.	8.11

1.3 Siting Flexibility

Northern Divide Wind seeks a Certificate for the Project Area (**Figures 1-1** through **1-3**), as opposed to specific infrastructure locations, which facilitates siting flexibility and allows Northern Divide Wind to modify the Project site plan to constraints as they are identified. If any changes to the Project site plan are made after submission of this application, Northern Divide Wind will submit to the Commission an updated site plan and site plan modification memorandum. A pre-construction conference call will be held with Commission staff to ensure that the final Project site plan conforms to the Certificate requirements. Northern Divide Wind believes that this siting process is consistent with North Dakota siting rules and provides Northern Divide Wind with the flexibility necessary to develop a timely, cost-effective project in an environmentally responsible manner.

1.4 Project Summary

Northern Divide Wind proposes to site, construct, and operate the approximately 200-MW wind generation facility in northwestern Burke County, North Dakota, a rural, agricultural area located six miles south of Columbus and approximately 15 miles northwest of Powers Lake. All facilities are on private land except where underground collection and communication cables cross public road rights-of-way. The Project location optimizes and balances wind resource, transmission interconnection, environmental considerations, economic perspectives, and N.D. Admin. Code Section 69-06-08-01 criteria.

1.4.1 Project Area

The Project Area is approximately 10,912 acres (17.05 square miles), consisting of 88 land parcels (41 landowners), and all landowners within the Project Area are participants (**Figure 1-5**). **Table 1-2** summarizes the Public Land Survey System subdivisions that are included within the Project Area.

Table 1-2 Project Area Public Land Survey System Subdivisions

County	Township Name	Township	Range	Section(s) [1]
Burke	Keller	162 North	94 West	20, 26 - 35
	Fay	162 North	93 West	31
	Harmonious	161 North	94 West	1 - 3, 6, 7, 11 - 13
	Leaf Mountain	161 North	93 West	4 - 8, 17 - 20

[1] Note that locations within the Project Area may be located within the Section but may not encompass the entire Section.

Within the Project Area, permanent impacts are considered the final operational footprint (*e.g.,* turbine foundation, turbine pads, access roads, etc.), which will occupy approximately 57.2 acres (see **Tables 1-3** and **1-4** below), or less than one percent of the total Project Area. These permanent impacts will remain for the life of Project, but will be removed upon decommissioning (see section 4.6). Temporary impacts are those that result from certain construction activities but are later reclaimed (*e.g.*, laydown and storage areas, underground systems installation, etc.). **Table 1-3** summarizes the assumptions used to calculate Project infrastructure impacts. **Table 1-4** summarizes the estimated impact for each Project component during construction, reclamation (or the Project temporary impacts), and operation (or the permanent Project impacts). The Project Area and Project layout are shown on **Figures 1-1** through **1-3**.

Table 1-3 Project Impact Assumptions

Project Component	Total Construction Impacts	Temporary/Reclaimed Impacts	Permanent Operational Impacts [6]
Wind Turbines [1]	4.5 acres per turbine	4.44 acres per turbine	0.06 acres per turbine
Access Roads [2]	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 [3]	50 feet wide per linear foot for a single line	50 feet wider per linear foot minus 12 feet by 8 feet per junction box	12 feet by 8 feet for each junction box
Permanent MET Tower [4]	1.25 acres per tower	1.25 acres per tower	0 acres
Temporary MET Towers [5]	1.25 acres per tower	1.25 acres per tower	0 acres
ADLS Radar Tower	21,780 square feet (0.5 acres)	21,380 square feet	400 square feet
Crane Paths	50 feet wide per linear foot	50 feet wide per linear foot	0 acres
O&M Building	4 acres	1 acre	3 acres
Collection Substation	4 acres	1 acre	3 acres
Batch Plant	3.2 acres	3.2 acres	0 acres
Construction Laydown Area	20 acres	20 acres	0 acres

[1] 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 an 18-foot diameter turbine base with a 20-foot buffer for the gravel pad, or 0.06 acres per turbine.

[2] 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 would remain up to 38 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.

[3] 50 feet is the width needed for a single collection with a maximum width of 200 feet where eight collections lines run parallel.

[4] Once installed, the tower has a negligible one square-foot base plate.

[5] Temporary MET towers will be installed up to two year and then reclaimed.

[6] Permanent disturbance during the life of the Project; following decommissioning all areas will be reclaimed per landowner preference.

Table 1-4 Total Project Impacts

Project Component	Total Construction Impacts (acres)	Temporary/Reclaimed Impacts (acres)	Permanent Operational Impacts (acres) [9]
Wind Turbines [1]	310.8	306.4	4.4
Access Roads [2]	146.0	99.3	46.7
Collection Lines [3]	213.6	213.6	0.0
MET Towers [4]	3.75	3.75	0.0
ADLS Radar Tower [5]	0.3	0.3	0.01
Crane Paths [6]	11.9	11.9	0.0
O&M Building	4.0	1.0	3.0
Collection Substation	4.0	1.0	3.0
Batch Plant	3.2	3.2	0.0
Construction Laydown Area	20.0	20.0	0.0
Total	717.4	660.3 [7]	57.2 [8]

[1] Assumes 74 turbines times 4.5 acres of ground disturbance during construction; 0.06 acre/turbine of that remaining as permanent. Four alternate turbine locations have been identified to allow siting flexibility but were not included in the calculation; calculations for associated

roads and collection lines included all roads and collection lines shown in the layout because these facilities may be needed to access the proposed turbine locations.

[2] Assumes a 50-foot wide disturbance for roads during construction; 16 feet of that remaining during operation. Assumes a total of approximately 25 linear miles of service roads. The overlapping areas for turbines were excluded from the road impact calculations to avoid double counting the same footprint.

[3] The overlapping areas between the collection line corridor buffer and the turbine and access road buffers were removed from impact calculation to avoid double counting the same footprint. The layout includes approximately 67 miles of collection lines. Junction boxes will be located on the ground throughout the Project Area and will each require approximately 12 feet by 8 feet. A total of 22 junction boxes are required.

[4] Includes one permanent MET tower and two temporary MET towers. MET tower has a negligible one square-foot base plate.

[5] The ADLS radar tower is contained within the access road construction footprint. Therefore, temporary impacts were excluded to avoid double counting the same footprint.

[6] The overlapping areas between the crane path buffer and turbines, access roads, and collection line corridor buffers were removed from the impact calculation to avoid double counting the same footprint.

[7] Assumed temporary impacts.

[8] Assumed permanent impacts.

[9] Permanent disturbance during the life of the Project; following decommissioning all areas will be reclaimed per landowner preference.

1.4.2 Project Area Selection

Multiple factors and inputs contributed to Project Area selection and development, and all must be carefully weighed and balanced. The Project Area must have an optimal wind resource and proximity to an interconnection point (substation) to meet the customer's need. Stakeholder engagement and input, including community support, landowner participation, and agency feedback, are vitally important, as this feedback helps to identify developable and suitable areas. Finally, environmental studies, setback analyses, and N.D. Admin. Code criteria further define potential constraints and feasibility.

1.4.3 Project Area Wind Characteristics

Northern Divide Wind utilized wind data from MET towers and sonic detection and ranging (SODAR) devices to quantify and analyze the wind resource and determined that the wind resource in this region is optimal.

Northern Divide Wind utilized WINDExchange to analyze the wind resource. WINDExchange, which is supported by the Wind Energy Technologies Office at the U.S. Department of Energy (USDOE) and facilitated by the National Renewable Energy Laboratory (NREL), published a state-specific wind resources map for North Dakota. This wind resources map identifies annual average wind speeds at an elevation of 80 meters (262 feet) above ground level that could be used for utility-scale wind development (NREL 2011). Wind, as a renewable resource, is categorized by typical wind speeds. In most cases wind speeds of 6.5 meters per second (14.5 miles per hour [mph]) or greater can be efficient in generating power with large turbines at a height of 80 meters (262 feet). Wind speeds range between 8.0 and 8.5 meters per second (18 to 19 mph) and thus the wind resource is optimal.

Northern Divide Wind 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 Northern Divide Wind. Industry standard software, such as Windographer, Openwind, WRF, and ArcGIS as well as internal Northern Divide Wind 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 Project Area effects to predict the spatial wind variations. Various site layouts and wind turbine generator parameters can be tested to predict energy production and array efficiency in order 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 Northern Divide Wind's internal wind resource group, NEXTera Analytics, there is good correlation between the long-term wind measurements and the short-term Project-specific wind.

1.4.4 Projected Wind Energy Production

The Project will have a nameplate (gross) capacity of approximately 200 MW, with a net capacity factor of 47.8 percent. As with all wind projects, output is dependent upon wind resource, final design, site-specific features, and equipment.

1.5 Project Schedule

Key schedule milestones include:

1. **Certificate of Site Compatibility and Other Permit**: Requested by May 2020.

2. **Land Acquisition**: All land easement agreements necessary for Project development are acquired.

3. **Equipment Procurement, Manufacture, and Delivery**: All turbines are secured. Ordering of other long-lead equipment, such as substation components, is in progress.

4. **Construction**: Anticipate construction activities running approximately 6 months from May through October 2020.

5. **Testing Operations**: Anticipate beginning in November 2020.

6. **Commercial Operation**: Anticipated by the end of November 2020.

7. **Expansions or Additions**: Consistent with its commitments to the NDGFD and USFWS, Northern Divide Wind will not expand or add to the Project.

1.6 Project Ownership

Northern Divide Wind will own the entire Project and, as a result, will manage the construction of all equipment and associated facilities. Northern Divide Wind has selected a third-party EPC contractor to perform construction.

2.0 NEED FOR FACILITY

2.1 Need Analysis

North Dakota's energy consumption per capita rank among the top five states, mainly because of its energy-intensive industrial sector that includes oil and natural gas extraction industries, mining that includes lignite coal production, and agriculture (USEIA 2019). Additional electrical generation is required to keep up with demand within North Dakota, due to population expansion as well as the high demand for heat in winter.

Created by the North Dakota Legislature under the Department of Commerce, the EmPower North Dakota Commission (EmPower) – a group comprised of leaders from all the state's energy industries – is charged with developing comprehensive energy policy recommendations for the state's diverse and growing energy industry. According to EmPower's *Comprehensive State Energy Policy Report 2011-2025*, one of the state's energy goals is to increase installed wind energy capacity to 5,000 MW by 2020 assuming it is cost effective to do so (EmPower ND 2010). As of second quarter 2019, North Dakota has a total of 3,155 MW of installed wind capacity (AWEA 2019).

Consistent with these overall state energy goals and needs, in October 2016, Northern Divide Wind executed a 30-year PPA with Basin Electric for the Project, which will interconnect to the electrical grid via Basin Electric's Tande Substation. The Tande Substation was constructed in 2017 to meet regional electricity demands, primarily from ongoing oil and gas activities in the Bakken, and to meet electric transmission reliability standards in accordance with the requirements of the North American Electric Reliability Corporation (NERC). Preliminary Basin Electric interconnection studies determined that Tande Substation was the optimized point of interconnection based on the Project's proximity.

2.2 Alternatives

Feasible technology alternatives to wind include electricity generation using coal, natural gas, or biomass. None of these alternatives to wind were considered because these technologies do not meet the state's goal of adding new wind energy. Based on the size, type and timing of the Project, it is unlikely that an alternative to wind would meet the same need. No alternatives to wind are in the same position to satisfy the need for a low-cost energy resource to meet the demand for forecasted regional load growth.

Although the Project includes up to 74 turbine locations, an additional four alternate turbine locations have been included in the Project layout to provide siting flexibility and account for unforeseen circumstances identified during construction. The Project will also include one permanent Supervisory Control and Data Acquisitions (SCADA) MET tower and two temporary power performance MET towers.

2.3 Ten-Year Plan

Northern Divide Wind will file a Ten-Year Plan for the Project with the Commission in compliance with N.D.C.C. Section 49-22-04.

3.0 SITE SELECTION CRITERIA

Siting turbines is an iterative process, balancing wind resources, transmission, stakeholder engagement and input, economics, setbacks, and environmental constraints. Northern Divide Wind evaluated the Project Area to determine optimal locations for up to 74 turbines, and an additional four alternate turbine locations have been included in the Project layout in order to provide siting flexibility; however, only up to 74 wind turbines will be constructed.

Northern Divide Wind has secured voluntary wind option agreements with landowners and identified turbine locations based on site inspection, topographic maps, known environmentally sensitive areas, review of North Dakota's energy conversion facility siting exclusion and avoidance areas, review of Burke County and state wind siting requirements, and communications with local, state, and federal agencies. NextEra subsidiaries have used this siting process in developing past wind energy projects, including 15 wind energy projects in North Dakota. Through this process, NextEra subsidiaries address environmental issues that commonly arise during project development and works within the parameters of local, state, and federal requirements. Northern Divide Wind has reviewed the criteria in N.D. Admin. Code Chapter 69-06-08 and has considered these criteria in Project design. These criteria are discussed in this section.

3.1 Exclusion Areas

In accordance with N.D. Admin. Code Section 69-06-08-01(1) and (2), the geographical areas listed in **Table 3-1** must be excluded in the consideration of a site for an energy conversion facility. **Figure 3-1** depicts the exclusion areas.

Table 3-1 Exclusion Areas

Exclusion Area	Description if Present in or Applicable to the Project	Section Addressed
Designated or registered national: 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.	Not applicable.	5.2, 5.7, Figure 3-1, Appendix D
Designated or registered state 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.	Archaeological sites, as identified through a Class I Literature Search and a Class III Cultural Resources Inventory are present, which the Project will avoid.	5.2, 5.6, 5.7 Figure 3-1[1]
County parks and recreational areas; municipal parks; parks owned or administered by other governmental subdivisions; hardwood draws; and enrolled woodlands.	Not applicable.	5.2, 5.7 Figure 3-1, Appendix D
Areas critical to the life stages of threatened or endangered animal or plant species.	Not applicable.	5.13, 5.14
Areas where animal or plant species that are unique or rare to this state will be irreversibly damaged.	Not applicable.	5.2, 5.13, 5.14
Areas within 1,200 feet of the geographic center of an intercontinental ballistic missile launch or launch control facility.	Not applicable.	Table 3-5

Exclusion Area	Description if Present in or Applicable to the Project	Section Addressed
Wind-energy specific exclusion areas: • 1.1 x height of turbine from interstate or state roadway right-of-way; • 1.1 x height of turbine + 75 feet from center line of county or maintained township roadway; • 1.1 x height of turbine from railroad right-of-way; • 1.1 x height of turbine from 115kV or higher transmission lines; • 1.1 x height of turbine from property line of non-participating landowners; and • 3 x height of turbine from residences of non-participating landowners.	The Project complies.	3.5, Table 3-5

[1] Known archaeological sites are not depicted on **Figure 3-1** due to confidentiality.

3.2 Avoidance Areas

In accordance with N.D. Admin. Code Section 69-06-08-01(3) and (4), the geographical areas listed in **Table 3-2** cannot 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 Commission 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. The area of avoidance must include a buffer zone of a reasonable width to protect the integrity of the area. Avoidance areas are also mapped for the Project Area on **Figure 3-1**.

Table 3-2 Avoidance Areas

Avoidance Area	Description if Present in Project Area or Applicable to Project	Section Addressed
Historical resources which are not designated as exclusion areas	Historic farmsteads and cemeteries are present, which the Project will avoid.	5.6, 5.15, Figure 3-1
Areas within the city limits of a city or the boundaries of a military installation	Not applicable.	5.3, 5.4, Figure 3-1, Appendix D
Areas within known floodplains as defined by the geographical boundaries of the hundred-year flood	Not applicable.	5.11, 5.15
Areas that are geologically unstable	Not applicable.	5.10, 5.15
Woodlands and wetlands	The Project will avoid direct impacts to all wetlands. The Project minimizes impacts to trees/shrubs. For unavoidable impacts Northern Divide Wind will comply with the Commission's Tree and Shrub Mitigation Specifications.	5.2, 5.12, Figure 3-1
Areas of recreational significance which are not designated as exclusion areas	Not applicable.	5.2, 5.7
Geographic area where, due to operation of the facility, the sound levels within 100 feet of an inhabited residence or a community building will exceed 50 decibels, A-weighted (dBA)	The Project complies.	5.5

3.3 Selection Criteria

In accordance with N.D. Admin. Code Section 69-06-08-01(5), a site can be approved in an area only when the applicant has demonstrated to the Commission 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 3-3**, will be at an acceptable minimum, or that those effects will be managed and maintained at an acceptable minimum.

Table 3-3 Selection Criteria

Selection Criteria	Potential Effects	Section Addressed
The impact upon agriculture:		
Agricultural production	Negligible/minimal effect anticipated. Landowners will be compensated through an easement payment for loss of agricultural production. Only land needed during operations will be permanently affected. Temporarily disturbed areas will be restored as practicable.	5.2, 5.8, Figure 5-1
Family farms and ranches	Negligible/minimal effect anticipated. Wind development is a compatible use with existing family farms and ranches and will not displace any farms or ranches.	1.3, 5.8
Land which the owner demonstrates has soil, topography, drainage, and an available water supply that cause the land to be economically suitable for irrigation	No effect anticipated. Participating landowners have not expressed concerns related to economically suitable irrigation on their land. No irrigation is occurring within the Project Area.	5.8, 5.9
Surface drainage patterns and ground water flow patterns	No effect anticipated. Project infrastructure will avoid impacts to surface waters 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.	5.10, 5.11, 5.12, Figure 5-4
The agricultural quality of the cropland	No effect anticipated. If compaction of soils occurs during construction, Northern Divide Wind will work with landowners to alleviate the compaction.	5.8, 5.9, Figure 5-4
The impact upon the availability and adequacy of:		
Law enforcement	Positive effect anticipated. The Project will have a positive economic effect on law enforcement due to increased county tax revenue.	5.3
School systems and education programs	Positive effect anticipated. The Project will have a positive economic effect on school systems and education programs due to increased county tax revenue.	5.3
Governmental services and facilities	Positive effect anticipated. The Project will have a positive economic effect on governmental services and facilities due to increased county tax revenue.	5.3
General and mental health care facilities	No effect anticipated.	N/A
Recreational programs and facilities	Negligible/minimal effect anticipated. Recreational impacts will be auditory and visual in nature and limited to individuals using land in and near the Project Area for hunting, fishing, or nature observation.	5.3, 5.7, 5.15
Transportation facilities and networks	Negligible/minimal effect anticipated. Vehicle traffic will temporarily increase during construction, but no long-term effects are expected. Project operation will have a negligible effect on transportation facilities and networks.	5.3

Selection Criteria	Potential Effects	Section Addressed
Retail service facilities	Positive effect anticipated. Local services such as motels, restaurants, and convenience stores are likely to experience an increase in business during Project construction.	5.3
Utility services	No effect anticipated. The Project will utilize station service from Burke-Divide Electric Co-Op, Inc., which will suggest appropriate configurations for the electrical system, and Northern Divide Wind will abide by the recommendations to prevent impacts to the transmission system.	5.3
The impact upon:		
Local institutions	No effect anticipated.	N/A
Noise-sensitive land uses	Negligible/minimal effect anticipated. WildWood Park campground was modeled as a noise-sensitive land use as part of the acoustic assessment, and the sound level at that location is predicted to be no more than 41 dBA.	5.5, 5.15
Light-sensitive land uses	Negligible/minimal effect anticipated. The Project will include Federal Aviation Administration (FAA) approved ADLS, consistent with N.D. Admin. Code Chapter 69-06-11.	4.3, 5.3
Rural residences and businesses	Negligible/minimal effect anticipated. The Project will comply with state and local setbacks.	3.5, 5.1, Appendix D
Aquifers	No effect anticipated. Based on the small amount of increased impervious surface area, which will be created by Project components, relative to the separation of these components and the size of the entire Project Area, the Project would likely have minimal impacts to regional groundwater recharge.	5.10
Human health and safety	No effect anticipated based on compliance with sound, shadow flicker, and light regulations and standards.	4.3, 5.3, 5.4, 5.5,
Animal health and safety	No effect anticipated. Northern Divide Wind will implement measures to avoid and minimize effects to wildlife by siting turbines at least 0.25 miles from active raptor nests and 0.5 miles from leks. Northern Divide Wind will implement a Wildlife Response and Reporting System once wind turbine construction is complete.	5.13, 5.14
Plant life	Negligible/minimal effect anticipated. Minimal impact to native plant life due to siting predominantly in cropland and broken grassland. Trees/shrubs will be replaced according to the Commission's Tree and Shrub Mitigation Specifications. Temporarily disturbed areas will be restored as practicable.	5.2, Table 5-2, Figure 5-1
Temporary and permanent housing	Positive effect anticipated. Operations staff are likely to live in the region. Existing temporary housing, such as hotels, will be utilized during construction.	5.1
Temporary and permanent skilled and unskilled labor	Positive effect anticipated. Local contractors employed for construction will result in increased wages.	5.1
The cumulative effects of the location of the facility in relation to existing and planned facilities and other industrial development	No effect anticipated. Due to no existing or known planned facilities or industrial development, there is no cumulative effects. Northern Divide Wind has committed it will not expand or add to the Project.	5.1, 8.11

3.4 Policy Criteria

In accordance with N.D. Admin. Code Section 69-06-08-01(6), the Commission may give preference to an applicant that will maximize benefits that result from the adoption of the policies and practices listed in **Table 3-4** and may require the adoption of such policies and practices as appropriate.

Table 3-4 Policy Criteria

Policy Criteria	Potential Benefits	Section Addressed
Recycling of the conversion byproducts and effluents	Not applicable.	N/A
Energy conservation through location, process, and design	Northern Divide Wind designed the Project to optimize wind resources and maximize energy output while maintaining compliance with Commission siting criteria.	4.2
Training and utilization of available labor in this state for the general and specialized skills required	Northern Divide Wind has utilized several local firms in developing the Project and compiling this application and will continue to use local labor to the extent practicable.	5.1
Use of a primary energy source or raw material located within the state	The energy generated at the site will utilize the wind resources in North Dakota.	1.3.3
Not relocating residents	Not applicable.	5.1
The dedication of an area adjacent to the facility to land uses such as recreation, agriculture, or wildlife management	Not applicable.	N/A
Economies of construction and operation	Northern Divide Wind will utilize local contractors to the extent practicable.	5.1
Secondary uses of appropriate associated facilities for recreation and the enhancement of wildlife	Not applicable.	N/A
Use of citizen coordinating committees	Not applicable.	6.0
A commitment of a portion of the energy produced for use in this state	Basin Electric will purchase the Project's energy for 30 to serve their customers, which are in nine states, including North Dakota.	1.0, 2.1
Labor relations	Not applicable.	5.1
The coordination of facilities	Not applicable.	3.5
Monitoring of impacts	The engineering, procurement, and construction contractor will employ best management practices during construction to monitor soil impacts and segregate topsoil. A storm water pollution prevention plan will be prepared for the Project. Northern Divide Wind will implement a Wildlife Response and Reporting System once wind turbine construction is complete.	4.5, 5.13

Policy Criteria	Potential Benefits	Section Addressed
A commitment to installing light mitigation technology for wind energy conversion facilities subject to commercial availability and Federal Aviation Administration (FAA) approval	Northern Divide Wind will install an FAA-approved ADLS, consistent with N.D. Admin. Code Chapter 69-06-11.	4.3, 5.3,

3.5 Setbacks

The setbacks used in designing the Project comply with or exceed those required by the Commission, Northern Divide Wind's internal setbacks, vendor standards, and local setbacks. The Project complies with or exceeds the following wind energy-specific exclusion areas provided in N.D. Admin. Code Section 69-06-08-01(1) and (2) and N.D.C.C. Section 49-22-05.1. The Project also complies with or exceeds the following Burke County Zoning Regulations setbacks for wind turbines (Burke County 2019). **Tables 3-5** through **3-7** list the setbacks utilized in designing the Project layout. The distances are based on the GE 2.72, which is taller than the GE 2.32. The GE 2.72 will measure 485.6-feet from the base of the tower to the tip of the upright blade. Northern Divide Wind will comply with all applicable Commission and Burke County setbacks.

Table 3-5 Setback Distances as Designated by the Commission

Setback Type	Setback Distance	Setback Distance
Interstate and state road right-of-way	1.1 x height of the turbine	534.1 feet
Centerline of any county or maintained township roadway	1.1 x height of the plus 75 feet	560.6 feet
Railroad right-of-way	1.1 x height of the turbine	534.1 feet
115 kV or higher transmission lines	1.1 x height of the turbine	534.1 feet
Property line of non-participating landowners	1.1 x height of the turbine [1]	534.1 feet
Non-participating residences	3 x height of the turbine	1,456.7 feet
Geographic center of an intercontinental ballistic missile launch or launch control facility	1,200 feet [2]	1,200 feet
Inhabited residence or a community building	A wind energy conversion site must not include a geographic area where, due to the operation of the facility, the sound levels within 100 feet of an inhabited residence or a community building will exceed 50 dBA [3]	-

[1] Per N.D.C.C. Section49-22-05.1 - A variance may be granted if an authorized representative or agent of the permittee and affected parties with associated wind rights file a written agreement expressing all parties' support for a variance to reduce the setback requirement in this subsection. A non-participating landowner is a landowner that has not signed a wind option agreement or a wind easement, as defined in N.D.C.C. 17-04, with the permittee of the wind energy conversion facility.

[2] The nearest turbine to an ICBM launch or launch control facility is approximately 13.18 nautical miles (80,078 feet).

[3] Per N.D. Admin. Code Section 69-06-08-01 - The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building.

Table 3-6 Setback Distances as Designated by Burke County Zoning Regulations

Setback Type	Setback Distance	Setback Distance
Occupied structures [1]	One-half mile from the turbine	2,640 feet
Public roads (includes section lines)	1.1 x height of the turbine	534.1 feet
Bridges	1.1 x height of the turbine	534.1 feet
Rail lines	1.1 x height of the turbine	534.1 feet
Above ground electrical or communication lines	1.1 x height of the turbine	534.1 feet
Antenna towers	1.1 x height of the turbine	534.1 feet
Unoccupied structures	1.1 x height of the turbine	534.1 feet
Improvements with an estimated value over $25,000	1.1 x height of the turbine	534.1 feet
Boundary between the host property and any property that adjoins the host property [2]	1.1 x height of the turbine	534.1 feet
Occupied structure [3]	Operation of the wind energy facility must not cause any EPA level for activity interference or hearing loss to be exceeded either inside or within 50 feet of an occupied structure.	-

[1] A variance to a setback related to an occupied structure may be granted if that structure has not been used as an occupied structure in a year or more prior to submission of the permit application or request for variance.

[2] A variance to a setback related to private property may be granted if the permittee and the affected party sign a waiver agreement.

[3] The Burke County Zoning Regulations adopted the 1974 EPA guidelines from the Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. The guidelines equate to a 49-dBA sound level.

Table 3-7 Northern Divide Wind Internal Setbacks

Setback Type	Setback Distance
Receptor (barn, shed, etc.)	1,014 feet
Roads (public)	609 feet and 1,014 feet from State Highway 40
Railroad	609 feet
Transmission line	534 feet
Distribution lines	534 feet
Participating parcels	223 feet
Underground cable or pipeline	223 feet
Section line	572 feet

3.6 Design and Construction Limitations

Key design and construction limitations when building a wind farm are wind resources, landowner easements, regulatory setbacks (local and state), environmental and cultural exclusion and avoidance areas, and available transmission. The wind resource is essential to selecting and designing a wind farm. Northern Divide Wind has conducted an analysis to ensure that the site has ample wind resource for efficient use. Easements allowing construction of turbine towers and transmission facilities are also critical to the Project. Northern Divide Wind has secured voluntary land agreements with landowners necessary to develop the Project.

3.7 Economic Considerations

Economics were considered when selecting a location for the Project. As discussed above, it is important to select a site with a wind resource capable of generating energy. The Project Area takes advantage of the wind resource in the area. Information on the wind resource at the site is discussed in Section 1.3.3.

The Production Tax Credit (PTC), first enacted in 1994, changed the economics of wind production through a federal tax incentive to develop and operate wind facilities. The provides an economic benefit that lowers the cost of wind energy for the customer and helps promote a sensible energy policy that wisely encourages diversification of energy sources. It is similar to many other government programs for goods and services the government wishes to promote and protect for national economic growth and stability, such as those for farming, housing, and healthcare.

The PTC, which provides operators with a federal tax credit per kilowatt hour of renewable electricity generation for the first 10 years a facility is in operation, was initially set to expire for all eligible technologies at the end of 2012 but was later retroactively renewed. When renewed in 2013, the PTC provided a maximum tax credit for wind generation of 2.3 cents per kilowatt hour (kWh) for the first 10 years of production.

Under the current PTC legislation, wind projects are eligible to receive credit based on either the year the project begins operation or the year in which they demonstrate that 5% of total capital cost for the project has been spent and project construction has begun. This method, known as safe harboring, enables wind developers to receive the PTC at a given year's level, provided they complete construction no more than four calendar years after the calendar year that construction of the facility began. Under the PTC phase out, the amount of the tax credit decreases by 20% per year ending in 2023.

3.8 County Criteria

The Burke County Commission approved the Burke Wind Conditional Use Permit (CUP) for the Previous Project on September 4, 2018. The Burke County Planning and Zoning Board and County Commission approved Northern Divide Wind's request for a CUP amendment on November 19, 2019.

4.0 ENGINEERING AND OPERATIONAL DESIGN ANALYSIS

This section provides a summary description of the Project engineering and operational design analysis, which includes a description of the Project layout, turbines, electrical system, and associated facilities. Additional design components addressed in this section are Project construction, schedule, operation, and decommissioning of the site. There are other turbines that are feasible choices for the Project Area that are available from various manufacturers, and Northern Divide Wind reserves the right to select alternative turbines similar to the GE 2.72 and GE 2.32. Turbine type may affect the number and configuration of the turbine array. Details for the GE 2.72 and GE 2.32 are presented below. However, if an alternative but comparable turbine model is selected, the engineering and operational design considerations and procedures would be expected to be consistent with the description below for the GE 2.72 and GE 2.32.

4.1 Project Layout

Northern Divide Wind has developed a wind farm layout that optimizes the wind resource while minimizing potential impacts on land resources and any 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 will increase the available energy by a factor of eight times. Analysis of wind direction data within the Project Area 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. **Figure 4-2** is a diagram of the path of energy from a wind energy center to energy users, and **Figure 4-3** shows a typical wind energy center layout.

4.2 Wind Turbines

The Project is designed to include a total of up to 74 wind turbines (66 GE 2.72 and eight GE 2.32). As previously stated, Northern Divide Wind is seeking flexibility from the Commission to select the most appropriate technology for the Project at the time of construction to ensure optimization of wind and land resources and cost efficiency.

4.2.1 Turbine

The GE 2.72 has a 295.3-foot hub height and will measure 485.6 feet from the base of the tower to the tip of the upright blade (**Figure 4-1**). The GE 2.32 has a 262.5-foot hub height and will measure 452.7 feet from the base of the tower to the tip of the upright blade (**Figure 4-1**). As the wind passes over the turbine blades, it creates lift and causes the rotor to turn. 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.

Other specifications of the turbines include:

- Rotor blade pitch regulation
- Gearbox with three-stage planetary/helical system
- Double fed three-phase asynchronous 6-pole generator with a wound rotor
- A braking system for each blade (three self-contained systems) and a fail-safe disc brake
- Electromechanically driven yaw systems

4.2.2 Rotor

The rotor consists of three blades mounted to a rotor hub. The rotor is connected by a hub and main shaft to a system of gears, which are connected to a generator that converts the wind energy to electricity. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system, and other electrical and mechanical systems. Both the GE 2.72 and GE 2.32 have a 380.6-foot rotor diameter, with a swept area

of 114,743 square feet. The GE 2.32 and GE 2.72 begin operation in wind speeds of about 16 and 17 mph (respectively).

4.2.3 Turbine Tower

Land will be graded on site for the turbine pads. 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 to the turbine's control system to signal when sufficient winds are present for operation. Turbines feature variable-speed control and independent blade pitch to assure aerodynamic efficiency.

The portion of the foundation that is above ground will be approximately 16 to 18 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 will be made by automatically controlled power welding machines and ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces will be sandblasted, and multi-layer coated for protection against corrosion. Corrosion Protection Classification for external areas of tower components is C5-1. Access to the turbine will be provided through a lockable steel door at the base of the tower.

4.2.4 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 will be placed in each rotor blade and in the turbine tower. The electrical components will also be protected.

4.3 Associated Facilities

In addition to wind turbines, the Project includes access roads, an underground electrical collection system, an underground SCADA communication system, a collection substation, an O&M building, one permanent SCADA MET tower, and two temporary power performance MET towers. The turbine-generated electricity is transmitted to a pad-mounted transformer, where it is converted to the 34.5 kV collection line voltage. The underground collection line system transmits the electricity to the collection substation, where it is converted to the Project Transmission Line voltage. The Project Transmission Line will transmit Project-generated electricity to the Tande Substation. All facilities are on private land except where underground collection and communication cables cross public road rights-of-way. The land for the Project collection substation and O&M building has been purchased.

Additionally, subject to FAA approval, Northern Divide Wind will install an FAA-approved ADLS, consistent with N.D. Admin. Code Chapter 69-06-11.

4.4 Description of Electrical System

In the nacelle of each turbine, a step-up transformer will convert the voltage to the power collection line voltage of 34.5 kV. The power from these transformers will be run through an underground collection system consisting of various sized buried cables. Collection lines will be buried 48 inches deep and will not affect farming operations. The wind turbines will be interconnected by underground power collection cables and co-located fiber optic communication cables. All the collection system cables will terminate at the Project substations. The substations will include power transformers to step up the voltage from 34.5 kV to 345 kV and provide the necessary protection and control for interconnection to the transmission grid.

Collection line corridors are shown on **Figure 1-1** and have been surveyed for environmental, cultural, and tribal constraints. These corridors provide enough area for the final design of the collection lines to avoid all environmental, cultural, and tribal constraints during construction while still meeting design specifications. The

disturbed area will be reclaimed upon installation of the collection lines and that normal agricultural practices can continue where applicable.

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

4.5 Project Construction

Several activities must be completed prior to the 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 Project. Construction activities include:

- Ordering of all necessary components including turbine towers, nacelles, blades, foundations, and transformers
- Final turbine siting
- Complete survey to site locations of structures and roadways
- Complete soil borings, testing, and analysis for proper foundation design and materials
- Complete construction of access roads, to be used for construction and maintenance
- Construct underground feeder lines
- Design and construction of the collection substation
- 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

Turbine access roads service construction, operation, and maintenance. Each wind turbine will be accessible via all-weather access roads that will connect with public roads. Typical access roads are 16 feet wide; have an aggregate, pervious surface; and are adequate to support the size and weight of maintenance vehicles. The turbine location dictates siting and length of access roads.

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. Northern Divide Wind estimates that there will be approximately 600 additional trips per day in the area during peak construction periods. That volume will occur during the peak time when the majority of the road, foundation, and turbine tower assembly are taking place. At the completion of each construction phase, this equipment will be removed from the site or reduced in number.

Post-construction reclamation activities generally include:

- Cleaning up all construction sites, including removing and properly disposing of debris;
- Removing all temporary facilities, including staging areas;
- Installing appropriate erosion control measures; and
- Reseeding and replacing trees and shrubs as necessary in disturbed areas with vegetation similar to vegetation that was removed and restoring the areas to their original condition to the extent practicable. Trees and shrubs will be replaced according to the Commission's Tree and Shrub Mitigation Specifications.

4.5.1 Construction Management

Northern Divide Wind's EPC contractor will be primarily responsible for construction management. 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
- Performing detailed civil, structural, and electrical engineering
- Scheduling and execution of construction activities
- Forecasting labor requirements and budgeting

The EPC contractor will also serve as key contact and interface for subcontractor coordination. The EPC contractor will oversee the installation of communication and power collection lines as well as 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. Project construction will consist of the following tasks:

- Site development, including roads
- Foundation excavation
- Concrete foundation installations
- 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 subcontractors to complete all aspects of construction. Throughout the construction phase, ongoing coordination will occur between the development and the construction teams. The on-site construction manager will help to coordinate all aspects of the Project, including ongoing communication with local officials, citizens groups, and landowners. Even before the Project becomes fully operational, the O&M staff will be integrated into the construction phase. The construction manager and the O&M staff manager will work together continuously to facilitate a smooth transition from construction through wind farm commissioning and operations.

4.5.2 Foundation Design

Each freestanding cylindrical or tubular wind turbine tower 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 or circular, are approximately 16 to 18 feet across at the base, and extend seven to 10 feet below grade. The wind turbine foundation design will be prepared by a professional engineer licensed to practice in the State of North Dakota.

4.5.3 Civil Works

Construction 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
- 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 electrical collection system 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 site fencing and security where necessary
- Restoration and revegetation of disturbed land when construction activities have been completed

Any improvements to existing public access roads will 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 (such as access for 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 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.

4.5.4 Commissioning

The Project will be commissioned after completion of the construction phase. The 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.

4.5.5 Project Operation and Maintenance

Northern Divide Wind will operate and maintain the Project. Five to seven full-time employees will operate and maintain the Project. The O&M staff will have full responsibility in ensuring the Project operates consistent with applicable permits, prudent industry practice, and equipment manufacturer recommendations.

In addition to the on-site O&M staff, remote staff will control, monitor, operate, and maintain the Project by means of a SCADA computer software program and can shut down turbines if necessary. Monitoring of the Project will occur 24 hours a day, seven days a week. The operation of the entire wind farm, including discrete settings for individual turbines, will be managed by the on-site operations staff and remotely via the SCADA system. For example, in the unlikely scenario on-site staff must evacuate the site or are unable to access the O&M facility, the remote staff can effectively manage system operations.

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 (*e.g.*, generator speed, wind speed, power output) 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 SCADA communication system will be collocated with the collection line system.

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

4.5.6 Maintenance Schedule

Northern Divide Wind’s on-site O&M staff will be responsible for maintenance of the Project on a daily basis. This monitoring will be accompanied by visual inspections by the on-site operations staff. Service and maintenance will be carefully planned and consistent with prudent industry practices. An initial maintenance inspection of each turbine will be performed after turbine commissioning. Following this initial inspection, each

turbine will receive annual visits that will include inspections of the various systems and components such as the gearbox, generator, brake, pitch, lubricant, bolts, and transformer.

4.5.7 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 structures, access roads, drainage systems and other facilities necessary for operation
- Maintenance of all O&M field maintenance manuals, service bulletins, revisions, and documentation
- Maintenance of all parts, price lists, and computer software
- Maintenance and operation of substation facilities
- 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

4.6 Decommissioning and Restoration

Northern Divide Wind will develop a Decommissioning Plan in accordance with the requirements set forth in N.D. Admin. Code Chapter 69-09-09 and file the plan with the Commission for approval prior to commercial operations as required by N.D. Admin. Code Section 69-09-09-06. Consistent with the Commission's requirements, Northern Divide Wind will engage a North Dakota-licensed engineer to develop a Decommissioning Plan that, at the end of the Project's useful life, provides for dismantling and removal of all towers, turbine generators, transformers, and overhead cables; removal of underground cables to a depth of 24 inches (two feet); and removal of foundations, buildings, and ancillary equipment to a depth of 48 inches (four feet); restoration and reclamation to the approximate original topography that existed prior to construction of the Project with topsoil respread over the disturbed areas at a depth similar to adjacent lands; and grading and topsoil of areas disturbed by the Project, and reseeding according to resource conservation service recommendations, as required by N.D. Admin. Code Section 69-09-09-05. Northern Divide Wind will also submit to the Commission financial assurance sufficient to ensure decommissioning, as required by N.D. Admin. Code Section 69-09-09-08. Northern Divide Wind will provide its financial assurance for the construction period prior to commencement of construction, as required by N.D. Admin. Code Section 69-09-09-08(1).

In addition to meeting the Commission's decommissioning requirements, Northern Divide Wind has a contractual obligation to the landowners to remove the wind facilities, including foundations to a depth of four 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. Northern Divide Wind also reserves the right to explore alternatives regarding decommissioning at the end of the Project's 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.

5.0 ENVIRONMENTAL ANALYSIS

5.1 Socioeconomics

5.1.1 Description of Resources

There are no incorporated or unincorporated communities within the Project Area. Burke County had a population of 1,968 in 2010, with an estimated 6.7 percent increase in 2018 for an estimated total population of 2,100 in 2018 (U.S. Census Bureau 2018). The county contains 1,129 square miles of land, with a density of approximately 2.0 persons per square mile. As of 2018, it is estimated that approximately 20.8 percent of the county population is 65 years or older, while approximately 8.3 percent of the population is under 5 years of age.

Recent oil and gas development activity has had a large impact on the local economy. Burke County ranks eighth in barrels of oil produced per County in North Dakota with 295,916 barrels produced in August 2019 (NDDMR 2019b) and ranks sixth in cubic feet of gas produced with 771,270 thousand cubic feet produced in August 2019 (NDDMR 2019c).

Agriculture continues to play a significant role in Burke County's land use and economy with 488 farms located in the County (USDA, NASS 2017). According to the 2017 Census of Agriculture, total market value of agricultural products produced in Burke County was $71,578,000, 85 percent of which was from crops and 15 percent from livestock sales. The primary livestock for Burke County are cattle and the principal crops include wheat, barley, oats, and corn.

5.1.2 Impacts

The 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. No residents will be displaced by the Project.

Northern Divide Wind estimates that the Project will provide over $30 million in tax revenue to Burke County over 30 years. In addition, the Project will create approximately 200 to 300 temporary construction jobs and five to seven full-time O&M jobs. The Project will also provide over $30 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.

Landowner compensation has been established under individual lease agreements and includes compensation for crop damage during surveys and construction. A 2015 study of property values in North Dakota concluded that property values were not diminished by wind farms or turbines (Hoefs 2015). In general, agricultural areas surrounding each turbine can still be farmed, and the permanent footprint of turbines is minimal (0.06 acres per turbine). Additionally, 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 will help assure the continued viability of farming in the Project Area. Project construction will not cause additional impacts to leading industries within the Project Area. There is no indication that any minority or low-income population is concentrated in any one area of the Project, or that the wind turbines will be placed in an area occupied primarily by any minority or low-income group.

To the extent that local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in Burke County 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.

Approximately 200 to 300 temporary construction workers are expected to be required for the approximately six-month construction period. It is likely that general skilled labor is available either in the county or the state to serve the basic infrastructure and site development needs. 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 Tioga, Kenmare, or Crosby. The Project will create approximately five to seven full-time O&M jobs. Most of these employees are expected to reside locally. Sufficient permanent housing is available within Burke County to accommodate these new employees.

Long-term beneficial impacts to the Burke and Mountrail Counties' tax base as a result of the construction and operation of the Project and Project Transmission Line 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 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 contributes to the economic growth in the region; there are four wind energy-related manufacturing facilities in North Dakota (AWEA 2019).

5.1.3 Mitigative Measures

Socioeconomic impacts will be primarily positive, with an influx of wages and expenditures made at local businesses during 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 diversify the revenue stream for farmers and ranchers.

5.2 Land Use and Vegetation

5.2.1 Description of Resources

The Project Area is located in rural North Dakota in an area predominantly comprised of cultivated land, hayfields, pasturelands, and grasslands. Accordingly, much of the Project Area is utilized for agricultural purposes supporting both livestock grazing and crops, and most of the Project Area has been converted to wheat, canola, and other commercial crops. The Project Area is not within any city limits or within an area of any known military installments. All facilities are on private land except where underground collection and communication cables cross public road rights-of-way. Wooded areas within the Project Area are limited to shelterbelts between fields, windbreaks surrounding farmsteads, along drainages, and near wetlands.

A desktop land use classification was completed using current and historical Google Earth aerial imagery (Google Earth 2019) and North Dakota statewide historical imagery from 1957-1962, 1995-1998, 2003-2006, 2009, 2010, 2012, and 2014-2018 (ND GIS Hub 2019). Parcels of land were classified based on features such as rock piles indicating extensive mechanized rock clearing; presence and amount of trees and shrubs; field edge changes; absence of scattered rocks; straight line features indicating plowing, disking, harvesting, or planting; or any other features indicating human disturbance. Land use was grouped into six different categories and each category was defined as follows:

1. Cropland: parcels of land that are currently being used for agricultural crop production.
2. Broken Grassland: grassland where the soil has been historically disturbed by tilling, construction, or other mechanical methods.
3. Unbroken Grassland: grassland where the soil has not been disturbed by tilling, construction, or other mechanical methods. Native prairie is considered unbroken grassland. Areas used as pasture and hayland that have not been historically broken (*e.g.*, cultivated or extensive mechanized rock clearing) are also considered unbroken grassland.
4. Tree Row: deliberately planted tree rows.

5. Forest/Shrubland: native forested areas that were not deliberately planted and areas predominantly vegetated with shrubs.
6. Existing infrastructure: residences, farmsteads, oil well pads.
7. Wetland: wetlands and other surface waters such as ponds and streams.

Once land cover features were evaluated, Google Earth and GIS mapping software were used to produce a digital data layer of polygons delineating the land use. All of the 74 planned turbines and four alternative turbines locations are located in cropland. See **Table 5-1** below for the land use of each turbine.

Table 5-1 Land Use Classification Per Turbine

Turbine Type	Land Use		
	Cropland (Turbine ID)	Broken Grassland (Turbine ID)	Unbroken Grassland (Turbine ID)
Planned Turbine	1 – 74	None	None
Alternative Turbine	Alt 1 – Alt 4	None	None

Unbroken grasslands and other land uses are presented in **Figure 5-1**. **Table 5-2** summarizes the land use classification, including acreage within the Project Area and acres that will be permanently impacted by Project infrastructure.

Table 5-2 Land Use Classification within the Project Area

Land Cover	Acreage within Project Area [1]	Percentage of Project Area [1]	Acres Permanently Impacted by Project Infrastructure
Cropland	6,953	64%	53.5
Wetland	1,591	15%	0.0
Broken Grassland	1,066	10%	3.5
Unbroken Grassland	742	7%	0.0
Forest/Shrubland	427	4%	0.2
Tree Row	75	<1%	0.0
Existing Infrastructure	43	<1%	0.0

[1] Rounded to the nearest whole number.

The USFWS manages lands including their easements within the Project Area (**Figure 5-2; Appendix D**). These easements are agreements between landowners and the USFWS to protect wetlands and grasslands that are vital to wildlife habitat. The USFWS owns the perpetual rights to certain wetland basins within wetland easements that cannot be burned, drained, filled, or leveled without authorization under a Special Use Permit from the USFWS. The upland portions of wetland easements may be developed without a permit as long as the wetland basins are avoided. USFWS easements were provided from the USFWS Crosby Wetland Management District for the Project Area. Within the Project Area there are approximately 611 acres of USFWS wetlands easements and 12 acres of USFWS grassland easements. Northern Divide Wind will not place infrastructure on any USFWS easements.

There are no USFWS Waterfowl Production Areas (WPA) or National Wildlife Refuges (NWR) within the Project Area (**Figure 5-2; Appendix D**). The nearest NWR is the Lostwood NWR, which is located approximated 14.1 miles southeast from the nearest turbine. In designing the Project, Northern Divide Wind utilized information and feedback from the Previous Project and its proximity to Lostwood NWR and shifted the Project Area approximately seven miles further away from Lostwood NWR.

Private landowners hold voluntary agreements with NDGFD as part of the Private Land Open to Sportsmen (PLOTS) program, which allows walk-in public hunting access to otherwise private land. The landowner is

allowed to conduct normal farming and ranching activities, and the PLOTS agreements are subject to change on an annual basis at the private landowner's discretion should land use change. The Project Area includes three PLOTS parcels, totaling approximately 638 acres. Two areas of the Project will be located on PLOTS parcels: one area consists of two wind turbines and associated facilities and the second area is a collection line (**Figure 5-2; Appendix D**). Any changes to the voluntary PLOTS agreement will be negotiated between the individual landowner and the NDGFD.

Conservation Reserve Program (CRP) lands administered by the Farm Service Agency (FSA) through the U.S. Department of Agriculture (USDA) have the potential to occur in the Project Area. In exchange for yearly compensation, CRP lands are removed from agriculture production and planted with species that will improve environmental quality and health, with a long-term goal of establishing valuable land cover to improve water quality, prevent soil erosion, and reduce the loss of wildlife habitat (USDA, FSA 2019). Specific CRP acres are subject to privacy laws between each landowner and the FSA.

There are 13 state noxious weeds: absinth wormwood (*Artemisia absinthium*), Canada thistle (*Cirsium arvense*), dalmatian toadflax (*Linaria genistifolia*), diffuse knapweed (*Centaurea diffusa*), houndstongue (*Cynoglossum officinale*), leafy spurge (*Euphorbia esula*), musk thistle (*Carduus nutans*), palmer amaranth (*Amaranthus palmeri*), purple loosestrife (*Lythrum salicaria*), Russian knapweed (*Acroptilon repens*), Saltcedar (*Tamarix chinensis, T. parviflora, T. ramosissima*), spotted knapweed (*Centaurea maculosa*), yellow toadflax (*Linaria vulgaris*), and one additional noxious weed listed for Burke County, common tansy (*Tanacetum vulgare*) (NDDA 2019).

5.2.2 Impacts

The development will not result in a significant change in land use in the Project Area. Approximately 0.52 percent, or 57.2 acres, of the total participating land will be permanently impacted by Project infrastructure. No residences or farms will be displaced due to construction activities or Project O&M. No turbines or associated infrastructure will be located within USFWS easements. Any land taken out of CRP will be negotiated between the individual landowner and the FSA. No economically important forestry resources are found within or around the Project Area.

5.2.3 Mitigative Measures

Northern Divide Wind proposes the following mitigative measures:

- Avoid placement of turbines in previously undisturbed shrub/scrub vegetation types that may provide additional habitat for breeding birds.
- Avoid all direct impacts to USFWS wetland and grassland easements.
- Develop and implement a noxious weed prevention plan.
- Avoid all direct, permanent impacts to unbroken grassland from turbines, roads, meteorological towers, and substations.
- Provide contractors with static constraint maps and facilitate compliance through onsite environmental construction monitoring.
- Protect existing trees and shrubs by avoiding tree removal for turbines, access roads, and underground collector lines, or if removal is necessary, replace consistent with the Commission's Tree and Shrub Mitigation Specifications.
- Coordinate with local Natural Resources Conservation Service staff to revegetate non-cropland and pasture areas temporarily disturbed during construction or operation of the wind facility with locally sourced native seed mixes appropriate to the region.
- Reseed temporarily disturbed areas or restore to crop, based on the conditions of the area prior to construction and based on landowner preference.

5.3 Public Services

5.3.1 Description of Resources

Local Government Services

Within the Project Area is a network of established roads and utilities that provide access and necessary services to cities, communities, homesteads, and farms. There are no incorporated or unincorporated cities. The Project Area is located approximately five miles southeast of Noonan, four miles south of Larson, six miles south of Columbus, 10 miles southwest of Lignite, 12 miles north of Battleview, and 13 miles north of McGregor. The county seat of Burke County is Bowbells.

Electrical Service

Burke-Divide Electric Co-Op, Inc. (Burke-Divide Electric Co-Op) provides rural electrical service in the Project Area.

Roads

Public roads located within the Project Area are State Highway 40, county roads (gravel graded and drained roads), township roads, section lines, private roads, oil and gas access roads. The Project Area lies in the North Dakota Department of Transportation (NDDOT) District Boundary of Williston, North Dakota.

Traffic

The NDDOT supplies annual average daily traffic (AADT) levels for major roadways in North Dakota. The data is used for planning and transportation engineering. The total volume is used to calculate vehicle traffic of major roadways for a year. Existing traffic volumes for state highways, county roads, and township roads that are located within and within close proximity to the Project Area are documented in **Table 5-3**. In general, the NDDOT indicates that roads with vehicle counts under 100 AADT are rarely counted and roads with no count data are likely lower than those with count data.

Table 5-3 Existing Daily Traffic Levels

Roadway Segment	Average Daily Traffic	Average Daily Truck Traffic	Year
County Road 6 at the county line	80	15	2017
County Road 6 west of State Highway 40	55	-	2017
State Highway 40 south of Columbus	150	-	2005
County Road 6 east of State Highway 40	25	-	2017
91st NW at the county line	55	20	2017
State Highway 40	165	-	2017
94th Ste NW east of State Highway 40	10	5	2017

Source: NDDOT's Transportation Information Map (NDDOT 2019)

Air Traffic

Spray planes used for aerial application of pesticides or fertilizer operated by local spray plane operators may occur within the Project Area. There are no public airports or private airports/airstrips within the Project Area. The closest airport/airstrip is the Columbus Municipal Airport southwest of Columbus, North Dakota, which is located approximately six miles north of the Project Area. The nearest airport certified for commercial carrier operations is the Estevan Regional Airport, located in Estevan, Saskatchewan, Canada, approximately 26 miles north of the Project Area. Existing public and private airports within 25 miles (excluding Canadian airports) of the Project Area are documented in **Table 5-4**.

Table 5-4 Public/Private Airports

Airport	Type	Direction from the Project Area
Columbus Municipal Airport	Public	North
Strom Private Airport	Private	North
Bowbells Municipal Airport	Public	East
Stanley Municipal Airport	Public	Southeast
Tioga Municipal Airport	Public	South
Troy Field Airport	Private	Northwest
Crosby Municipal Airport	Public	Northwest

Source: ND GIS Hub 2019

Water Supply

The Western Area Water Supply Authority supplies potable water to communities near the Project Area. Northern Divide Wind will evaluate obtaining water for construction from an on-site water well or obtain water from the cities of Crosby, Bowbells, Stanley, Ross, Tioga, or Wildrose and truck the water to the construction site. Northern Divide Wind will consult with Crosby, Bowbells, Stanley, Ross, Tioga, or Wildrose to obtain the appropriate permits and/or approvals.

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 (Angulo *et al*. 2014). Northern Divide Wind conducted a preliminary telecommunications study to identify all non-federal microwave telecommunication systems within the Project Area. There are no beam paths crossing the Project Area.

5.3.2 Impacts

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

Local Government Services

No impact is expected to local services.

Electrical Service

The Project will require station service from Burke-Divide Electric Co-Op when the Project is not generating electricity.

Roads

Project construction will require approximately 25 miles of new aggregate-surfaced access roads. During Project operation, access roads will be used by operation and maintenance crews while inspecting and servicing the wind turbines. The access roads will be designed to allow for adequate crane access. One road will be required for each string of turbines. Although the access road construction easement is 200 feet wide on average, temporary disturbance is limited to 50 feet on average, and the final permanent access roads will primarily be 16 feet wide with a low profile to allow cross-travel by farm equipment.

Traffic

There will be a temporary increase in vehicular traffic during construction activities. The maximum construction workforce is expected to generate approximately 600 additional vehicle trips per day on each road within the Project Area. Using any combination of state and county highways and other township roads throughout the Project 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 in two days per foundation. While there may be some noticeable increase in heavy vehicle traffic in discrete locations for limited amounts of time, 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 will be used.

Truck access to the Project is provided by area highways, which includes State Highway 5, State Highway 40, and State Highway 50. Roads located within the Project Area are county roads (gravel graded and drained roads), township roads, section lines, and State Highway 40. Specific truck routes will be dictated by delivery location. Additional operating permits will be issued by the state or county for over-sized truck movements.

Air Traffic

The installation of wind turbines creates a potential for air traffic collision including spray planes. The wind turbines and the MET towers 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. Northern Divide Wind will submit Notices of Construction or Alteration to the FAA for all Project turbines and will install an FAA-approved lighting system that is consistent with the Commission's requirements in N.D. Admin. Code Chapter 69-06-11.

Water Supply

Construction will not significantly impact local water supply. Construction will require approximately three and a half million gallons of water for foundations, backfill, and compaction; six million gallons of water for road construction and civil infrastructure; and 12 million gallons of water for dust control. Construction water estimates are subject to change due to final site investigation and weather. Water for construction will be brought on site via trucks, most likely from the Western Area Water Supply Authority, the cities of Crosby, Bowbells, Stanley, Ross, Tioga, or Wildrose or via an on-site water well. Water for the O&M facility will be obtained from an on-site water well. The abandonment of wells is not required. The Project will not require appropriation of surface water or permanent dewatering. Temporary dewatering of groundwater (*i.e.*, locally lowering groundwater levels in the vicinity of the excavation) may be required during construction of turbine foundations.

Communications

Existing telephone and fiber optic cables will be located in the field by the respective utility companies prior to construction so that impacts to telephone and fiber optic cables will be avoided. Federally operated communications systems can be identified through consultation with the National Telecommunications and Information Administration (NTIA). Northern Divide Wind has contacted the NTIA, and no agencies within the Interdepartment Radio Advisory Committee had issues with turbine placement (**Appendices B** and **C**). No impacts to Federal Communications Commission licensed microwave beams are anticipated because none are located within the Project Area.

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 feet 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 (Angulo *et al*. 2014).

5.3.3 Mitigative Measures

Construction and operation will be in accordance with all applicable local, state, and federal permits and laws, as well as industry construction and operation standards. Due to the minor impacts expected on the existing communications infrastructure during Project construction and operation, additional mitigation measures are not required.

Local Government Services

No impact to local government services is anticipated, and no mitigation is required.

Electrical Service

Northern Divide Wind will purchase station service from Burke-Divide Electric Co-Op, which will suggest appropriate configurations for the electrical system that Northern Divide Wind will abide by to prevent impacts to the transmission system. Northern Divide Wind has established a setback of 534 feet from existing transmission and distribution lines. No additional mitigation is necessary.

Roads

Northern Divide Wind is working closely with local landowners to locate access roads in order to minimize land-use disruptions to the extent possible. The preliminary layout of the turbines and access roads is shown in **Figure 1-1** and **Appendix D**. Additionally, lease agreements allow landowners to utilize access roads, which can be beneficial for agriculture operations by providing access to fields.

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.

Air Traffic

Northern Divide Wind submitted Form 7460-1 to the FAA for each turbine to determine whether the Project layout and lighting will impact navigable airspace or communications technology used in aviation operations. The response from the FAA will be submitted to the Commission when received. Northern Divide Wind will install an FAA-approved ADLS, consistent with N.D. Admin. Code Chapter 69-06-11.

Northern Divide Wind will work with local farmers and spray plane operators so that spray planes are able to safely spray agriculture fields within the Project Area. Local farmers and spray plane operators can coordinate with the Northern Divide O&M Manager to curtail turbines to accommodate for spraying.

Water Supply

The abandonment of wells is not anticipated. However, in the event wells are abandoned, they will be sealed as required by North Dakota law.

Communications

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

5.4 Human Health and Safety

5.4.1 Description of Resources

Federal Radar Interference

Wind turbines may interfere with radar systems and airspace navigation. AECOM queried the online U.S. Department of Defense (USDOD) Preliminary Screening Tool to obtain a preliminary review of potential impacts to Long Range Radar and Weather Radars, Military Training Routes and Special Airspaces (FAA 2019). The USDOD Preliminary Screening Tool produces a map relating the structure to any of the USDOD/U.S. Department of Homeland Security (USDHS), and National Oceanic and Atmospheric Administration (NOAA) resources listed above.

The FAA reviews potential impacts to USDOD radar as part of its aviation hazard review of structures that file a Notice of Construction or Alteration (FAA Form 7460-1). The FAA will request that the USDOD and the USDHS review the filing and may issue a Notice of Presumed Hazard if the USDOD and USDHS 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.

Air Defense and Homeland Security Radars (Long-Range Radar)

The results of the Preliminary Screening Tool indicated no anticipated impacts to Air Defense and Homeland Security radars (FAA 2019). The entire search area appears as green on the map produced by the screening tool, which indicates there will be no anticipated impact to Air Defense and Homeland Security radars (**Appendix B**).

Weather Surveillance Radar

The results of the Preliminary Screening Tool indicated that impacts on weather surveillance radar are not likely for the Project Area, (shown as green on the map in the screening tool) (**Appendix B**). The results of the Preliminary Screening Tool indicate that because the Weather Surveillance Radar-1988 Doppler radar (WSR-88D, also known as NEXRAD) can detect wind turbines occasionally at great distances, NOAA would like to know the location of all wind farm projects so that corrupted radar data can be flagged (FAA 2019). Northern Divide Wind has contacted the NTIA, and no agencies within the Interdepartment Radio Advisory Committee had issues with turbine placement (**Appendices B** and **C**).

Military Training Routes and Special Use Airspace

The Project's four boundary locations, in degrees, minutes, and seconds, encompassing the Project Area were utilized for review in the Preliminary Screening Tool (FAA 2019). The results of the Preliminary Screening Tool indicate impacts to military airspace are not likely (**Appendix B**).

Electromagnetic Fields

Power frequency electric and magnetic fields (EMF) are created wherever electricity flows, which includes the wiring in our homes and schools, power lines, and the electrical equipment and devices we use at work and home. Leading U.S. and international scientific organizations, such as the National Cancer Institute and the World Health Organization, have evaluated EMF research. These organizations generally conclude that overall the body of scientific research does not show that exposure to EMF causes or contributes to any type of cancer or any other disease or illness (NIEHS 1999).

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 occurrence 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 Project is located in a rural area of North Dakota. Hazardous wastes from large industrial or commercial activities are not likely to be present in the Project Area. Potential hazards may exist in rural areas from farm dumps and agricultural chemicals. A Phase I Environmental Site Assessment (Phase I ESA) will be conducted in the Project Area prior to construction to identify any recognized environmental conditions that may exist.

Potentially hazardous materials associated with the 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. When more than 1,320 gallons of oil storage is located on-site, a Spill Prevention, Control, and Countermeasures (SPCC) Plan is required to address the safe and secure containment of oil as well as procedures for operations and spill prevention practices.

Security

The Project Area is located in an area that has low population density. Construction and operation of the Project will have minimal impact on the security and safety of the local communities.

5.4.2 Impacts

Air Defense and Homeland Security Radars (Long-Range Radar)

The Project is not anticipated to impact Air Defense and Homeland Security radars. The results of the Preliminary Screening Tool indicate that the entire Project Area appears as green on the map produced by the screening tool (**Appendix B**).

Weather Surveillance Radar

No impacts to weather radar operations are expected. The results of the Preliminary Screening Tool indicate that the entire Project Area appears as green on the map produced by the screening tool (**Appendix B**). Northern Divide Wind will notify NOAA of the Project so that any potential impacts can be tracked.

Military Training Routes and Special Use Airspace

No impacts to military airspace are expected (**Appendix B**). The nearest turbine to an ICBM launch or launch control facility is approximately 13 nautical miles (68,640 feet). The Military Aviation and Installation Assurance Siting Clearinghouse in coordination with the USDOD performed an informal review of the Project and indicated that the Project will have minimal impact on military operations conducted in the area (**Appendix C**).

Electromagnetic Fields

Low-level power frequency EMF will occur around the wind turbine generators (in the nacelles), around the generator step-up transformers, along the collector lines, and at the Project substations. All Project facilities will be set back from residences as required by state and county regulation. At these distances, EMF levels will not be above background levels. The only exposure will be brief exposure to maintenance workers, primarily at the substations. Based on the above, no significant adverse impacts are anticipated.

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. Thirty hours per year of shadow flicker is the wind power generation industry's generally accepted standard and the standard that has been utilized by the Commission.

An analysis of potential shadow flicker impacts from the Project turbine layout was conducted using the WindPro software package (**Appendix B**). 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 3,806 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 which may block sunlight. In reality, the windows of many houses will not face the sun directly to be affected by the key shadow flicker impact times.

A total of 66 receptors were identified within and near the Project Area (**Appendix D**) and are considered potential shadow flicker receptors for the purpose of this analysis. The predicted shadow flicker impacts are

less than 30 hours per year at all receptors (the model includes both primary and alternative turbine locations). The maximum predicted shadow flicker impact at any occupied residence receptor is 22 hours per year.

Hazardous Materials/Hazardous Waste

Northern Divide Wind conducted a preliminary, internal Phase I ESA as part of the initial scoping of the Project. The Phase I ESA was conducted in an area larger than the Project Area and encompassed the Project Transmission Line. The Phase I ESA identified 26 oil-gas facilities with reportable spill incidents. The spilled materials included crude oil, brine (produced water/saltwater), and drilling mud. Many of these spill incidents occurred within the earthen containment berm (dike) surrounding the oil-gas facility wellhead and storage tank batteries, but several did release outside the dike and impacted adjacent lands. Review of Incident Summaries, available on the North Dakota Department of Health website, indicated that 24 of the 26 identified spill incidents have been remediated, and no further action was required by the regulating agency. The two identified spill incidents that have not been remediated are located outside of the Project Area.

Prior to construction, Northern Divide Wind will conduct another Phase I ESA and the results will be used avoid and minimize risk associated with potential recognized environmental conditions in the Project Area. 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 Project. The potential of such events will be minimized through implementation of a SPCC Plan, which will 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 will ensure that surface and groundwater quality will not be degraded through inadvertent spillage of contaminants.

Security

Project construction and operation will have minimal impacts to the security and safety of the local communities.

5.4.3 Mitigative Measures

Air Defense and Homeland Security Radars (Long-Range Radar)

Since no significant adverse impacts are anticipated, no mitigative measures are proposed at this time.

Weather Surveillance Radar

Since no significant adverse impacts are anticipated, no mitigative measures are proposed at this time.

Military Training Routes and Special Use Airspace

Since no significant adverse impacts are anticipated, no mitigative measures are proposed at this time.

Electromagnetic Fields

Since no significant adverse impacts are anticipated, no mitigative measures are proposed at this time.

Shadow Flicker

Since no significant impacts are anticipated, no 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:

- Security measures will be taken during the construction and operation of the 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 tower is only through a solid steel door that will be locked when not in use.
- Where necessary or requested by landowners, Northern Divide Wind will construct gates or fences such as those around the collection substation.
- Northern Divide Wind will provide educational materials to landowners within the site boundaries and upon request to interested persons about the Project.

5.5 Sound

5.5.1 Description of Resources

The Project Area is primarily rural and agricultural. The nearest planned Project turbine is approximately six miles from the city of Larson, the closest city. The existing acoustic environment is defined primarily by distant traffic sounds from the nearby arterial highways and will also include intermittent aircraft overflights and sound from agricultural operations. In addition to anthropogenic sound sources, the windy conditions of this site define a somewhat elevated ambient sound level, which increases with wind speed. Windy conditions can generate sound caused by the rustling of grass and tree leaves and wind interaction with natural or man-made formations/structures.

5.5.2 Impacts

The Commission's rules (N.D. Admin. Code Section 69-06-08-01(4)) specify that sound levels from a wind facility may not exceed 50 A-weighted (dBA) within 100 feet of an inhabited residence or a community building, unless waived in writing by the owner. Wind turbine generators produce sound through a number of different mechanisms roughly grouped into mechanical and aerodynamic sources. Modern wind turbines include design features that minimize sound emission from mechanical sources. The interaction of air and the turbine blades produces aerodynamic sound through a variety of processes as air passes over and past the blades. Unlike other sound sources, wind turbines generally radiate more sound as wind speed increases. However, at elevated wind speeds the wind tends to generate significant background sound by moving trees and grasses, which can create a masking effect and may aid in reducing the audibility of wind turbine sound.

An acoustic engineering analysis was developed to assess potential sound levels resulting from wind turbine operations (**Appendix B**). Wind turbine operation was analyzed for the Project employing the GE 2.72 and GE 2.32. The GE 2.72 and GE 2.32 sound specifications were used for their respective turbine locations. Acoustic modeling was completed at both wind turbine cut-in and maximum rotational conditions, inclusive of the entire range of future Project operational conditions. Project compliance was assessed at a total of 66 receptors in and near the Project Area. Acoustic modeling results indicated that predicted sound limits will not exceed the Commission's current sound limit of 50 dBA within 100 feet of, or the County's sound limit of 49 dBA within 50 feet of, an inhabited residence or community building. The acoustic modeling conservatively predicts outdoor sound levels and assumes no shielding or attenuation by trees or other vegetation.

Project construction may cause short-term, but unavoidable sound 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 sound 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 sound resulting from construction activities.

Construction activity will generate traffic having potential sound effects, such as trucks traveling to and from the site on public roads. At the early stage of the construction phase, equipment and materials, such as hydraulic excavators and associated spreading and compacting equipment needed to form access roads and foundation platforms for each turbine, will be delivered to the site. Once the access roads are constructed, equipment for lifting the towers and turbine components will arrive. Traffic sound is categorized into two categories: (1) the sound 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.

5.5.3 Mitigative Measures

Since the Project complies with regulatory criteria, no mitigation is proposed at this time.

5.6 Cultural Resources

5.6.1 Description of Resources

Class I Literature Review

AECOM conducted a Class I Literature Review through an initial file search of the North Dakota Cultural Resources Survey (NDCRS) data files maintained by the State Historical Society of North Dakota (SHSND). The methods employed for the Class I Literature Review follow the North Dakota State Historic Preservation Office (NDSHPO) Guidelines Manual for Cultural Resources Inventory Projects (SHSND 2018).

NDCRS data files were reviewed between June and July of 2019. Review of NDCRS data files included review of archaeological, historical, and architectural resource forms and cultural resources survey reports, as well as Cultural Heritage Forms available at the SHSND in Bismarck, North Dakota. The Study Area for the Class I Literature Review comprised the Project Area plus a one-mile-buffer. AECOM utilized this Study Area to take into consideration any resources that might potentially be impacted by Project construction activities. In addition, AECOM reviewed the National Register of Historic Places (NRHP) records maintained by the National Park Service to find listings of historic properties listed on the NRHP. Historic plat maps and U.S Geological Survey (USGS) topographic maps were also reviewed.

The Class I Literature Review identified 13 previous cultural resource inventories conducted in the Study Area. A total of 154 previously recorded cultural resources are present within the Study Area. These include 137 resources previously recorded on NDCRS forms and 17 previously recorded Cultural Heritage Sites.

Cultural resources can be defined as any resource that has cultural character (King 2004). Expanding upon this simple definition, “cultural resources” include all landscapes, buildings, sites, districts, structures, or objects that have been created by or associated with humans and are considered to have historical or cultural value. The term “historic property” includes only those cultural resources that are listed in or eligible for listing in the NRHP, which was established by the National Historic Preservation Act, 1966 (16 U.S. Code 470 *et seq.*, as amended). Finally, “site” refers to any location in which human activities have occurred and where material evidence of those activities remains.

Sites are defined as locations of past human activity older than 50 years, containing one or more cultural features, six or more artifacts, intact subsurface cultural materials, or a combination of these qualities, within an area of approximately 60 square meters (645 square feet), and spatially discrete from areas of similar content by approximately 60 meters (approximately 200 feet) (NDSHPO 2018). Isolated finds are defined as areas of past human activity older than 50 years, containing five or fewer artifacts with limited potential to

possess subsurface cultural materials (NDSHPO 2018). Site leads are either a) isolated finds, as defined above, with the potential to possess substantial subsurface deposits, or b) locations reported by non-archaeologists as containing cultural resources that have not been field verified by an archaeologist (NDSHPO 2018).

Of the resources recorded on NDCRS forms, one has been previously recommended as eligible for the NRHP. This site, the South St. Olaf Church and Cemetery, was recommended as eligible as part of a district. A further 77 resources have not been formally evaluated for eligibility for the NRHP. These include 64 Native American site leads, five Native American sites, five Euro-American site leads, and three architectural sites.

A total of 59 resources have been previously recommended not eligible for the NRHP. These include seven Euro-American isolated finds, 20 Native American isolated finds, two multicomponent isolated finds, seven Euro-American archaeological sites, 22 architectural sites, and one multicomponent site.

Seventeen Sites of Religious and/or Cultural Significance to Tribes (SRCSTT) previously recorded on Cultural Heritage Forms were identified in the Study Area. All previously recorded SRCSTTs were recommended eligible by Traditional Cultural Surveyors (TCS) in the field. No resources currently listed on the NRHP were identified in the Study Area.

Nearly all of the Native American site leads were depressions or lithic scatters. Many of the Native American site leads recorded in the Project Area were documented through notes and maps compiled by Thad Hecker, an avocational archaeologist, who identified the site locations in the early- to mid-20th century. The exact location of the features Hecker recorded are not well known, and the features are typically only mapped as accurately as the quarter section (160 acres) in which they might be located. The Euro-American sites include collapsed storage buildings, foundations, cultural material scatters, or a combination of these feature types.

Class III Cultural Resources Inventory for Archaeological Resources

Northern Divide Wind and AECOM coordinated with the SHSND on the appropriate scope and level of survey. A Class III Cultural Resources Inventory has been completed for all areas affected by temporary and/or permanent ground disturbance (Survey Corridor) to identify archaeological resources, and a Class III Cultural Resources Inventory Report is currently underway. The Class III Cultural Resources Inventory Report will be filed separately from this application.

Class II Cultural Resources Inventory for Architectural Resources

Based on the SHSND guidelines, AECOM conducted a Class II Architectural Inventory to identify architectural resources within an architectural Study Corridor that includes the area within two miles of all proposed turbines. An architectural historian completed a survey of architectural resources within the architectural Study Corridor in the spring of 2018 and the fall and winter of 2019.

Native American Coordination

Northern Divide Wind sent outreach letters to the following 24 Native American Tribes on July 20, 2017 for both the Project and the associated Project Transmission Line:

- Cheyenne River Sioux Tribe
- Chippewa Cree-Rocky Boy's
- Crow Creek Sioux Tribe
- Crow Nation
- Flandreau Santee Sioux Tribe
- Fort Peck Assiniboine and Sioux Tribes
- Lower Brule Sioux Tribe
- Lower Sioux Indian Community
- Manda, Hidatsa, and Arikara Nations
- Northern Arapaho
- Northern Cheyenne Tribe
- Oglala Lakota Nation

- Prairie Island Indian Community
- Red Lake Band of Chippewa Indians
- Rosebud Sioux Tribe
- Santee Sioux Nation
- Sisseton-Wahpeton Oyate
- Spirit Lake Tribe
- Standing Rock Sioux Tribe
- Turtle Mountain Band of Chippewa Indians
- Upper Sioux Community
- White Earth Nation of Minnesota Chippewa
- Yankton Sioux Tribe

Since that time, numerous discussions have taken place with the following eight interested Native American Tribes to discuss the Project, survey plans, and cultural resource report content and format:

- Cheyenne River Sioux Tribe
- Northern Cheyenne Tribe
- Rosebud Sioux Tribe
- Sisseton Wahpeton Oyate
- Spirit Lake Tribe
- Standing Rock Sioux Tribe
- Turtle Mountain Band of Chippewa Indians
- Yankton Sioux Tribe

The first stage of tribal participation focused on assisting with the micrositing of proposed turbine and service road locations for the Previous Project in November and December 2017. During this stage, representatives from the Standing Rock Sioux Tribe and the Rosebud Sioux Tribe visited each turbine and service road location with representatives from Northern Divide Wind and AECOM to assess the locations for potential cultural resources and sites of cultural and religious significance to the tribe (SCRSTT). After completion of this preliminary stage, AECOM provided all micrositing results to Northern Divide Wind along with avoidance recommendations. Based on this information, Northern Divide Wind revised the Previous Project infrastructure. A second round of micrositing was conducted in May 2018. A tribal representative from the Rosebud Sioux Tribe participated in this effort.

In May through August 2018, stage two of the tribal study focused on field surveys. During stage two, TCS from the Rosebud Sioux Tribe, Turtle Mountain Band of Chippewa Indians, Northern Cheyenne Tribe, and the Spirit Lake Tribe completed a joint field survey together with cultural resources consultants for SCRSTT and cultural resources.

A third round of micrositing was conducted in August 2019 to ensure tribal coordination on the current Project. A tribal representative from the Rosebud Sioux Tribe participated in this effort. In September 2019, TCS from the Rosebud Sioux Tribe, Turtle Mountain Band of Chippewa Indians, and the Spirit Lake Tribe completed a joint field survey together with cultural resources consultants for SCRSTT and cultural resources. If future location changes in Project infrastructure occur, further fieldwork and tribal coordination will be completed. TCS from the Rosebud Sioux Tribe, Turtle Mountain Band of Chippewa Indians, Northern Cheyenne Tribe, and the Spirit Lake Tribe will be invited to assist in joint tribal and cultural resource consultant field surveys.

Northern Divide Wind, participating Tribal Historic Preservation Officers, cultural resource consultants, and the SHSND are coordinating preparation of a report that includes the results of the joint surveys into a Class III Cultural Resources Inventory Report.

5.6.2 Impacts

Archaeological Resources

Northern Divide Wind utilizes an avoidance strategy and will avoid newly documented sites and previously documented archaeological sites that are recommended for avoidance by the SHSND and participating Tribal Historic Preservation Officers. Because numerous archaeological leads in the Project Area are mapped at the quarter section (160 acres) level, identification of lead locations based on available historic information was not possible. However, Class III cultural resources inventories are being conducted to identify any features within the archaeological Survey Corridor that are associated with archaeological leads. These features will be recorded as new archaeological sites. AECOM will create avoidance buffers for previously recorded archaeological sites and newly recorded archaeological sites, including those associated with archaeological leads. The buffers will be delineated prior to construction to ensure avoidance of archaeological resources. The pedestrian survey and shovel testing associated with the Class III Cultural Resources Inventory was completed in May through October 2018, May through June 2019, and September through October 2019. Once complete, the resulting cultural resources report will be submitted to the SHSND for review and concurrence and a management summary will be submitted to the Commission.

Architectural Resources

An architectural historian conducted a survey of architectural resources within the architectural Study Corridor in the spring of 2018 and the fall and winter of 2019. Two significant architectural resources were identified within the architectural Study Corridor. The Project is designed to avoid direct impacts to these properties. Northern Divide Wind is coordinating with SHSND to determine whether the Project will have indirect impacts to these resources and if so what mitigation will be requested. The Class II Architectural Inventory Report will be submitted to the SHSND for review and concurrence, and a management summary will be submitted to the Commission.

Historical resources which are not designated as exclusion areas such as historic farmsteads and cemeteries are present within the Project Area. Northern Divide Wind will avoid impacts to historic resources.

5.6.3 Mitigative Measures

Archaeological sites will be avoided during construction in accordance with input from the SHSND and participating Tribal Historic Preservation Officers. Additionally, Northern Divide Wind is prepared to provide mitigation for indirect impacts to architectural resources, if requested by SHSND.

Cultural sites that are recommended for avoidance by the SHSND and participating Tribal Historic Preservation Officers that are in close proximity to proposed construction easements will be fenced to reduce the potential for inadvertent disturbance. An Unanticipated Discoveries Plan will be prepared and will outline the procedure utilized to address any unanticipated discoveries of cultural resources, including possible human remains. In the event that unanticipated discoveries are made during construction, the Unanticipated Discoveries Plan will provide direction to on-site personnel and their consultants regarding proper procedures for addressing the discoveries. In the event that burials are discovered during construction, construction would stop within 100 feet of the site and the site will be protected until the Burke County Sheriff's office has been contacted. The Sheriff will contact the North Dakota State Forensic Examiner to determine if 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 to coordinate how to proceed. Therefore, no significant impacts to cultural resources are anticipated.

5.7 Recreational Resources

5.7.1 Description of Resources

There are no designated public recreational areas such as municipal, state or federal parks, NWRs, WPAs, Wildlife Management Areas (WMA), or designated scenic trails within the Project Area; however, a number of recreational opportunities exist around the Project Area. The nearest designated recreational area is the

Columbus Park District - WildWood Park which is located directly adjacent to the Project Area. Recreational opportunities at the park include hiking, biking, horseback riding, and camping. The park is approximately 237 acres and contains one primitive campground, a one-mile looped dirt road (limited to dry conditions), and no amenities. The park is likely seasonal and restricted to warm weather possibly from May to October.

There are no school trust lands located within the Project Area; however, there is school trust land located directly adjacent to the Project Area. School trust land is managed by the North Dakota Department of Trust Lands (NDDTL). These lands are dedicated to producing income for the schools and designated trust funds of North Dakota. Ninety-nine percent of North Dakota's school trust lands are leased to farmers and ranchers (NDDTL 2018). School trust land is generally open to walk-in public use; however, lessees may restrict access if livestock are present.

The nearest NWR is the Lostwood NWR, located approximated 13.6 miles southeast of the Project Area. The nearest WPA is located approximated 1.5 miles west of the Project Area. The nearest WMA is located approximated 1.2 miles southeast of the Project Area. NWRs, WPAs, and WMAs are open to a variety of public uses including hunting, fishing, wildlife observation, photography, and cultural and environmental education.

5.7.2 Impacts

No recreational resources will be directly impacted as impacts to recreational resources would mainly be visual in nature. Sportsman, landowners, and sightseers that make use of private land, NWRs, WPAs, WMAs, fishing waters, and school trust lands could potentially be temporarily impacted by construction activities. Results of the acoustic model for WildWood Park predicted 41 dBA within 100 feet of the campground closest to turbines. Thus, impacts to recreational resources are expected to be minimal.

Recreational opportunities that rely on wildlife resources may be temporarily impacted during construction as wildlife may avoid the busier construction areas. It is anticipated that wildlife will resume their normal behavior once construction is complete.

5.7.3 Mitigative Measures

No recreational resources will be directly impacted as impacts to recreational resources will mainly be visual in nature. Northern Divide Wind proposes the following measures:

- Site turbines, access roads, and associated facilities off public recreational lands.
- Provide contractors with static constraint maps and facilitate compliance through onsite environmental construction monitoring so that direct impacts to public recreational lands are avoided.

5.8 Effects on Land-Based Economies

5.8.1 Description of Resources

The majority of the Project Area is planted in cropland. Croplands encompass 6,953 acres (approximately 64 percent) of the Project Area; broken grasslands comprise 1,066 acres (approximately 10 percent) of the Project Area; and unbroken grassland comprises 742 acres (approximately 7 percent) of the Project Area (**Figure 5-1**).

5.8.2 Impacts

Construction of the Project will permanently take 57.2 acres (0.52 percent of the Project Area and participating land), and temporarily take 581 acres (5.3 percent of the Project Area and participating land), of cropland out of production. Areas of cropland temporarily impacted will be restored to cropland based on landowner preference.

A total of 3.5 acres of broken grassland (0.03 percent of the Project Area and participating land), some of which is used for livestock grazing, will be permanently taken out of use. No impacts to physical livestock are expected. Areas of grassland temporarily impacted will be restored based on landowner preference.

5.8.3 Mitigative Measures

The Project will result in a minimal amount of direct, permanent impacts to farmland during operations by turbines, access roads, collection lines, collection substation, MET towers, and an O&M building. Economic losses to producers of the farmland are anticipated to be minimal in comparison to the additional income provided by the Project. Northern Divide Wind will work with landowners to minimize impacts to their land. Where feasible, turbine and access road locations were positioned along section lines and field edges to lessen the fragmentation of land. During construction, areas will be separated from grazing animals by temporary or permanent fencing. Once construction activities have been completed, temporary construction areas will be able to go back to their previous use. Construction sites will utilize a stormwater pollution prevention plan (SWPPP) to mitigate disturbed soils and prevent erosion and contamination of surface waters.

5.9 Soils

5.9.1 Description of Resources

The USDA has mapped 43 soil map units within the Project Area (USDA 2019). These soils are primarily loams, clay loams, and silty clay loams. In Burke County the soil parent material is mostly of glacial origin, with significant areas of till and glaciofluvial deposits. Many soils are susceptible to soil blowing or water erosion (USDA 2003).

5.9.2 Impacts

Impacts to soils within the Project Area will be limited to areas removed from their current use by the occupancy of Project structures. Soil disturbance activities including grading for the roads, turbine pads, and associated facilities, and excavation activities for turbine foundations and underground utilities has the potential to contribute to soil erosion through the exposure of soils that were previously vegetated and stable.

5.9.3 Mitigative Measures

Northern Divide Wind proposes the following mitigative measures:

- Develop and implement a noxious weed prevention plan.
- Utilize the Project SWPPP during construction to mitigate disturbed soils and prevent erosion.
- Maintain appropriate water and soil conservation practices during construction through the implementation of best management practices (BMPs). These practices include silt fencing, temporary reseeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways and sod stabilization, and separation of topsoil and subsoil.
- Implement a 25-mph speed limit on Project roads to minimize dust.
- Alleviate compaction of soils if it occurs during construction

5.10 Geologic and Groundwater Resources

5.10.1 Description of Resources

The Project Area is divided into two Class IV ecoregions, which are more detailed ecoregions for state-level applications (Bryce *et al*. 1996) (**Figure 1-3**). The two ecoregions are the Northern Missouri Coteau and the Northern Dark Brown Prairie. The Northern Missouri Coteau lies in a transition zone to a more boreal climate to the north and a more arid climate to the west. Willow and aspen, southern outliers of aspen parkland to the north, may occur at wetland margins. Rough fescue, also a northern species, appears in grassland associations. Wetlands tend to dry out earlier in the summer than on the Missouri Coteau to the south and east. Mixed dryland agriculture is the major land use. The Northern Dark Brown Prairie soils developed under

drier conditions and have less organic material which gives them a lighter color. Crop and native grass production is generally lower than in ecoregions further east. See **Table 5-5** below for the number of turbines in each ecoregion.

Table 5-5 Ecoregion Classification Per Turbine

Turbine Type	Class IV Ecoregion	
	Northern Missouri Coteau (Turbine ID)	Northern Dark Brown Prairie (Turbine ID)
Planned Turbine	1-8, 10, 11, 17-19, 24-28, 30, 32-39, 43-45, 47-61, 64-71, 73	9, 12-16, 20-23, 29, 31, 40-42, 46, 62, 63, 72, 74
Alternative Turbine	Alt 1, Alt 2, Alt 3, Alt 4	None

Source: Bryce *et al*. 1996

There are no aquifers within the Project Area (NDSWC 2019). There are no active sand or gravel mines are located within the Project Area (Anderson 2012). There are three active oil and gas wells in the Project Area (NDDMR 2019a). There are no abandoned or active coal mines within the Project Area (ND GIS Hub 2019).

5.10.2 Impacts

Viable sand and gravel resources occur within and around the Project Area. If sand and gravel resources are found during Project construction, Northern Divide Wind will coordinate with landowners to facilitate any future development of these resources. If the Project impacts any sand or gravel resources, the regional supply of these materials will not be adversely impacted due to the abundance of this resource in the area. A total of 20 planned turbines are located in the Northern Dark Brown Prairie ecoregion, with the remaining 54 located in the Northern Missouri Coteau (**Figure 1-3**). No unique geological resources have been identified in these areas. Impacts to geological resources are anticipated to be minimal.

Impacts to groundwater resources are anticipated to be minimal and temporary as major groundwater withdrawal will only be required during construction. Based on the relatively small amount of increased impervious surface at each turbine and large distance between each turbine foundation, the Project would not contribute to significant impacts on groundwater flow or recharge. If groundwater is disturbed by the construction of turbine foundations, it is anticipated that it would resume its natural course of flow upon construction completion. Northern Divide Wind coordinated with oil and gas developers with respect to oil and gas wells and turbine locations and no issues were identified.

5.10.3 Mitigative Measures

Wind turbines will be sited to avoid any identified or known sand and gravel resources. Where these resources cannot be avoided, coordination will be done with landowners regarding impacts and any requested mitigation. If dewatering of excavations is necessary during foundation construction and as long as the water is known to be uncontaminated, all water would be discharged according to items outlined in the SWPPP. If discharge water is suspected to be contaminated, an application for a temporary discharge permit (NDG-070000) will be submitted to the North Dakota Department of Environmental Quality (NDDEQ). If subsurface blasting is required, a blasting plan will be developed and implemented to localize impacts and fracture the minimal amount of bedrock required for construction.

5.11 Surface Water and Floodplain Resources

5.11.1 Description of Resources

USFWS National Wetlands Inventory (NWI) data and USGS National Hydrography Dataset (NHD) data was used to identify potential surface waters (USFWS 2019c; USGS 2019; **Figure 5-4**) and as a precursor for field delineations. The Project Area contains prairie pothole wetlands, as well as small drainages and streams found at the transition from the Northern Missouri Coteau to the Northern Dark Brown Prairie. This transition

lies along one of North America's continental divides, the Northern Divide (aka Laurentian Divide), that separates the Hudson Bay watershed to the north and Gulf of Mexico watershed to the south.

Due to the Project Area's rural location, no Federal Emergency Management Agency (FEMA) flood rating maps have been developed for the area (USDHS, FEMA 2019).

5.11.2 Impacts

The project has been designed to avoid all direct, permanent impacts to surface waters. As major watercourses and drainages are absent, and the prairie pothole wetlands are closed depressions, flooding is of low risk. This combined with the FEMA's lack of flood ratings, suggest no potential impacts.

5.11.3 Mitigative Measures

Northern Divide Wind proposes the following mitigate measures:

- The Project will be built to allow stormwater runoff to flow unrestricted.
- Maintain appropriate water and soil conservation practices during construction through the implementation of best management practices outlined in the SWPPP. These practices include silt fencing, temporary reseeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization.
- Coverage under the NDDEQ's National Pollutant Discharge Elimination System (NPDES) general construction permit will be obtained prior to the start of construction.
- Provide contractors with static constraint maps and ensure compliance through onsite environmental construction monitoring.

5.12 Wetlands

5.12.1 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. The Project is located within the Prairie Pothole Region. Prairie potholes (*i.e.*, emergent wetlands, freshwater ponds) are scattered throughout the Project Area and are fringed with a variety of vegetative cover types.

Wetlands are defined in the 1977 Executive Order 11990 – Protection of wetlands and in Section 404 of the Clean Water Act of 1986, as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The three parameters that define a wetland, as outlined in the USACE Wetland Delineation Manual, are hydric soils, hydrophytic vegetation, and hydrology (Environmental Laboratory 1987). Wetlands generally include swamps, marshes, bogs, and similar areas such as slough, potholes, and river overflows. The functions of wetlands include providing habitat for wildlife, improving water quality through filtration and purification, storing floodwaters, and recharging groundwater.

A desktop analysis, using NWI, NHD, and aerial photography data was performed to identify probable locations of wetlands and waterbodies prior to field work (**Figure 5-4**). The initial desktop analysis was followed by a site visit to microsite turbine locations. Micrositing provided a preliminary field review to identify potential critical issues regarding the turbine locations. Field wetland delineations were completed in August, September, October, and November 2019 (**Figure 5-4; Appendix D**).

The wetland delineations followed methodology from the USACE Wetlands Delineation Manual (Environmental Laboratory 1987) and Regional Supplement to the USACE Wetland Delineation Manual:

Great Plains Region (Version 2.0) (USACE 2010). Each wetland was identified, and sufficient information was gathered for the preparation of jurisdictional determinations, should they be warranted.

5.12.2 Impacts

Northern Divide Wind will avoid direct, permanent impacts to all wetlands regardless of their jurisdictional status, including those protected by USFWS easements.

5.12.3 Mitigative Measures

Northern Divide Wind proposes the following measures:

- Avoid all direct impacts to wetlands, including temporary impacts from underground collection by boring.
- Avoid all direct impacts to USFWS wetland easements.
- Wetlands will be delineated and flagged prior to construction when in close proximity to Project features.
- Maintain appropriate water and soil conservation practices during construction through the implementation of BMPs outlined in the SWPPP. These practices include silt fencing, temporary reseeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways and sod stabilization.
- Coverage under the NDDEQ NPDES general construction permit will be obtained prior to the start of construction.
- Provide contractors with static constraint maps and ensure compliance through onsite environmental construction monitoring.

5.13 Wildlife

5.13.1 Description of Resources

The following desktop assessments and field studies were conducted, with respect to the voluntary USFWS Wind Energy Guidelines (USFWS 2012), to document wildlife habitat and use. Additional surveys will be conducted in the spring of 2020 to avoid any potential impacts to eagle/raptor nests and sharp-tailed grouse leks (**Appendix C**).

- Bi-weekly eagle use surveys were completed from April 2017 through March 2018.
- General avian use surveys were completed from April 2017 through March 2018.
- Eagle and raptor nest aerial surveys were completed in April 2017.
- Sharp-tailed grouse (*Tympanuchus phasianellus*) lek surveys were completed in April 2017.
- Breeding waterfowl use surveys were completed from May 2017 through July 2017.
- Sensitive breeding grassland bird surveys were completed from June 2017 through July 2017.
- Dakota Skipper surveys were completed in 2017 through 2019.
- Desktop whooping crane (*Grus americana*) habitat assessment was completed in 2019.
- Northern long-eared bat (NLEB; *Myotis septentrionalis*) habitat assessment was completed in 2019.

Avian Species

Avian species information for the Project Area are described relative to information from a previously proposed project (Previous Project) overlapping and in proximity to the Project Area. Based on the field observations and habitat present within the Project Area, most avian species that are likely to occur within the Project Area are those which are found in grassland, wetland, and agricultural habitats. Studies conducted for the Previous Project and applicable to the Project included avian use point count surveys from April 2017 through March 2018 to document species presence and overall avian use (**Appendix B**).

In total, surveys from the Previous Project totaled 840 hours of standardized effort in keeping with the USFWS Wind Energy Guidelines (USFWS 2012). In addition, over 400 cumulative hours were invested in documenting incidental (*i.e.*, non-standardized) eagle and species of concern observations recorded while en route to bald and golden eagle (*Haliaeetus leucocephalus* and *Aquila chrysaetos*, respectively) nest surveys, and during targeted breeding season surveys throughout the Project. Previous surveys recorded total of 142 bird species during standardized migration use surveys during the spring and fall. Cumulatively, five species accounted for 45.6 percent of all individual observations; lesser scaup (*Aythya affinis*), mallard (*Anas platyrhynchos*), Franklin's gull (*Leucophaeus pipixcan*), Lapland longspur (*Calcarius lapponicus*), and red-winged blackbird (*Agelaius phoeniceus*). Over the course of the avian field surveys, one federally listed species (whooping crane) was recorded migrating at least 500 feet overhead (above the rotor-swept zone). During the course of the full year study, 20 species of raptors were recorded with low overall raptor use. Red-tailed hawks (*Buteo jamaicensis*), northern harriers (*Circus cyaneus*), Swainson's hawks (*Buteo swainsoni*), and rough-legged hawks (*Buteo lagopus*) were the most frequently observed raptors.

Based on Project Area location, habitat features, and results of Tier 3 studies, overall avian use, richness and abundance, patterns of spatial use, and potential for sensitive species to occur in the Project Area are likely to be equal or lower than those recorded in the Previous Project (Derby and Agudelo 2019; **Appendix B**). Use by some avian guilds or bird types, such as area-sensitive grassland-associated birds is expected to be lower, while use by raptors and wetland-associated birds is expected to be similar to those described above.

Sensitive breeding grassland bird surveys were conducted during June and July 2017 for the Previous Project. No federally endangered or federally threatened bird species were detected during June and July surveys in 2017. The USFWS maintains a list of Birds of Conservation Concern (USFWS 2008) and five grassland associated Birds of Conservation Concern including Sprague's pipit (*Anthus spragueii*), grasshopper sparrow (*Ammodramus savannarum*), Nelson's sparrow (*Ammodramus nelsoni*), marbled godwit (*Limosa fedoa*), and upland sandpiper (*Bartramia longicauda*) were observed during 2017 summer breeding season. There was limited observation of four of these species within the Project Area with no Sprague's pipits observed.

Sharp-tailed grouse ground and aerial based surveys were conducted out to a 0.5-mile buffer surrounding the Previous Project area in April 2017 and included nearly all of the current Project Area except for some areas consisting predominantly of cultivated cropland in portions of the Project Area in the west and northwest. Sharp-tailed grouse prefer habitat consisting of relatively dense herbaceous cover found in mixed-grass prairie with scattered shrubs (Connelly *et al*. 1998). Five confirmed leks were located within the Project Area during the course of the April 2017 surveys. It can be expected that the portion of the Previous Project not surveyed could have some previously unreported lek locations, but likely a low number based on the density of leks previously found in the area with higher proportions of grasslands.

Aerial raptor nest surveys were conducted for the Previous Project and within a 10-mile buffer of the Previous Project for eagle nests. During the course of the surveys, two active red-tailed hawk nests and two active great horned owl (*Bubo virginianus*) nests were observed within the Project Area. Each of these active nests was observed with either: an incubating adult, an adult defending the nest, or a nest containing eggs or nestlings. No eagle nests were located within the Project Area or 10-mile buffer of the Previous Project area.

Bat Species

Eleven bat species are found in North Dakota (Gullickson 1999). Based on the presence of suitable habitat, known distribution ranges, and documented occurrences, five of these species are expected to have a moderate to high potential to occur within the Project Area: the little brown bat (*Myotis lucifugus*), the big brown bat (*Eptesicus fuscus*), the silver-haired bat (*Lasioncycteris noctivagans*), the Eastern red bat (*Lasiurus borealis*), and the hoary bat (*Lasiurus cinereus*). These bat species are often found roosting in attics, barns, or in trees underneath a canopy of leaves. The remaining six species including the federally threatened NLEB are expected to have a low potential for occurrence in the Project Area. Western EcoSystems Technology, Inc. (WEST) completed a desktop review of potential NLEB summer habitat (Derby *et al*. 2019; **Appendix B**). The analysis found limited potential NLEB summer habitat within the Project Area, with three small patches along the north and northeastern portions of the Project Area. Additionally, given lack of known caves or other

features that could serve as hibernacula, wintering use is not expected in the Project Area. Migration of NLEB through the Project Area is possible, but unlikely given overall lack of woodlands in the Project Area and surrounding area.

Suitable natural roosting habitats in the Project Area are limited to individual trees, windrows, woodlots, buildings, bridges, and riparian zones. Farmstead buildings (*e.g.*, houses, barns) could also provide potential roosting locations within the Project Area; however, the suitability of these man-made structures has not been evaluated. Consideration was made to completing pre-construction bat acoustic surveys within the Project Area. However, since pre-construction bat acoustic surveys do not necessarily predict direct impacts to bats (Hein *et al*. 2013), and low direct impacts have been measured at past wind projects in North and South Dakota, bat acoustic surveys were not conducted. Bat use of the Project Area and impacts are likely to be low given the limited availability of roosting habitat and expected use.

5.13.2 Impacts

Potential impacts from the Project to avian and bat species include direct impacts, such as collisions with wind turbines, and indirect impacts, such as displacement or habitat loss and fragmentation.

Avian Species

The collision risk for birds at the Project will likely be low based on records of fatalities at other wind energy facilities in the region and nationally overall (Erickson *et al*. 2014). Recent meta-analyses relevant to the Project have estimated an average all-bird 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 Project Area and it is likely that rates of collision at the Project will be similar to rates reported by these studies. Beston *et al*. (2016) calculated measures of turbine risk for 428 species and determined that modeled risk of potential population level impact is species-specific and that small birds are at relatively low risk of population impacts.

No leks will be directly impacted by construction activities as no turbines will be located within one-half mile of identified leks. New leks found during surveys in spring 2020 will have a one-half mile timing stipulation placed on them whereas construction activities will be minimized to the extent practicable within 0.5 mile of known sharp-tailed grouse lek locations during the lekking and breeding season.

Bat Species

According to the NLEB Bat Habitat Assessment (Derby *et al*. 2019), highly suitable habitats (*i.e.*, woodlands) for NLEB and other bats are largely absent from the Project Area. Natural roosting habitat (individual trees, windrows, woodlots, and riparian zones) is limited and fragmented. Lower quality habitat in the form of grasslands and agriculture lands compose the majority (approximately 80 percent) of the Project Area. The Eastern red bat, silver-haired bat, and the hoary bat are migratory tree roosting species and have been the predominant species found during post-construction mortality monitoring studies at operational wind energy facilities in North America. The precise reason as to why these species comprise the majority of bat fatalities is unknown. The NLEB, little brown bat, and other species make shorter distance seasonal movements between summer roosts and winter hibernacula. NLEB and other bat species may transit through the Project Area during spring and fall migration; however, identifiable migration and movement corridors for bats are not known in the Project Area. There are no large forested riparian corridors for bat species to follow or utilize as stopover day roosting sites. Forested areas within the Project Area consist mainly of small wooded parcels that are disconnected from each other. Given the lack of large, forested riparian corridors and limited roosting habitat within the Project Area, use of the Project Area by migrating bats, and thus risk of collision, is likely to be low.

Habitat Loss

Turbine locations have been sited in agricultural croplands, thus, minimizing native habitat fragmentation and loss. For bats, the limited and highly fragmented nature of existing habitat in the Project Area suggests that development of the Project will be unlikely to reduce or fragment bat habitat.

5.13.3 Mitigative Measures

Northern Divide Wind conducted environmental studies, relied upon studies conducted as part of the Previous Project, and consulted with the NDGFD and USFWS on appropriate avoidance, minimization, and offset measures so that the Project would have minimal environmental impacts (Section 6 and **Appendix C**). Based on the above the following measures will be used, to the extent practicable, by Northern Divide Wind:

- Design utility lines according to Avian Power Line Interaction Committee (APLIC) guidelines to prevent bird collision, as practicable.
- Site turbines at least 0.25 mile from active raptor nests and 0.5 mile from leks.
- Implement pad-mounted transformers to reduce risk of bird electrocution.
- Construct wind turbines using tubular, monopole towers as opposed to a lattice structure, to minimize perching opportunities for raptors and other birds.
- Implement a 25-mph speed limit on Project roads to minimize wildlife collisions.
- Bury collection lines from the turbines to the collection substation to avoid collision risk in accordance with the APLIC suggested practices.
- Minimize construction activities to the extent practicable within 0.5 mile of known sharp-tailed grouse lek locations during the lekking and breeding season
- Avoid construction to the extent practicable with 0.25 mile of active raptor nest locations during the nesting season.
- If any raptor nest is discovered during construction, the nest will be monitored to determine if there is a change in the nest activity status in order to avoid impacts that might have the potential to precipitate nest abandonment.
- Provide contractors with static constraint maps and ensure compliance through onsite environmental construction monitoring.
- Prepare a voluntary Wildlife Conservation Strategy (WCS) that includes an adaptive management approach, so that information gathered during post-construction monitoring can be used to inform future management decisions at the Project.
- Conduct one year of Tier 4 post-construction monitoring to better understand bird and bat impacts that are attributable to operations.
- Once turbine construction is completed, implement a Wildlife Response and Reporting System (WRRS). The WRRS will include reporting protocols to report and document bird and bat mortality during routine maintenance activities. If a dead or injured bird or bat is found, its location will be marked and reported to the Plant Lead/Site Supervisor. The dead or injured bird or bat will not be removed from the location it was found.
- Pursuant to Northern Divide Wind's agreement with NDGFD and USFWS, provide voluntary offsets for indirect waterfowl and grassland bird displacement (**Appendix C**).

5.14 Federally-Protected Species

5.14.1 Description of Resources

The USFWS administers the Endangered Species Act (ESA), which mandates protection of species federally listed as threatened or endangered (T&E) and their associated habitats. An endangered species is a species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is a species that is likely to become endangered in the foreseeable future. Critical habitat for these species can be designated if that habitat includes specific areas that are occupied by a species at the time of listing or unoccupied areas that are considered essential to the conservation of a species. Candidate species receive no statutory protection from the USFWS unless they are formally listed. North Dakota does not have a state T&E species list; however, it recognizes those federally listed under the ESA.

Nine species are federally listed in North Dakota; however, the USFWS Information for Planning and Conservation (IPaC) tool (USFWS 2019b), indicated that five T&E species could potentially occur within the Project Area. These species include three birds, one mammal, and one insect: piping plover (*Charadrius melodus*) (threatened), red knot (*Calidris canutus rufa*) (threatened), whooping crane (*Grus Americana*) (endangered), NLEB (threatened), and Dakota skipper (*Hesperia dacotae*) (endangered).

Additionally, bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA protects bald eagles and golden eagles throughout their range in the United States. Although it does not designate critical habitat, BGEPA protects individual eagles and nests from disturbance. These federally protected species are described in greater detail below.

Piping Plover (Federally Threatened)

Piping plovers are small shorebirds with a gray to brown back and a white belly (NDGFD 2015). Adults have orange legs and a black tipped orange bill. Males have a distinct black band that runs across the forehead and a single black band that encircles the body at the breast. Females will have the same but paler features. Their preferred nesting habitat is limited to sandy or gravelly beach and sandbars or alkaline wetlands while feeding on insects near the waterline. More than three-fourths of piping plovers in North Dakota nest on prairie alkali lakes, while the rest use the Missouri River (USFWS 2013c). The piping plover is a federally threatened species.

Piping plover populations are threatened by habitat loss due to vegetation encroachment, shoreline development, anthropogenic and animal disturbances, and water management activities, such as dam construction and channelization. Critical habitat has been federally designated for the piping plover in North Dakota. This habitat runs mainly along the shores of the Missouri River and Lake Sakakawea but encompasses some surrounding wildlife refuge areas as well. No designated critical habitat is located within the Project Area, and no suitable piping plover habitat was observed in the Project Area during the onsite surveys.

Red Knot (Federally Threatened)

Red knots are medium-sized shorebirds with a red or dull gray belly and olive-yellow legs (NDGFD 2015). The observations of Red knots in North Dakota are scattered throughout the state. There are no stopover sites consistently used by Red knots. There is no federally designated critical habitat for this species in North Dakota.

The USFWS listed the *rufa* subspecies of red knot as threatened on December 11, 2014. The red knot is noted for its long-distance migrations of up to 9,320 miles between circumpolar breeding habitats and marine wintering habitats in southern latitudes of South America. Most of the known migration routes for the *rufa* subspecies are along coastal regions of Canada and the U.S. However, an interior migratory route was identified to and from the Arctic passing through Saskatchewan and Alberta Canada through the Great Plains states to non-breeding areas mostly in Texas and Louisiana along coastal areas of the Gulf of Mexico (Skagen *et al*. 1999). Population sizes for red knots are in decline around the world, especially *C. c. rufa*, which declined from about 82,000 individuals in the 1980s to fewer than 30,000 in 2010 (Baker *et al*. 2013). Threats to the red knot include the loss of habitat in both breeding and nonbreeding areas; disruption of natural predator cycles on the breeding grounds; reduced prey availability at stopover areas and throughout the nonbreeding range; and increasing frequency and severity of asynchronies (“mismatches”) in the timing of the birds’ annual migratory cycle relative to favorable food and weather conditions (USFWS 2014b). No suitable red knot habitat was observed in the Project Area during the onsite surveys. However, it is possible, but unlikely, that red knots will occur within the Project Area during migration.

Whooping Crane (Federally Endangered)

Whooping cranes are North America’s tallest bird, standing five feet tall when erect (NDGFD 2015). Their plumage is all white with the exception of black wing tips and a red/black crown. They have long black legs

and can have a wing span of over seven feet. The whooping crane is a federally listed endangered species. There is no federally designated critical habitat for this species in North Dakota.

The whooping crane was considered endangered in the United States in 1970 and the endangered listing was 'grandfathered' into the ESA of 1973 (USFWS 2007). The whooping crane population was reduced to 16 individuals belonging to one flock that migrated between Wood Buffalo National Park in Canada and the Aransas National Wildlife Refuge in Texas. With conservation efforts the Aransas-Wood Buffalo National Park population, the single self-sustaining wild population, has been steadily rising with the population estimated at 505 birds (with a 95 percent probability of actual flock size being between 439 to 576 birds) as of the 2017/2018 later in winter whooping crane survey conducted by USFWS (USFWS 2018c). 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 (Urbanek and Lewis 2015). Stopover habitat during migration includes a variety of croplands with roosting occurring in shallow, freshwater inland wetlands.

To date, no whooping crane fatalities have been recorded as a result of collisions with wind turbines. In addition, sandhill cranes are often used as surrogate for whooping cranes as they often migrate together along the same corridors. While there are significantly more sandhill cranes than whooping cranes (there are approximately 600,000 to 700,000 sandhill cranes, compared to 400 to 500 whooping cranes [Barzen and Ballinger 2017]), there have been no documented sandhill crane fatalities in the migratory corridor (Derby *et al*. 2012). Although flying at the height of the rotor swept area represents a collision risk, sandhill and whooping cranes have been documented altering flight direction in response to turbines at a wind facility in South Dakota (Nagy *et al*. 2012). The avoidance behavior observed and lack of documented turbine-related fatalities of whooping and sandhill cranes suggests a low risk of Project-related fatalities.

A whooping crane habitat review and analysis was completed for the Project (Derby and Thorn 2019). The habitat review and analysis evaluates whether or not the Project Area represents unique or high-quality whooping crane habitat compared to the surrounding landscape. The analysis concluded the Project Area is within the whooping crane migratory corridor and whooping cranes have been observed flying over the Project but none to date has been documented foraging or roosting on the ground. Given low potential use of the Project Area in any given year, similarity in relative probability of use indicating unlikely differential use compared to areas outside of the Project Area, lack of whooping crane mortalities to date, and lack of documented sandhill crane mortality during migration, impacts to whooping cranes are unlikely.

Northern Long-Eared Bat (Federally Threatened)

The NLEB is a medium sized brown bat three to four inches in length with a nine to 10-inch wingspan and has the largest ears of the Myotis genus (NDGFD 2015). The NLEB either roost singularly or in colonies underneath bark, in cavities, or in crevices of trees. During the winter, the NLEB hibernate in cool caves or mines. The NLEB is a federally listed threatened species.

The NLEB was listed as threatened on April 2, 2015, under an interim Section 4(d) rule. The final 4(d) rule was released on January 14, 2016 (USFWS 2016b). The USFWS determined that white-nose syndrome (WNS) is the primary threat to NLEB and regulating other sources of mortality or harm, such as from general habitat loss, will not effectively conserve this species. Additionally, in 2016 the USFWS determined designating critical habitat for NLEB was not prudent.

The 4(d) rule limits the prohibition of take to counties affected by WNS and an additional 150-mile buffer around these counties (the WNS Zone). However, under the final 4(d) rule, incidental take by wind turbine collision is not prohibited. Regulatory mechanisms for wind facilities were not included in the final 4(d) rule because the primary factor causing the rapid population decline in NLEB is WNS, and the best available information suggests that NLEB fatalities caused by wind facilities are not contributing significantly to the species' decline. Incidental take is prohibited within known NLEB hibernacula, and if tree removal occurs at an occupied hibernaculum during any time of year or maternal roost site from June 1 through July 31 (USFWS

2016b). However, there are no known NLEB hibernacula or maternal roost sites within or in the vicinity of the Project.

NLEB are believed to occur 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 2013a). The NLEB is considered common only in discrete portions of its western range, including the Black Hills of South Dakota. This species roosts in trees during the spring, summer, and fall. The species prefers large, contiguous tracks of upland forested habitat during the summer residency period. Natural roosting habitats in the Project Area are limited to individual trees and wind breaks. NLEB 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. Information on habitat use during migration is limited, but individuals in transit are likely to use foraging habitats at least part of the time. NLEB spend winter hibernating in caves and mines. However, there are no known wintering hibernacula within North Dakota, the closest likely being in the Black Hills of South Dakota or in caves in Minnesota.

Occurrence of the species in North Dakota is expected to be uncommon or rare (USFWS 2013a), and the likelihood of the species occurring in the Project Area during the summer residency period is low due to the general lack of potentially suitable roosting and foraging habitat (Derby *et al*. 2019). Therefore, there is a low likelihood of Project-related impacts to this species.

Dakota Skipper (Federally Threatened)

The Dakota skipper was listed as threatened under the Endangered Species Act (16 U.S.C. ch. 35 § 1531 et seq.) by the USFWS, effective on November 24, 2014 (USFWS 2014a). The primary causes for decline in Dakota skipper populations include the loss or fragmentation of high-quality native prairie habitat from overgrazing, conversion to agriculture, invasion by nonnative plants, urbanization, and disruption of natural prairie fire cycles (USFWS 2019a).

The Dakota skipper larval and adult foraging habitats are recognized by the USFWS as occurring in undisturbed native prairie, but also include those areas that may be invaded by Kentucky bluegrass (*Poa pratensis*) (USFWS 2016a). Suitable habitat for Dakota skipper includes two types: Type A and Type B (Royer *et al*. 2014; USFWS 2016a, 2018a). The Project Area only contains Type B Habitat.

Type B habitat occurs primarily on rolling terrain over gravelly glacial moraine deposits and is dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), and needleandthread (*Hesperostipa comata*) or porcupinegrasse (*Hesperostipa spartea*), and often invaded by Kentucky bluegrass. In a variant of Type B habitats common to western North Dakota, western wheatgrass (*Pascopyrum smithii*) is also typical. Bluebell bellflower (*Campanula rotundifolia*) and prairie lily (*Lilium philadelphicum*) are present in Type B habitats, but they support more extensive stands of purple coneflower (*Echinacea purpurea*), prairie coneflower (*Ratibida columnifera*), and common gaillardia (blanketflower; *Gaillardia aristata*). Type B habitat typically supports a high diversity and abundance of native forbs, including purple coneflower, purple prairie clover (*Dalea purpurea*), white prairie clover (*Dalea candida*), yellow sundrops (*Calylophus serrulatus*), prairie groundsel (*Packera plattensis*), groundplum milkvetch (*Astragalus crassicarpus*), eastern pasqueflower (*Pulsatilla patens*), old man's whiskers (prairie smoke; *Geum triflorum*), western silver aster (*Symphyotrichum sericeum*), dotted blazing star (*Liatris punctata*), tall blazing star (*Liatris aspera*), meadow zizia (heartleaf golden Alexanders; *Zizia aptera*), blanket flower (*Gaillardia* species), prairie sagewort (*Artemisia frigida*), and leadplant (*Amorpha canescens*) (USFWS 2016a; 2018a).

The Dakota skipper flight period is two to four weeks long, with year-to-year variability due to the weather and forb flowering times that occurs between mid-June and mid-July. Plants that are nectar sources for the Dakota skipper provide water and nutrients for adult Dakota skippers during their flight period (USFWS 2016a). Flowering forbs must be present in abundant quantity and near suitable larval habitat to provide reliable sources of nectar for adults during their flight period. They are not known to disperse widely (Swengel 1996;

Burke *et al*. 2011) and typically do not travel more than one kilometer between habitat patches (USFWS 2018b). However, average movement distances for individuals have been documented as less than 300 meters (Dana 1991).

During the flight period, eggs are laid on broadleaf plants (McCabe 1981) and grasses (Dana 1991). The eggs hatch after incubating for seven to 20 days, and the larvae then crawl to the bases of grass plants where they form shelters at or below the ground surface (Dana 1991). At night, they emerge from their shelters to forage. For growth and survival, larvae rely on native grasses such as little bluestem, big bluestem, sideoats grama (*Bouteloua curtipendula*), and prairie dropseed (*Sporobolus heterolepis*) (USFWS 2016a). Dakota skippers have six to seven larval stages (instars). They overwinter in their ground-level or subsurface shelters during either the fourth or fifth instar and resume feeding the following spring. One generation of Dakota skippers is completed per year.

The USFWS considers the Dakota skipper possibly extirpated in Burke County. Occurrences have been documented in one township in Burke County (Township 160 North, Range 91 West) (USFWS 2019d). The closest township with previously documented occurrences is located approximately 13 miles from the Project Area.

SWCA Environmental Consultants (SWCA) completed a desktop analysis to determine the presence of potential undisturbed grassland that could be habitat for the Dakota skipper (SWCA 2019; **Appendix B**). The Project Area was evaluated using GIS layers and aerial imagery interpretation. All areas mapped in publicly available GIS layers as cultivated, forest, wetland, open water, or disturbed (*e.g.*, roads, farmsteads, and towns) were removed from the potential habitat layer. During aerial imagery interpretation, any area that showed evidence of disturbance (*e.g.*, cultivation) was removed from the potential habitat layer. Aerial imagery interpretation was completed by a SWCA habitat biologist experienced with Dakota skipper habitat. SWCA completed field surveys on areas of potential habitat (as identified during the desktop analysis) that intersected with the construction footprint to determine the presence/absence of suitable habitat (USFWS 2018a). The surveys were conducted by a biologist experienced identifying Dakota skipper suitable habitat. All suitable habitat determinations were reviewed and approved by Mr. Jake Powell, a SWCA senior ecologist who holds an USFWS Dakota skipper scientific recovery permit (Permit No. TE64070B-1).

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 January-February and ends when the young fledge, typically in July. Although bald eagle nests have historically been found primarily along the Missouri River and Red River, 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). 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. The home range size 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), bald eagles will concentrate near large bodies of water where the water remains unfrozen and will roost up to 20 miles from foraging sites, depending on abundance of prey (Buehler 2000, USFWS 2013b). 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).

Two bald eagles were documented in the Project Area during large bird use surveys (Derby and Agudelo 2019). No eagle nests were located within the Project Area or buffer during aerial surveys conducted in 2017. Golden eagles may potentially occur in the Project Area during any time of the year but are unlikely to be

breeding within the Project Area due to a lack of suitable habitat. Bald eagles may potentially occur in the Project Area during any time of the year but are unlikely to be breeding within the Project Area due to a lack of suitable habitat.

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. Both year-round and migratory golden eagles occur in North Dakota (NDGFD 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 (Dyke *et al*. 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).

One golden eagle was observed during large bird surveys. No golden eagle nests were located within the Project Area or buffer during aerial surveys. Golden eagles may potentially occur in the Project Area during any time of the year but are unlikely to be breeding within the Project Area due to a lack of suitable habitat.

5.14.2 Impacts

Northern Divide Wind is developing a voluntary WCS, 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 Project. Based on operational data from the WRRS protocol in use at NextEra's 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-listed species is found, it must be left undisturbed and reported to USFWS. No irreversible damage to rare or unique animal or plant species is anticipated. Individual species are discussed below.

Piping Plover

There were no piping plover observed using habitat during avian surveys (Atwell 2019). The species is known to occur in Burke County. The closest designated critical habitat is located approximately 17 miles southeast of the Project Area, so it is unlikely, although possible, the piping plover will occur within the Project Area (USFWS 2013d). The potential for indirect impacts such as habitat loss is unlikely as all direct impacts to wetlands will be avoided.

Red Knot

There were no red knot observed using habitat during avian surveys (Atwell 2019). The species is known to occur in Burke County; however, there are no stopover sites consistently used by red knots in North Dakota. With no red knot observations during avian surveys and since there is no preferred stopover habitat identified within the Project Area, it is unlikely that the Project will affect the red knot.

Whooping Crane

Collisions with turbines and MET towers and the complete avoidance of the area around the Project are the two potential impacts of wind development on whooping cranes. In South Dakota, sandhill cranes, which whooping cranes often fly with, have been observed altering flight paths in response to turbines (Nagy *et al*. 2012). This avoidance behavior could minimize potential collisions. If whooping cranes do avoid the Project, similar and higher quality potential habitat is found adjacent to the Project for use by the species.

Although potentially suitable habitat was identified within and around the Project Area, these habitat features are not unique on the landscape (Derby and Thorn 2019). Comparison of the relative probability of use (Niemuth *et al*. 2018) indicates similar levels of potential habitat within the Project and outside the Project

(Derby and Thorn 2019). No whooping crane fatalities and no sandhill crane fatalities, a more abundant surrogate species, have been recorded at wind facilities in the migration corridor, suggesting that likelihood of collision is low (Derby *et al*. 2018). Impacts to whooping cranes are not anticipated.

Northern Long-Eared Bat

There is little suitable roosting or foraging habitat in the Project Area and no known hibernacula in North Dakota for the NLEB. The species could potentially collide with operational turbines during the spring and fall periods when migrating between summer roosts and winter hibernacula; however, migratory movements by the species are short, which reduces the likelihood of individuals encountering the Project Area. Due to the limited amount of forested habitat within the Project Area, the NLEB's likelihood of occurrence within the Project Area is low; therefore, likelihood of Project-related impacts is also low.

Dakota Skipper

Only two suitable habitat areas, totaling approximately four acres were identified within the construction easement as suitable Dakota skipper habitat (SWCA 2019; **Appendix B**). Project infrastructure was sited to avoid impacts to avoid all suitable Dakota skipper habitat. No Project construction activities will occur within identified suitable Dakota Skipper habitat. Avoidance will include boring collection lines under suitable habitat polygons and siting turbines, access roads, and other permanent infrastructure outside of suitable habitat boundaries. Suitable Dakota skipper habitat boundaries will be marked during construction to restrict entry by construction equipment. Thus, no impacts to Dakota skipper are anticipated.

Bald Eagle

Two bald eagles were recorded during large bird use surveys, and no bald eagle nests were located within the Project Area or buffer during aerial surveys conducted in 2017 (Derby and Agudelo 2019). Bald eagles may potentially occur in the Project Area during any time of the year but are unlikely to be breeding within the Project Area due to a lack of suitable habitat. Impacts to bald eagles are not anticipated.

Golden Eagle

One golden eagle was recorded during large bird use surveys within the Project Area, and no golden eagle nests were located within the Project Area or buffer during aerial surveys conducted in 2017 (Derby and Agudelo 2019). Golden eagles may potentially occur in the Project Area during any time of the year but are unlikely to be breeding within the Project Area due to a lack of suitable habitat. Impacts to golden eagles are not anticipated.

5.14.3 Mitigative Measures

Northern Divide Wind conducted environmental studies, relied upon studies conducted as part of the Previous Project, and consulted with the NDGFD and USFWS on appropriate avoidance, minimization, and offset measures so that the Project would have minimal environmental impacts (Section 6 and **Appendix C**). Based on the above, including all aforementioned mitigation measures, Northern Divide Wind will apply the following additional measures, to the extent practicable:

- Given the Project's location within the USFWS North American whooping crane corridor, implement NextEra's internal guidance document determining whooping crane curtailment triggers during migratory periods as part of the WCS. These curtailment steps include shutting down all operational turbines when a whooping crane is identified within one mile of the Project Area, with the turbines remaining shut down for 15 minutes following the departure of the whooping crane or until the whooping crane is observed moving away.
- Provide the appropriate whooping crane identification guide materials to be in all Project maintenance and operations vehicles for reference.
- Field-verified suitable Dakota skipper habitat has been and will continue to be avoided. High visibility fencing (*e.g.*, snow fence) will be placed around field-verified suitable Dakota skipper habitat areas in close proximity to construction to restrict construction equipment from disturbing these areas.

- No construction will occur during the Dakota skipper adult flight period (between June 15 and July 18) in areas proximal to field-verified Dakota skipper habitat.
- Provide contractors with training, spatial data and static constraints maps that identity where field verified suitable Dakota skipper habitat is located and where construction equipment is restricted.
- Educate construction contractors about threatened and endangered species and associated mitigative measures being implemented for each respective species.
- Provide contractors with static constraint maps and ensure compliance through onsite environmental construction monitoring.

5.15 Summary of Impacts

Table 5-6 summarizes the resources that will be affected as a result of the Project and the appropriate mitigation.

Table 5-6 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.	None proposed.
Land Use	Up to 57.2 acres of land will be permanently affected by turbines, associated access roads, and a substation during operation. Temporary impacts during construction for turbine installation, road construction, cable trenching, laydown and contractor staging, and turbine storage will require an additional 660.3 acres.	Work with landowners and regulatory agencies to minimize impacts.
Public Services	No impacts to public services are anticipated.	Utilize station service from the local electrical utility and will abide by the recommendations to prevent impacts to the transmission system.
Human Health and Safety	No impacts to human health and safety are anticipated based on compliance with sound, shadow flicker, and light regulations and standards.	A variety of security measures will be implemented to reduce the chance of physical and property damage.
Sound	No inhabited residences or community buildings are predicted to exceed the more restrictive Burke County sound limit of 49 dBA.	None proposed.
Cultural Resources	No impacts to cultural resources are anticipated as the Project layout avoids all documented sites. The sites are not shown on **Figure 3-1** due to confidentiality.	Fence sites near the Project prior to construction. Prepare and follow an unanticipated discoveries plan.
Recreational Resources	Impacts to recreational resources will be mainly visual in nature.	Avoid Waterfowl Production Areas, National Wildlife Refuges, or parks.
Land Based Economies	Up to 57.2 acres of land will be permanently impacted and up to 660.3 acres will be temporarily disturbed.	Work with landowners to minimize impact to their land. Only land needed for the facility will be permanently affected. Restore temporarily disturbed areas.

Resource	Impact	Mitigation
Soils	Up to 57.2 acres of land will be permanently impacted and up to 660.3 acres will be temporarily disturbed.	Utilize best management practices (BMPs) for erosion and sediment control to minimize wind and water erosion at the site in association with the project stormwater pollution prevention plan (SWPPP). Only land needed for the facility will be permanently affected. Restore temporarily disturbed areas.
Geologic and Groundwater Resources	No impacts to groundwater resources are anticipated.	None proposed.
Surface Water and Floodplain Resources	Access roads, turbines, and other Project facilities will be located and constructed in such a manner that no impacts are anticipated.	Avoid impacts to surface and implement BMPs to minimize erosion and sedimentation at the site in association with the project SWPPP.
Wetlands	Impacts to wetlands will be avoided.	Delineate and flag wetlands in close proximity to the construction easement prior to construction. Employ horizontal directional where necessary to avoid permanent impacts to wetlands from collection line trenching.
Vegetation	Up to 57.2 acres of land will be permanently impacted and up to 660.3 acres will be temporarily disturbed.	Avoid trees and shrubs as practicable. Restore temporarily disturbed areas to pre-construction conditions. Avoid permanent impacts to unbroken grasslands restore temporary impacts in accordance with landowner preferences.
Wildlife	Potential avian and bat collisions may occur but are anticipated to be minimal based on avian and bat studies conducted within the Project Area.	Implement mitigative measures as discussed in Section 5.14.3. Develop and implement a Wildlife Conservation Strategy (WCS) and operational Wildlife Response and Reporting System.
Federally-protected Species	Bald and golden eagles may occur seasonally within the Project Area and are unlikely to be breeding within the Project Area due to a lack of suitable habitat. While there is also potential whooping crane habitat near the Project, impacts resulting from Project activities are unlikely given low historic use and similar or more wetland roosting habitat in adjacent areas.	Implement mitigative measures as discussed in Sections 5.13.3 and 5.14.3. Develop and implement a WCS.

6.0 PUBLIC AND AGENCY COORDINATION

The Project largely overlaps a Previous Project. Many of the previous public and agency coordination efforts informed Project development. However, as the Project is newly proposed, Northern Divide Wind and its representatives contacted key local, state, and federal agencies per Section 69-06-01-05 of the N.D. Admin. Code. This started in July 2019 with in-person meetings with the NDGFD and USFWS, as well as issuing the requisite notification letters in August 2019 to inform agency stakeholders of the Project and requests for assistance in identifying concerns or issues within the Project Area. Northern Divide Wind has also maintained close coordination with landowner stakeholders throughout the process via in-person meetings, mailers, and phone calls; and Native American Tribes as described in Section 5.6. Coordination with Burke County is described in Section 3.8. Northern Divide Wind will continue to meet with county officials as the Project moves forward for any necessary local construction permits (*e.g.*, building permits, road use agreements, etc.). Public and agency correspondence as of November 21, 2019 are included in **Appendix C. Table 6-1** summarizes the responses received from agencies to date.

Table 6-1 Summary of Agency Comments

Agency	Comment Date	Comment Summary	Section Addressed
U.S. Army Corps of Engineers (USACE)	Aug. 26, 2019	A Section 10 permit would be required for work impacting navigable waters. A Section 404 permit would be required for the discharge of dredge or fill material (temporarily or permanently) in waters on the United States. The USACE has determined that the Project may need a Clean Water Act Section 404 permit.	5.11, 5.12, Table 7-1
North Dakota Department of Trust Lands (NDDTL)	Aug. 28, 2019	To obtain an easement across trust lands, an on-line application form must be completed. Any proposed towers or lines would be subject to review by the surface division staff and approval by the Land Commissioner of behalf of the Board of University and School Lands. There are school trust surface interests that are managed by the NDDTL on behalf of the Board of University and School Lands which are located within or near the proposed Project Area. There are no active coal leases on school trust lands within the Project Area.	1.4, 5.7 Table 7-1
State Historical Society of North Dakota (SHSND)	Aug. 29, 2019	The SHSND recommends a current Class I to determine any additional recorded cultural resources in the Project Area; a Class II (reconnaissance) and Class III (pedestrian) survey by a permitted architectural historian for standing buildings and structures over 50 years old in the visual area of potential effects; and a Class III archaeological survey of all areas of direct impact including crane paths, MET towers, access roads, turbine locations, and staging areas unless the footprint has been recently surveyed for cultural resources.	5.6, 8.9 Table 7-1
North Dakota Geological Survey	Aug. 30, 2019	There appears to be several areas within the proposed Project Area that contain mineable coal resources. A review of the Commission's Abandoned Mine Land (AML) locations data also shows seven AML locations just north of White Earth, ND that should be noted.	5.10
North Dakota Aeronautics Commission	Aug. 30, 2019	Due to the proximity to the Tioga Municipal Airport, the agency recommended that an airspace case be filed with the Federal Aviation Administration (FAA). If the height is above 200 feet above ground level, then the Project should to submit a case to the FAA for review and if the Project falls into any in the FAR Part 77 then the Project is required to file a case with the FAA.	5.3, 5.4, Table 3-4, Table 7-1

Agency	Comment Date	Comment Summary	Section Addressed
North Dakota Department of Environmental Quality (NDDEQ)	Sept.4, 2019	The NDDEQ believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. All necessary measures must be taken to minimize fugitive dust emissions created during construction activities. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. Disturbing one or more acres requires a permit to discharge stormwater runoff. Care should be taken to avoid spills. Noise from construction activities may have adverse effects on persons who live near the construction area. All solid waste materials must be managed and transported in accordance with the state's solid and hazardous waste rules.	5.3, 5.4, 5.9, 5.11, Table 3-3, Table 5-6, Table 7-1,
North Dakota State Water Commission (NDSWC)	Sept. 9, 2019	Initial review indicates the Project does not require a conditional or temporary permit for water appropriation. However, if surface water or groundwater will be diverted for construction of the Project, a water permit will be required per N.D.C.C. 61-04-02. If a NDSWC observation well must be removed, the Project was requested to contact the Water Appropriations Division. There are no floodplains identified and/or mapped at the Project location. No permits relative to the National Flood Insurance Program are required based on the current effective Flood Insurance Rate Map and State minimum standards.	5.3, 5.10, 5.11, Table 5-6, Table 7-1
North Dakota Game and Fish Department (NDGFD)	Sept. 12, 2019	The NDGFD provided information and recommendations regarding native prairie, the Missouri Coteau, whooping cranes, waterfowl production, bald and golden eagles, sharp-tailed grouse, and species of conservation concern. As we continue to address the challenges of stemming the decline of our state's most sensitive species, we cannot endorse or consent to the disturbance, fragmentation, and loss of the remaining high value habitats essential to Species of Conservation Priority without recommending that suitable replacement or offsets be applied back onto the landscape. As Northern Divide moves forward with the Project, the NDGFD requests to remain informed.	1.3.2, 5.10, 5.11, 5.13, 5.14, Appendix C
North Dakota Department of Transportation (NDDOT)	Sept. 20, 2019	This Project should have no adverse effect on the NDDOT highways. If any work needs to be done on highway right of way, appropriate permits and risk management documents will need to be obtained from the NDDOT District Engineer.	5.3, Table 7-1
NDGFD	Nov. 19, 2019	The NDGFD acknowledges Northern Divide Wind has taken the Department's recommendations seriously, resulting in significant impact avoidance and minimization. The NDGFD also recognizes Northern Divide Wind's voluntary offset proposal.	1.3, 5.13, Appendix C

7.0 POTENTIAL PERMITS/APPROVALS

Table 7-1 outlines the federal, state, and county permits or approvals that have been identified as potentially required for the construction and operation of the Project. Permits dependent on the final Project layout will be applied for after receiving Commission approval, but prior to construction.

Table 7-1 Potential Permits and Approvals Required for Construction and Operation

Agency	Type of Approval	Status*	Need
Federal Approvals			
United States Army Corps of Engineers	Nationwide Permit 12 and 14	N/A	Not required as wetland delineations have been completed so that impacts to wetlands and other surface waters are avoided.
	Section 404 Permit	N/A	
	Section 10 permit	N/A	
Federal Aviation Administration	Form 7460-1, Notice of Proposed Construction	2	Notice and approval are required for structures over 200 feet in height. FAA approval of lighting and marking of turbines is required.
U.S. Environmental Protection Agency	Spill Prevention, Control, and Countermeasure Plan	3	Required if more than 1,320 gallons of oil storage is located on-site.
U.S. Fish and Wildlife Service (USFWS)	Special Use Permit	N/A	Not required as Northern Divide Wind sited all Project infrastructure outside of USWFS easements.
State of North Dakota			
North Dakota Public Service Commission	Certificate of Site Compatibility	2	Required for construction of generation facility over 0.5 megawatt (MW) in size.
State Historical Society of North Dakota (SHSND)	Concurrence with effect Determinations	2	Reports for the Class III Cultural Resources Inventory will be submitted to SHSND for review when complete.
North Dakota Department of Environmental Quality	National Pollutant Discharge Elimination System Permit: General Construction Storm Water	3	Required for disturbance of over 1 acre of land and a stormwater pollution prevention plan must be prepared.
North Dakota Highway Patrol	Overheight/Overweight Permit	3	Required for hauling construction equipment and materials on State Highways.
North Dakota Department of Transportation	Road Approach/Access Permit	3	Required for construction of access roads from State Highways.
	Utility Permit/Risk Management Documents	3	Required for utility crossings on State Highway right-of-way.
North Dakota State Water Commission	Drainage Permit	N/A	The Project will not drain a pond, slough, lake or sheetwater, or any series thereof, that has a watershed area (*i.e.*, drainage area) of 80 acres or more.
	Conditional or Temporary Permit for water appropriation	N/A	No water appropriation required.
	Water Permit	3	Required if drilling a well.

Agency	Type of Approval	Status*	Need
Burke County			
Burke County Commission	Conditional Use Permit	1	Required to construct, operate or maintain the Project.
	Building Permit	3	Required to erect, move, or alter a building or structure within the County.
	County Road Crossing Permit	3	Permit required to install conduit across a county Road.
	Utility Occupancy Permit	3	Required to install a utility within a county road right-of-way.
	Re-Zoning of Batch Plant from Agricultural to Industrial (Laydown)	1	Submitted in October 2018 and approved November 2018.

*Status Explanation:
1 Completed and approved
2 Applied and/or decision pending
3 Will apply for prior to construction as applicable

8.0 FACTORS CONSIDERED

The North Dakota Energy Conversion and Transmission Facility Siting Act lists 11 factors to guide the Commission in the evaluation and designation of sites (N.D.C.C. Section 49-22-09).

8.1 Public Health and Welfare, Natural Resources, and the Environment

The preceding sections discuss the research and investigations relating to the effects of the Project on public health and welfare, natural resources, and the environment. These effects and the proposed mitigation to minimize these effects are summarized in Section 6.16.

8.2 Technologies to Minimize Adverse Environmental Effects

Northern Divide Wind 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.

8.3 Beneficial Uses of Waste Energy

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

8.4 Unavoidable Adverse Environmental Effects

Unavoidable adverse environmental effects are described for each resource area in Section 5.

8.5 Alternatives to Proposed Site

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

8.6 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 this 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 16 to 18 feet across. 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 will not have an adverse effect on the availability of these resources. In addition, the overall anticipated environmental and economic benefits of the Project will balance the irretrievable commitment of resources resulting from the construction of the Project.

8.7 Direct and Indirect Economic Impacts

Economic impacts include impacts associated with the temporary disturbance of up to 717.4 acres of land during construction, which could potentially interrupt farming and ranching for landowners. Permanent impacts will be lower, at approximately 57.2 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 Burke County will contribute to the total personal income of the region. Additional personal income will be generated for residents in the counties and the state by circulation and recirculation of dollars paid out by the Northern Divide Wind 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 counties and the state.

Long-term beneficial impacts to the counties' 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 will be important in diversifying and strengthening the economic base of northwestern North Dakota. Additional revenues are expected from property and income taxes. Continuing to establish the northwestern 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.

8.8 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.

8.9 Effect of Site on Scenic Areas and Cultural Resources

There are no designated recreational or scenic resources that will be affected by the Project. As described in Section 5.7, a Class I Literature Review was conducted, and a Class III Cultural Resources Inventory was completed in the May through October 2018, May through June 2019, and September through October 2019. The Class I Literature Review results identified 137 resources previously recorded on NDCRS forms and 17 previously recorded Cultural Heritage Sites. Once complete, the Class III Cultural Resources Inventory Report will be submitted to the SHSND for review and concurrence and a summary will be provided to the Commission. The Class III Cultural Resources Inventory Report will be filed separately from this application.

8.10 Effect of Site on Biological Resources

Detailed discussion of potential impacts and proposed mitigation measures on biological resources is provided in Section 5.2 (Land Use and Vegetation), Section 5.12 (Wetlands), Section 5.13 (Wildlife), and Section 5.14 (Federally-Protected Species).

8.11 Agency Comments

Agency coordination and potential permits/approvals are discussed in Section 6 and Section 7, respectively. A copy of agency response letters is included in **Appendix C**.

9.0 QUALIFICATIONS OF CONTRIBUTORS

Table 9-1 Qualifications of Contributors

Name Project Role	Education and Professional Experience
Dustin Jones Environmental Services Project Manager NextEra	Mr. Jones has 17 years of environmental permitting experience as both a consultant and environmental manager in the renewable industry. His primary responsibility is permitting and licensing projects on private and public land in compliance with federal and state environmental laws. He is a certified wetland delineator and obtained his Bachelor of Science in Wildlife and Fisheries Sciences from Texas A&M University.
John Bulich Engineering Senior Project Manager NextEra	Mr. Bulich has over 25 years of experience in Engineering design and management, with over 15 with NextEra working on combined cycle, transmission, and renewable projects (wind, solar, and energy storage). His primary responsibility is Engineering Management of the wind farm collection, substation, and transmission line. He holds a Bachelor of Science in Mechanical Engineering from Clemson University and is a Registered Professional Engineer.
Clay Cameron Wind Development NextEra	Mr. Cameron has over 21 years of experience in project management including development, construction, federal, state, and local permitting and compliance. His responsibilities include financial feasibility analysis, cost and schedule management, and coordination of functional project teams and customer relationships. He has 10 years of experience in the utility industry including roles of increasing responsibility in community development, engineering & construction, and project development. He studied business management at Louisiana State University, and holds a State of Florida General Contractor license, and a State of California General Engineering license.
Carolyn Stewart Director Tribal Relations NextEra	Ms. Stewart is Director Tribal Relations for NextEra and is responsible for all indigenous and tribal relations efforts in the U.S. and Canada. She has 40 years of energy industry experience in conventional and renewable energy development, energy planning, and gas distribution and electric distribution operations, including nearly 21 years of tribal renewable energy project development and tribal relations experience. She earned a Bachelor of Science in Finance from the University of Illinois, and an M.B.A. from University of Chicago Graduate School of Business.
Richard Estabrook, PhD, RPA Environmental Services Project Manager – Archaeologist NextEra	Dr. Estabrook has over 30 years of cultural resources management experience, both as a consultant and as an environmental manager in the renewable industry. He obtained his Bachelor of Arts in Anthropology from Stony Brook University, his Master of Arts in Public Archaeology from University of South Florida, his GIS Certificate from University of South Florida, and his PhD in Applied Anthropology/Archaeology from University of South Florida.
Tracy C. Davis Senior Attorney NextEra	Ms. Davis has over 15 years of experience practicing energy regulatory law, and has served as in-house counsel for NextEra for the past six years. Her responsibilities include representation of NextEra subsidiaries and affiliates before state regulatory commissions, including the North Dakota Public Service Commission. She has a Bachelor of Arts and a Doctor of Jurisprudence from the University of Texas at Austin.
Lindsey Churchill, PhD, PWS Project Manager AECOM	Dr. Churchill has 12 years of environmental permitting experience in wetland and natural resources. Her responsibilities included project management, application preparation, and oversight of the wetlands and cultural resources surveys. She has a PhD in Natural Resources Management from North Dakota State University, a Master of Science in Natural Resources Management from NDSU, and Bachelor of Science in biology and mathematics from University of Jamestown. She is registered as a Professional Wetland Scientist and a USACE certified wetland delineator.
Melinda McCarthy, MA, RPA Archaeologist/GIS Analyst AECOM	Ms. McCarthy has 11 years of cultural resources and historic preservation experience. Her responsibilities included leading the cultural resources archaeology and architecture surveys, GIS, and tribal outreach. She has a Bachelor of Arts in Anthropology with an emphasis in Archeology and a Master of Arts in History with a specialization in Historic Preservation, both from Southeast Missouri State University. She is permitted as a Principal Investigator through the North Dakota State Historic Preservation Office (NDSHPO) in North Dakota.

Name Project Role	Education and Professional Experience
Marcia Bender, MA, RPA Archaeologist AECOM	Ms. Bender has 16 years of cultural resources experience. Her responsibilities included leading the cultural resources archaeology and tribal surveys. She has a Bachelor of Arts in Anthropology and a Master of Arts in Anthropology with an emphasis in Archaeology, both from Wichita State University. She is permitted as a Principal Investigator through NDSHPO in North Dakota.
Dirk Churchill Environmental Specialist AECOM	Mr. Churchill has 8 years of experience in environmental assessment, permitting, and compliance services. His responsibilities included application preparation and leading the wetland surveys. He has a Bachelor of Science in Natural Resources Management from Natural Resources Management from North Dakota State University. He is a USACE certified wetland delineator.
Steven Ensley GIS Analyst AECOM	Mr. Ensley has 14 years of experience as a GIS specialist within the Planning, Design and Development group. His responsibilities included mapping, data analysis, and technical expertise. He has a Bachelor of Science in Environmental Conservation from Northern Michigan University.

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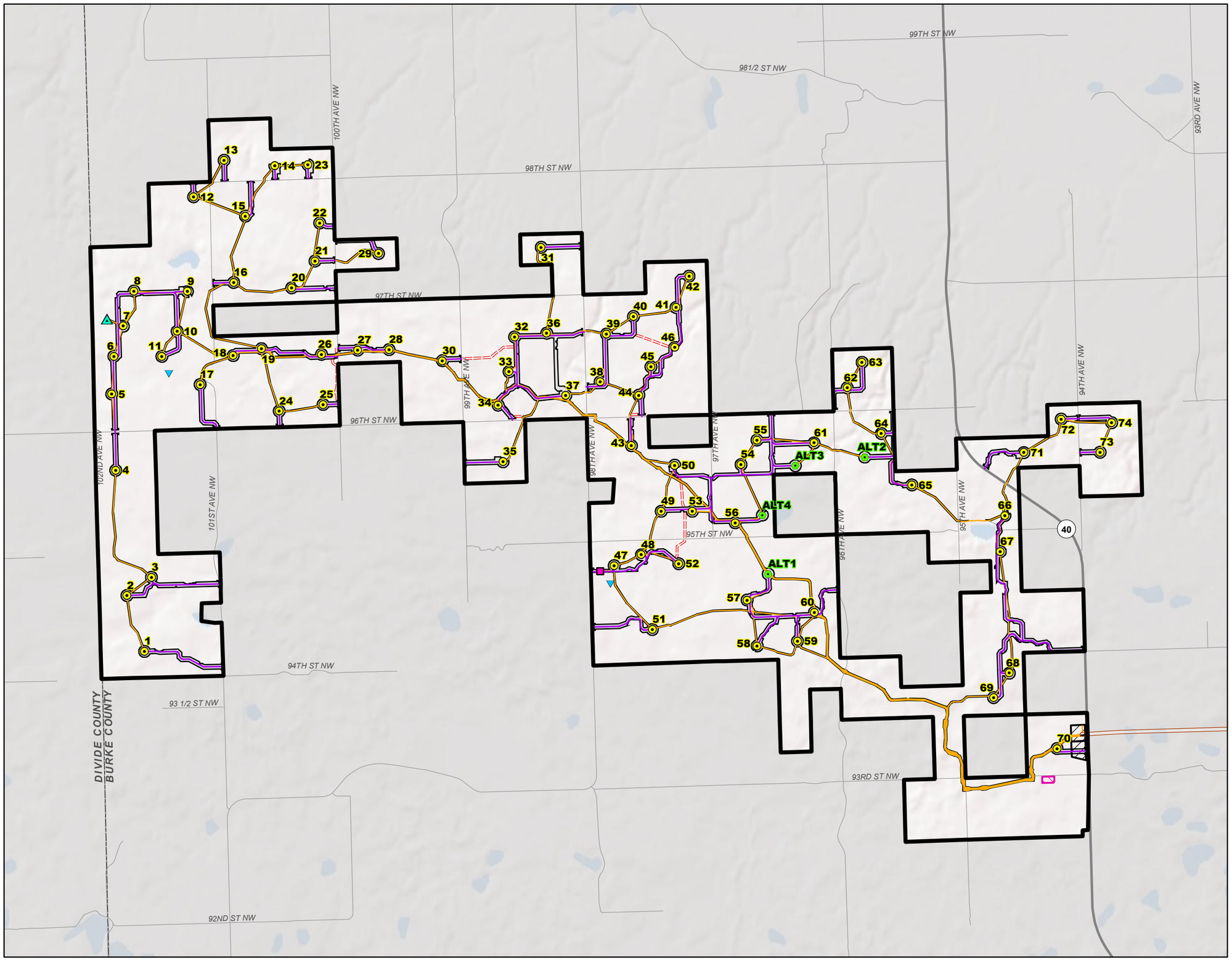
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11.0 ACRONYMS AND ABBREVIATIONS

AADT	annual average daily traffic
ADLS	Aircraft Detection Lighting System
APLIC	Avian Power Line Interaction Committee
Atwell	Atwell, LLC
AWEA	American Wind Energy Association
Basin Electric	Basin Electric Power Cooperative
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
Burke-Divide Electric Co-Op	Burke-Divide Electric Co-Op, Inc
Burke Wind	Burke Wind, LLC
Certificate	Certificate of Site Compatibility
Commission	North Dakota Public Service Commission
CUP	Conditional Use Permit
CRP	Conservation Reserve Program
dBA	decibel, A-weighted
EMF	electromagnetic fields
EPA	U.S. Environmental Protection Agency
EPC	engineering, procurement, and construction
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FSA	Farm Service Agency
GE	General Electric
GE 2.32	General Electric 2.32-MW wind turbine
GE 2.72	General Electric 2.72-MW wind turbine
ICBM	intercontinental ballistic missile
IPaC	Information for Planning and Conservation
kV	kilovolt
MET	meteorological evaluation tower
mph	miles per hour
MW	megawatt
NASA	National Aeronautics and Space Administration
NASS	National Agricultural Statistics Service
N.D. Admin. Code	North Dakota Administrative Code
N.D.C.C.	North Dakota Century Code
NDCRS	North Dakota Cultural Resources Survey
NDDMR	North Dakota Department of Mineral Resources
NDDOT	North Dakota Department of Transportation
NDDTL	North Dakota Department of Trust Lands
NDDEQ	North Dakota Department of Environmental Quality
NDGFD	North Dakota Game and Fish Department
NDSHPO	North Dakota State Historic Preservation Office
NERC	North American Electric Reliability Corporation
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places

NDSHPO	North Dakota State Historic Preservation Office
NDSWC	North Dakota State Water Commission
NextEra	NextEra Energy Resources, LLC
NHD	National Hydrography Dataset
NIEHS	National Institute of Environmental Health Sciences
NLEB	northern long-eared bat
NOAA	National Oceanic and Atmospheric Administration
Northern Divide Wind	Northern Divide Wind, LLC
NPDES	National Pollutant Discharge Elimination System
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory
NWP	Nationwide Permit
NWR	National Wildlife Refuge
O&M	operations and maintenance
PCN	preconstruction notification
Phase I ESA	Phase I Environmental Site Assessment
PLOTS	Private Land Open to Sportsmen
PPA	power purchase agreement
Project	Northern Divide Wind Energy Center
PTC	Production Tax Credit
SCADA	Supervisory Control and Data Acquisitions
SCRSTT	sites of cultural and religious significance to the tribe
SHSND	State Historical Society of North Dakota
SODAR	sonic detection and ranging
SPCC	Spill Prevention, Control, and Countermeasures
SPP	Southwest Power Pool
SRCSTT	Sites of Religious and/or Cultural Significance to Tribes
SWCA	SWCA Environmental Consultants
SWPPP	Storm Water Pollution Prevention Plan
T&E	threatened and endangered
TCS	Traditional Cultural Surveyors
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOD	U.S. Department of Defense
USDHS	U.S. Department of Homeland Security
USDOE	U.S. Department of Energy
USEIA	U.S. Energy Information Administration
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCS	Wildlife Conservation Strategy
WEST	Western EcoSystems Technology, Inc.
WNS	White Nose Syndrome
WMA	Wildlife Management Area
WOTUS	waters of the United States
WPA	Waterfowl Production Area
WRRS	Wildlife Response and Reporting System

Figures





Legend

- County Road
- State/Federal Highway
- County Boundary

Site Plan

- Primary Turbine
- Alternative Turbine
- Permanent MET Tower
- Temporary MET Tower
- ALDS Radar Tower
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Batch Plant
- Laydown Yard, O&M Building & Substation
- Northern Divide 345-kV Transmission Line Right-of-Way
- Northern Divide Wind Energy Center Project Area

Contractor will bore all wetlands and roads.

0 0.5 1 1.5 Miles

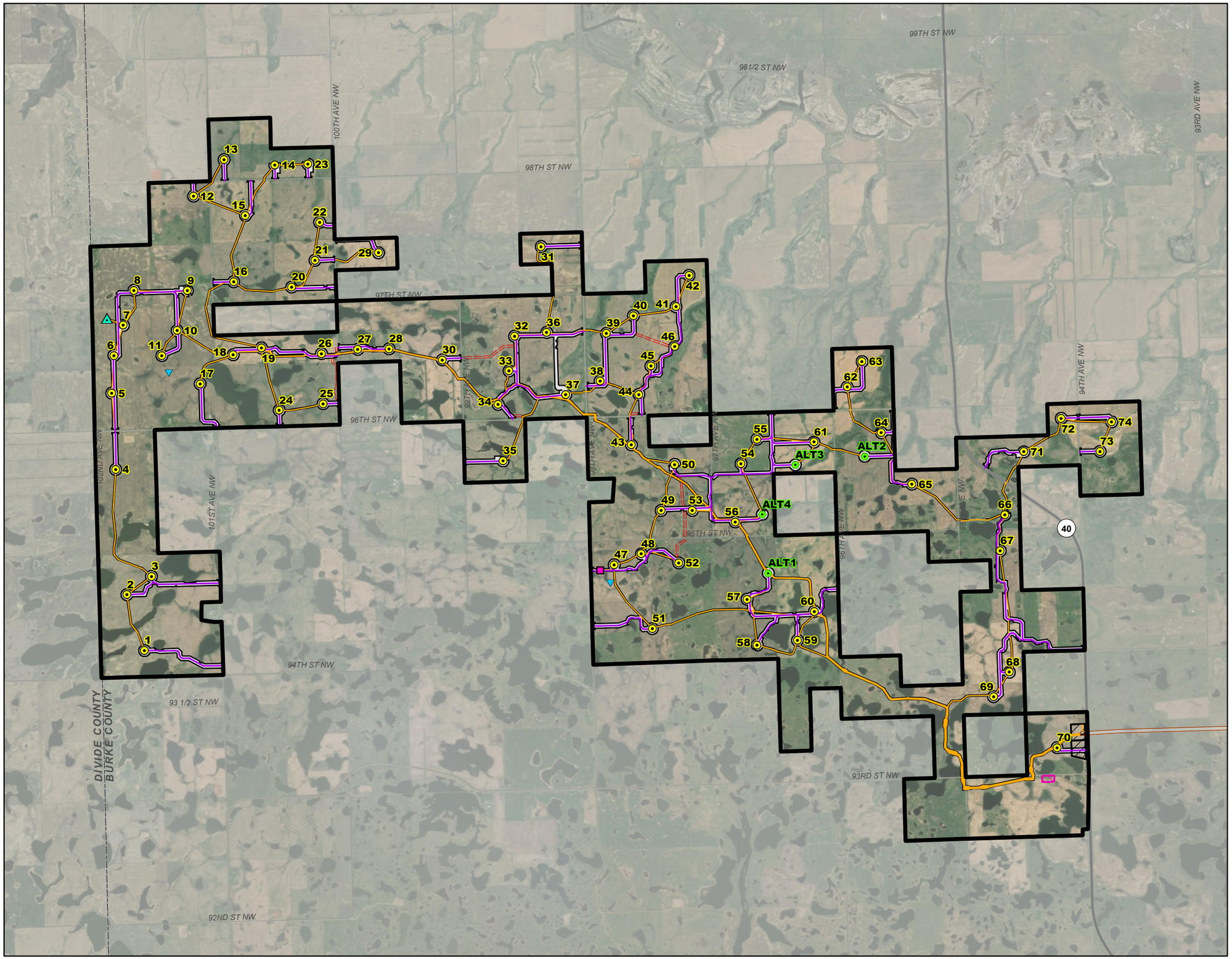
Figure 1-1

Project Location and Site Plan (Street Map)

Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM





Legend

- County Road
- State/Federal Highway
- County Boundary

Site Plan

- Primary Turbine
- Alternative Turbine
- Permanent MET Tower
- Temporary MET Tower
- ALDS Radar Tower
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Batch Plant
- Laydown Yard, O&M Building & Substation
- Northern Divide 345-kV Transmission Line Right-of-Way
- Northern Divide Wind Energy Center Project Area

Contractor will bore all wetlands and roads.

0 0.5 1 1.5 Miles

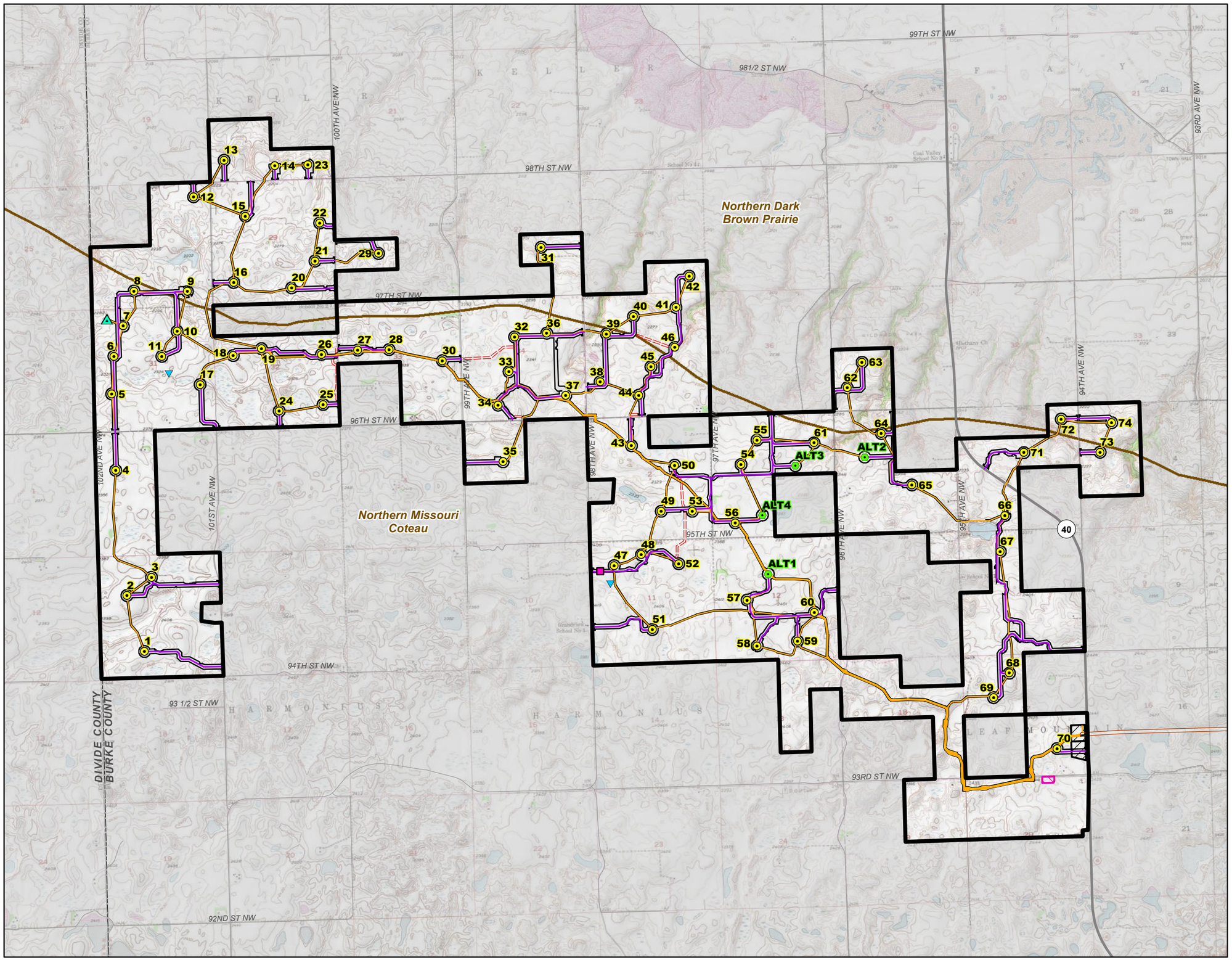
Figure 1-2

Project Location and Site Plan (Aerial)

Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM





Legend

- County Road
- State/Federal Highway
- County Boundary
- EPA Ecoregion Boundary

Site Plan

- Primary Turbine
- Alternative Turbine
- Permanent MET Tower
- Temporary MET Tower
- ALDS Radar Tower
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Batch Plant
- Laydown Yard, O&M Building & Substation
- Northern Divide 345-kV Transmission Line Right-of-Way
- Northern Divide Wind Energy Center Project Area

Contractor will bore all wetlands and roads.

0 0.5 1 1.5 Miles

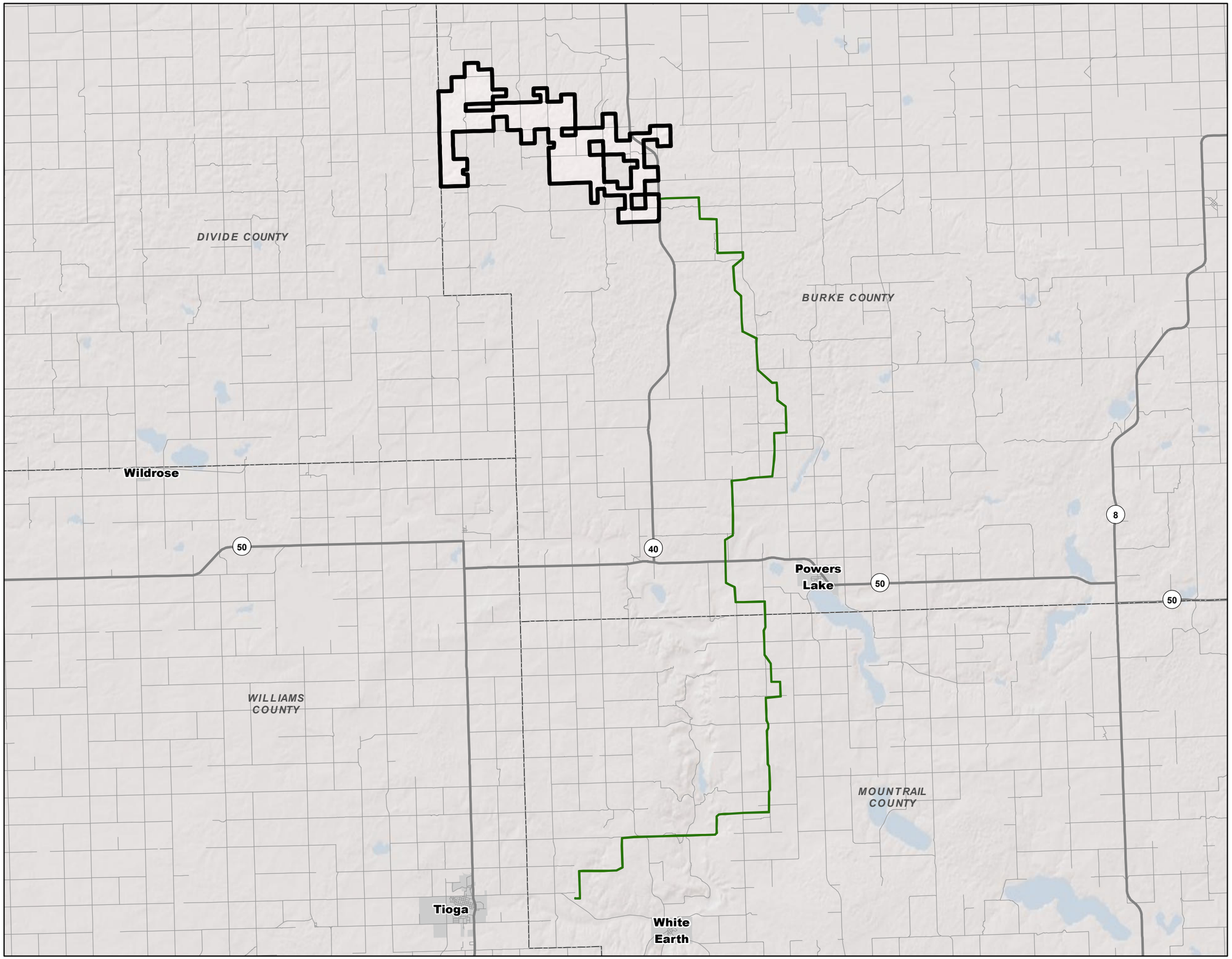
Figure 1-3

Project Location and Site Plan (Topographic)

Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM





Legend

- County Road
- State/Federal Highway
- County Boundary

Site Plan

- Northern Divide Wind Energy Center Project Area
- Northern Divide 345-kV Transmission Line Right-of-Way

Contractor will bore all wetlands and roads.

0 2 4 6 Miles

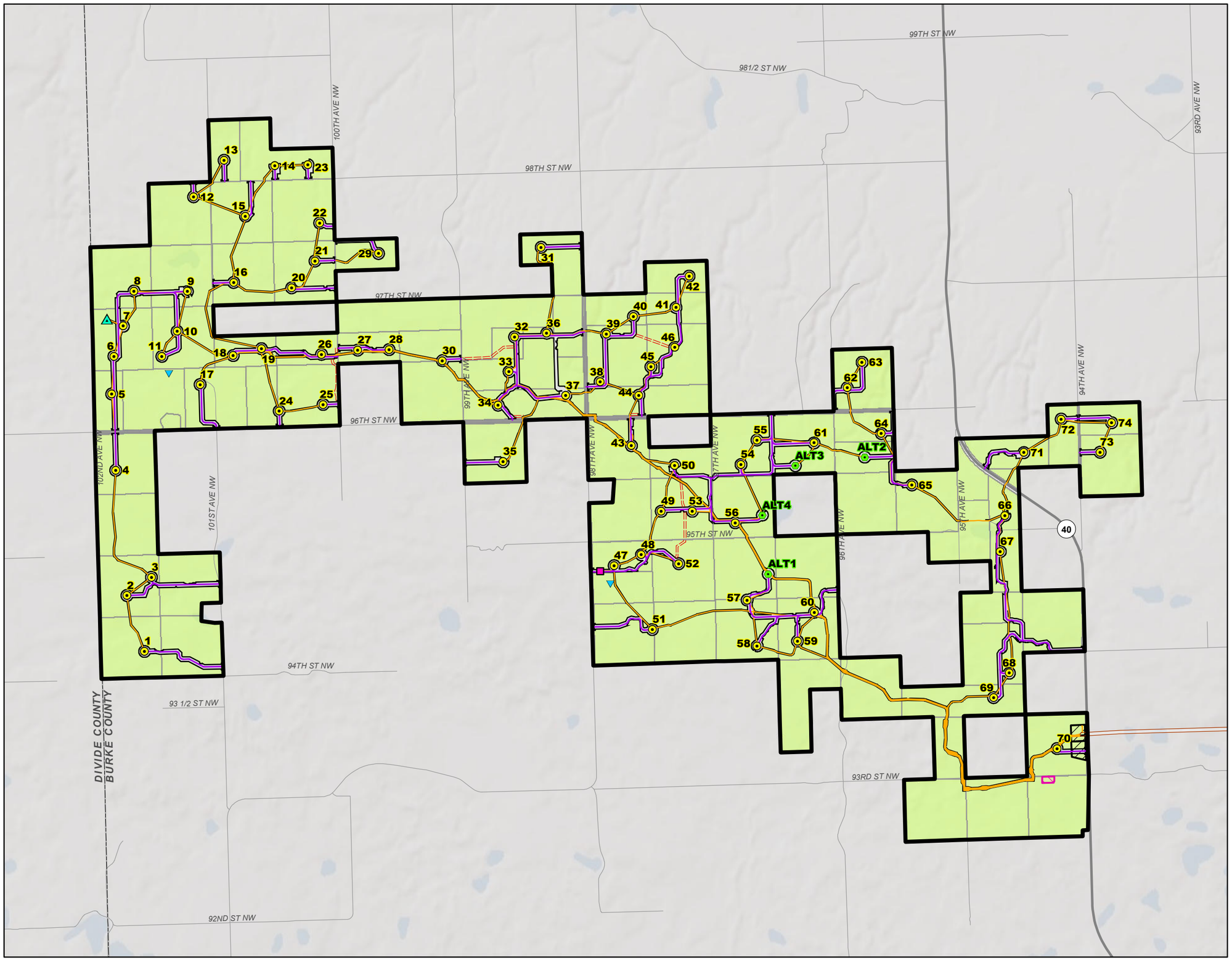
Figure 1-4

Project Area and Project Transmission Line

Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM





Legend

- County Road
- State/Federal Highway
- County Boundary
- Participating Landowner

Site Plan

- Primary Turbine
- Alternative Turbine
- Permanent MET Tower
- Temporary MET Tower
- ALDS Radar Tower
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Batch Plant
- Laydown Yard, O&M Building & Substation
- Northern Divide 345-kV Transmission Line Right-of-Way
- Northern Divide Wind Energy Center Project Area

Contractor will bore all wetlands and roads.

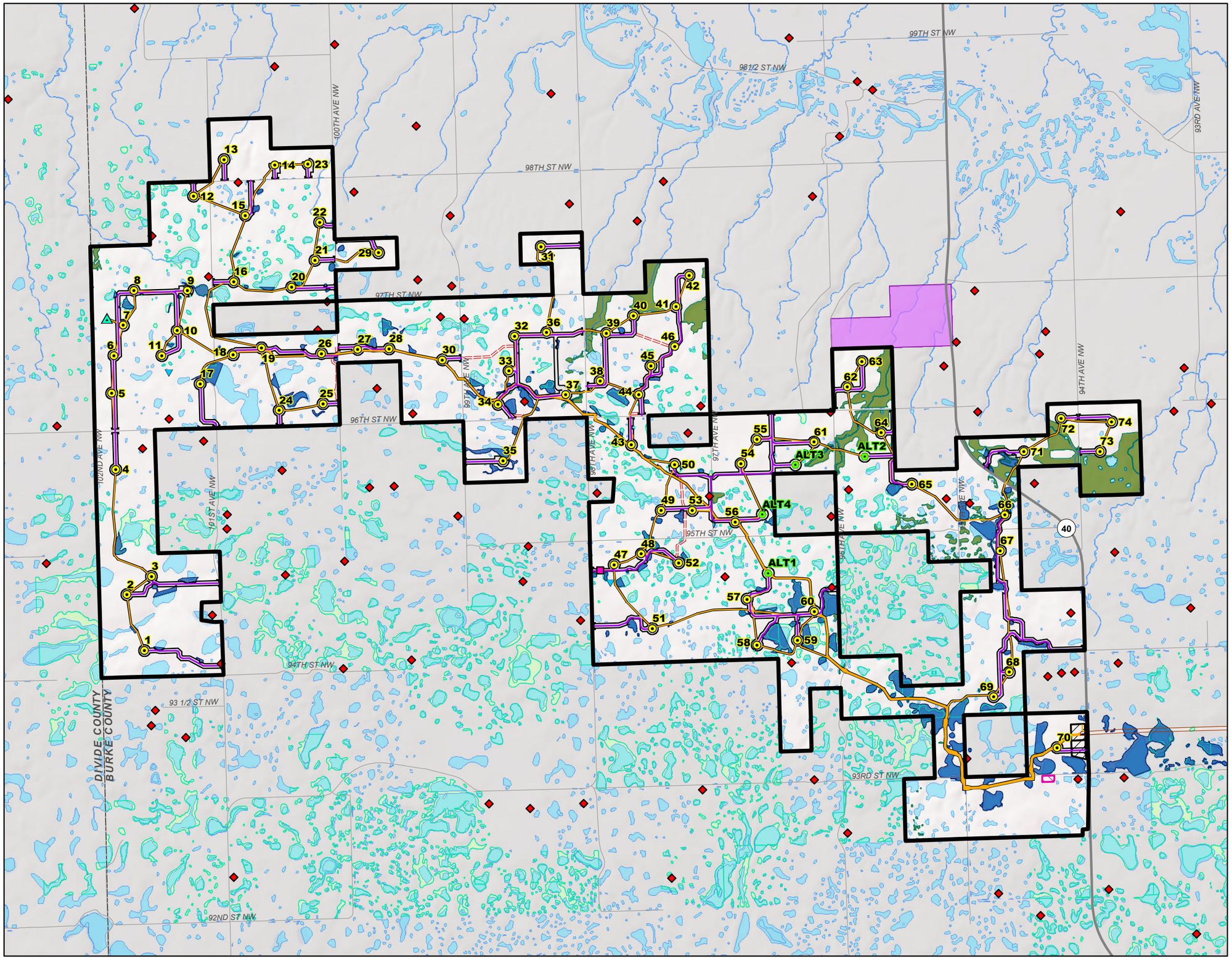
0 0.5 1 1.5 Miles

Figure 1-5
Participating Landowners

Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM





Legend

- County Road
- State/Federal Highway
- County Boundary

Site Plan

- Primary Turbine
- Alternative Turbine
- Permanent MET Tower
- Temporary MET Tower
- ALDS Radar Tower
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Batch Plant
- Laydown Yard, O&M Building & Substation
- Northern Divide 345-kV Transmission Line Right-of-Way
- Northern Divide Wind Energy Center Project Area

Exclusion Areas

- Columbus Park District - WildWood Park

Avoidance Areas

- Historical Resource
- Woodland
- USFWS Wetland Easement
- Delineated Wetland
- National Wetlands Inventory (USFWS 2018)

Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.

0 0.5 1 1.5 Miles

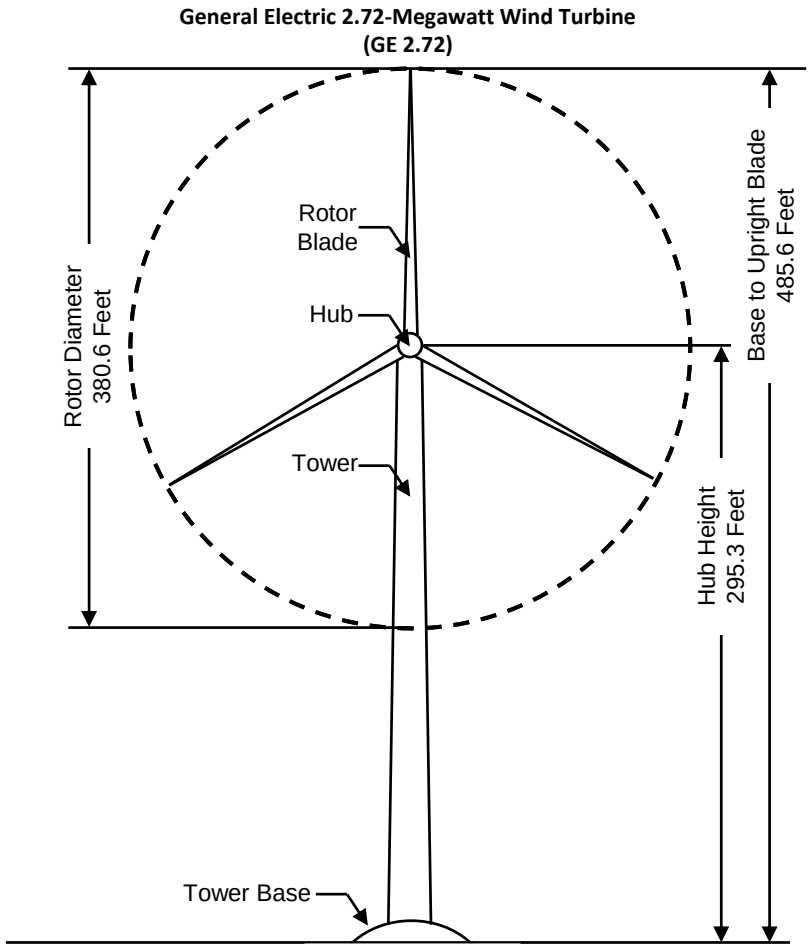
Figure 3-1

Exclusion and Avoidance Areas

Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM



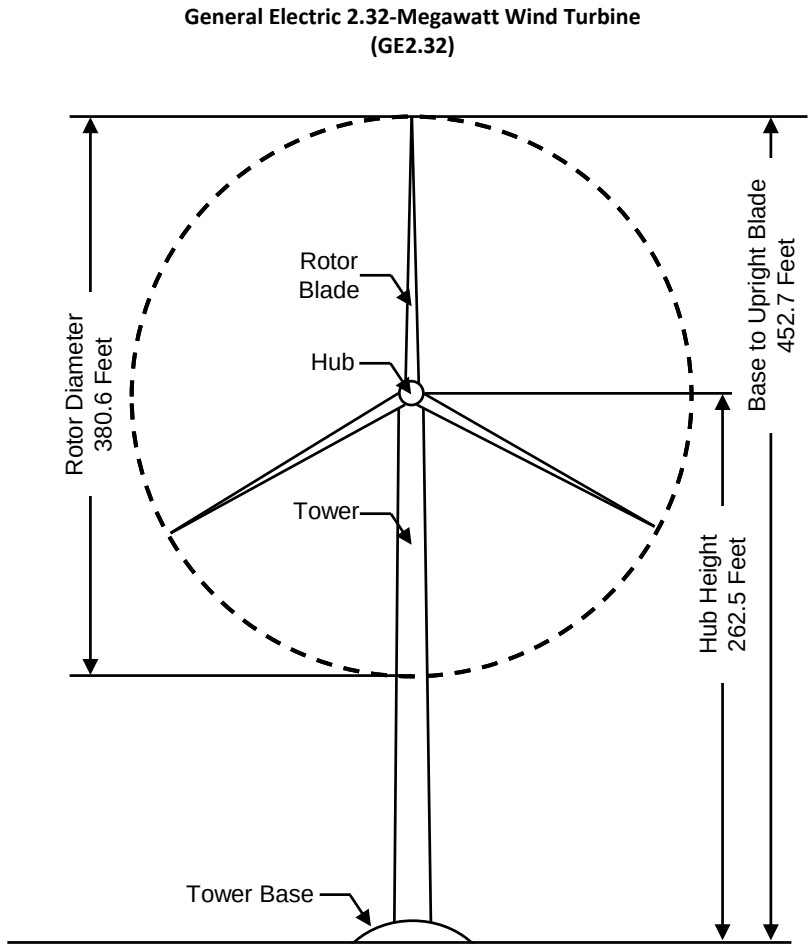


Figure 4-1
Wind Turbine Design Features

Northern Divide Wind Energy Center
Burke County, North Dakota

Not To Scale

AECOM

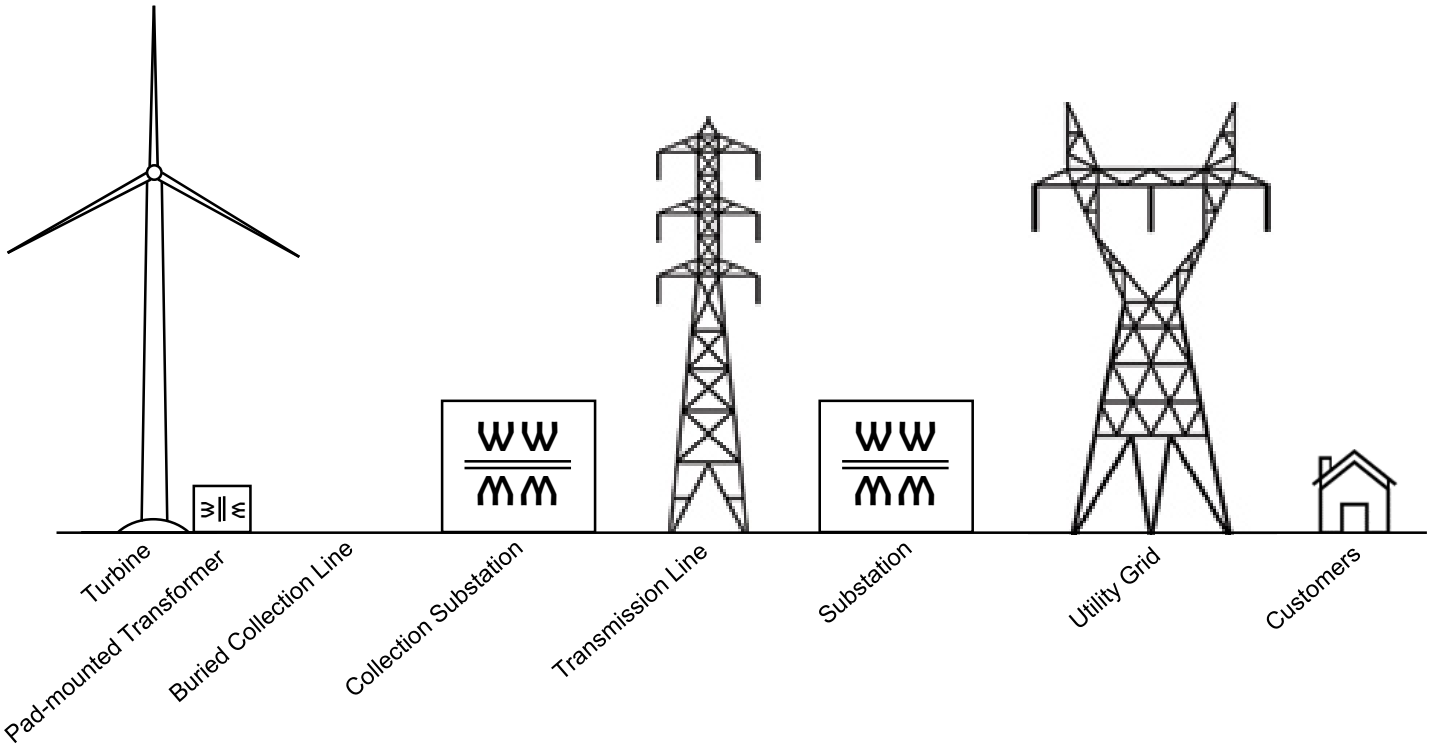


Figure 4-2
Path of Energy Diagram

Northern Divide Wind Energy Center
Burke County, North Dakota

Not To Scale

AECOM

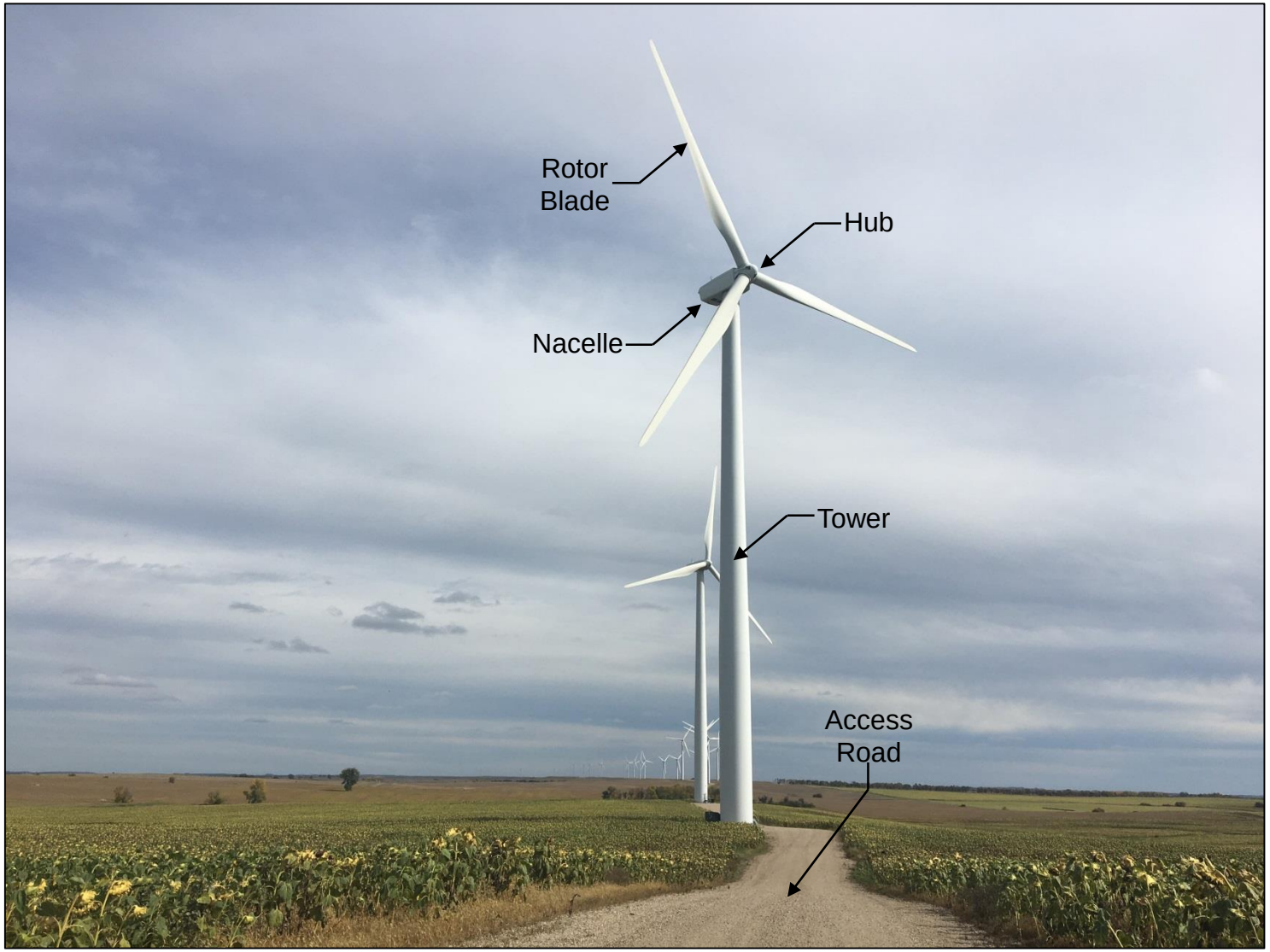
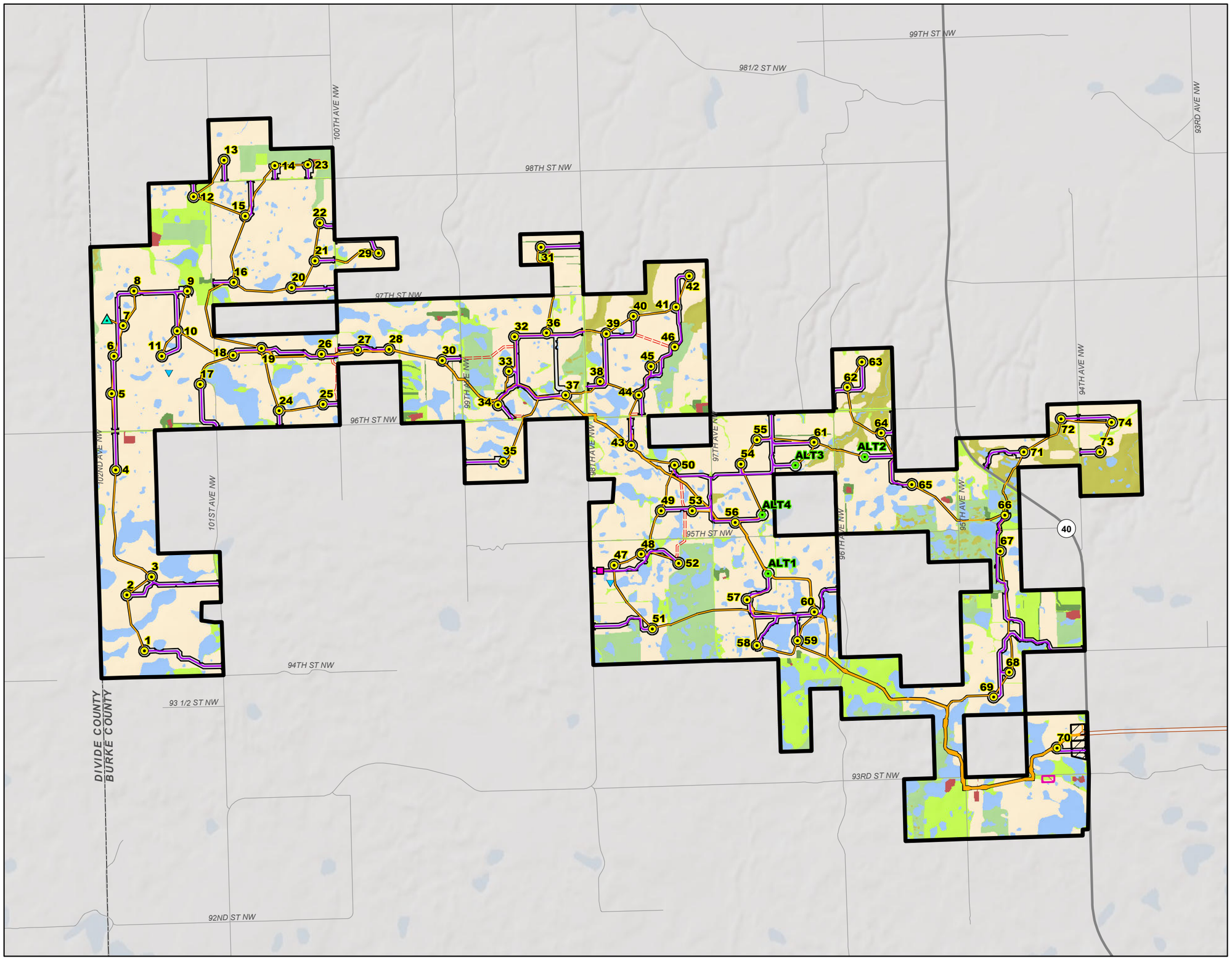


Figure 4-3
Typical Wind Energy Design Featurs

Northern Divide Wind Energy Center
Burke County, North Dakota

AECOM





Legend

- County Road
- State/Federal Highway
- County Boundary

Site Plan

- Primary Turbine
- Alternative Turbine
- Permanent MET Tower
- Temporary MET Tower
- ALDS Radar Tower
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Batch Plant
- Laydown Yard, O&M Building & Substation
- Northern Divide 345-kV Transmission Line Right-of-Way
- Northern Divide Wind Energy Center Project Area

Land Use Classification (% Project Area)

- Cropland (64%)
- Wetland (15%)
- Broken Grassland (10%)
- Unbroken Grassland (7%)
- Forest/Shrubland (4%)
- Tree Row (<1%)
- Existing Infrastructure (<1%)

Contractor will bore all wetlands and roads.

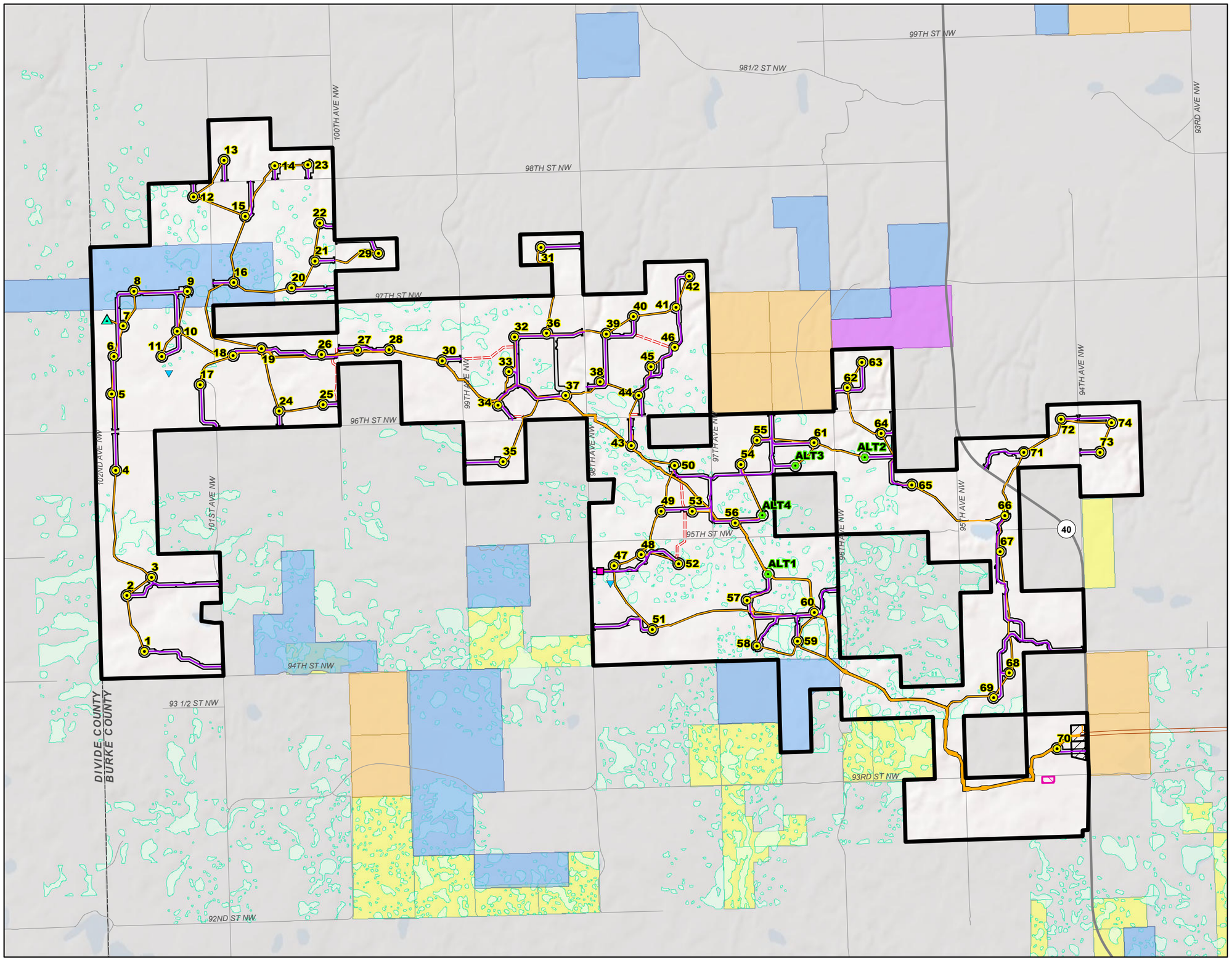
0 0.5 1 1.5 Miles

Figure 5-1
Land Use Classification

Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM





Legend

- County Road
- State/Federal Highway
- County Boundary

Site Plan

- Primary Turbine
- Alternative Turbine
- Permanent MET Tower
- Temporary MET Tower
- ALDS Radar Tower
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Batch Plant
- Laydown Yard, O&M Building & Substation
- Northern Divide 345-kV Transmission Line Right-of-Way
- Northern Divide Wind Energy Center Project Area

Public Lands, Easements, & Agreements

- Private Land Open to Sportsmen Agreement
- State Trust Land
- Columbus Park District - WildWood Park
- USFWS Wetland Easement
- USFWS Grassland Easement

Contractor will bore all wetlands and roads.

0 0.5 1 1.5 Miles

Figure 5-2
Public Lands, Easements, & Agreements
Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM



Typical cropland within the Project Area

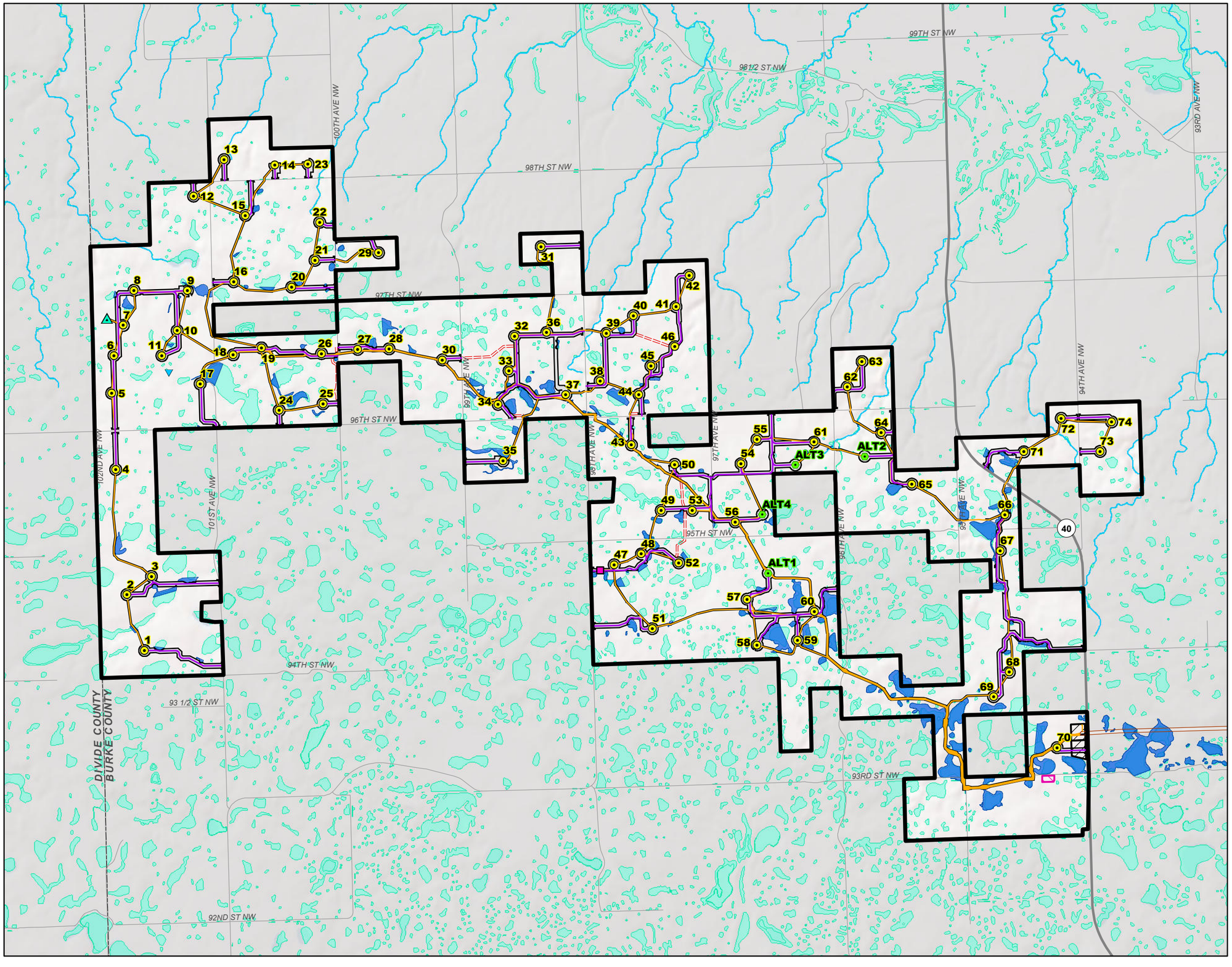


Typical grassland within the Project Area

Figure 5-3
Photos of Typical Landscape

Northern Divide Wind Energy Center
Burke County, North Dakota

AECOM





Legend

- County Road
- State/Federal Highway
- County Boundary

Site Plan

- Primary Turbine
- Alternative Turbine
- Permanent MET Tower
- Temporary MET Tower
- ALDS Radar Tower
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Batch Plant
- Laydown Yard, O&M Building & Substation
- Northern Divide 345-kV Transmission Line Right-of-Way
- Northern Divide Wind Energy Center Project Area

Surface Water Resources

- Delineated Wetland
- National Wetlands Inventory (USFWS 2018)
- National Hydrography Dataset (USGS 2018)

Contractor will bore all wetlands and roads.

0 0.5 1 1.5 Miles

Figure 5-4

National Wetlands Inventory and Surface Waters

Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM

Appendix A

Excerpt of NextEra Energy, Inc.’s 2019 Corporate Responsibility Report

2019 SUSTAINABILITY EXECUTIVE DIGEST
CORPORATE PROFILE





NEXTera® ENERGY

THIS IS OUR ERA THIS IS AMERICA'S ENERGY ERA™




Jim Robo

Our Vision

Be the largest and most capable clean energy infrastructure company in North America

Our Values

We Are Committed to Excellence
We Do the Right Thing
We Treat People with Respect

NYSE Ticker Symbol: NEE

Recognitions

Most Admired Companies (Fortune) – No. 1 in electric & gas utilities industry – 12 times, including 2019

Change the World (Fortune) – 2018

A World's Most Ethical Company® (Ethisphere Institute) – 12 times, including 2019

America's Best Employers (Forbes) – four times, including 2019

Best Employers for Diversity (Forbes) – 2019

A Fortune 200 company; included in the S&P 100 Index

At a Glance (2018)

~14,300 employees	~$6.6 billion in net income attributable to NextEra Energy
Operations in 36 states, four Canadian provinces	~$103.7 billion in total assets
~$16.7 billion in operating revenue	~45,500 megawatts (MW) of net generating capacity

Data in At a Glance is as of Dec. 31, 2018.
Cautionary statements and risk factors that may affect future results can be found on the inside back cover of this report.
Information and data contained in this report does not include Gulf Power Company, as the transaction was completed on Jan. 1, 2019.

To view our complete sustainability profile, visit **NextEraEnergy.com/Sustainability**.

Eras are defined by the people who power them, and, at NextEra Energy, our teams are writing a bright script for an American Energy Era that is affordable, efficient and clean. Through investment and innovation, we are solving the world's toughest energy challenges as we prove that a sustainable energy future is not only possible, but also beneficial to our shareholders.

In 2018, NextEra Energy was America's No. 1 capital investor in energy infrastructure and the fifth largest capital investor across all sectors. Our disruption of the energy sector is evident by the fact that no other company, in any industry, has done more than NextEra Energy to address carbon dioxide (CO_2) emissions.

Yet, we are far from finished. We recently announced a goal to reduce our CO_2 emissions rate by 67% by 2025, from a 2005 baseline, which will equate to a nearly 40% reduction in absolute CO_2 emissions, despite a near doubling of electricity production over that time. To put this into perspective, if all of the nation's utilities were able to achieve NextEra Energy's projected 2025 emissions rate, absolute CO_2 emissions for the power sector would be approximately 75% lower than they were in 2005.

We remain the largest generator of renewable energy from the wind and the sun. In fact, NextEra Energy Resources has more wind capacity in its portfolio than all but seven countries in the world. Florida Power & Light Company, a national leader in solar energy, is installing more than 30 million solar panels by 2030. And we continue to be a world leader in battery storage, with FPL recently announcing plans to build the world's largest battery storage project while approximately 40% of all NextEra Energy Resources' solar contracts signed in 2018 include an energy storage component.

NextEra Energy has accomplished these leadership positions through a commitment to excellence and by leveraging big data, machine learning and artificial intelligence to deliver results for our stakeholders and across our businesses.

We are deeply committed to doing well by doing good, and that means respecting our environment, providing value for our customers, sustaining our communities, focusing on continuous improvement and innovation, investing in our team and growing shareholder value. I hope you'll take some time to review the materials throughout this report to learn more about how NextEra Energy is creating a more sustainable energy future for America.

Through investment and innovation, we're powering America into the next era by making our company and our country more sustainable. By disrupting our own industry, our shared vision of sustainability will define the next era – America's Energy Era.

You can find more details on our sustainability performance throughout NextEraEnergy.com/Sustainability and on our company websites, including NextEraEnergy.com, FPL.com and NextEraEnergyResources.com.

Sincerely,

Jim Robo
Chairman and Chief Executive Officer



NextEra Energy was America's No. 1 capital investor in energy infrastructure in 2018. The Sholes Wind Energy Center in Randolph, Nebraska, is among the company's renewable energy projects under construction.

Respecting Our Environment

- In 2018, we achieved our lowest-ever emissions rates of carbon dioxide (CO_2), sulfur dioxide (SO_2) and nitrogen oxide (NO_x) — rates that were 55%, 96% and 81% lower, respectively, than the average U.S. utility sector.
- We remain the world's largest generator of renewable energy from the wind and sun. In 2018, nearly 100% of the power produced at our facilities was generated from a diverse mix of clean or renewable sources, including wind, solar, combined-cycle natural gas and nuclear.
- We've avoided the use of more than 14 billion gallons of water in 2018 due to our investments in water-free solar and wind energy. In addition, nearly 99% of the water we use is returned to its original source.
- We're committed to being an industry leader in environmental protection and stewardship, and that includes wildlife and habitat protection. That's why we've created wildlife programs to protect several species and their habitats.

For decades, NextEra Energy has been reducing emissions through the development of renewable energy and modernization of its generation fleet. The company's new goal is to reduce its CO_2 emissions rate 67% by 2025, from a 2005 baseline. This equates to a nearly 40% reduction in absolute CO_2 emissions, despite the company's total expected electricity production almost doubling over that time.

EMISSIONS REDUCTION TARGET

67%

LOWER

CO_2

rate by 2025

*Achievement of the CO_2 emissions rate goal will be dependent on many factors, including, but not limited to, future technology development, governmental policy and mergers and acquisitions.

Please note that the environmental attributes of NextEra Energy's electric generating facilities have been or likely will be sold or transferred to third parties, who are solely entitled to the reporting rights and ownership of the environmental attributes, such as renewable energy credits, emissions reductions, offsets, allowances and the avoided emission of greenhouse gas pollutants.



To view our complete sustainability profile, visit **NextEraEnergy.com/Sustainability**.

FPL's Turkey Point Nuclear Plant canals are home to hundreds of American crocodiles. FPL's crocodile management program has been a key component in moving the classification of crocodiles from endangered to threatened under the Endangered Species Act.

Outstanding Customer Value

- Our customers range from families to small businesses to industrial complexes to utilities, retail electricity providers, power cooperatives and municipalities, as well as individual companies and other organizations committed to renewable and sustainable energy across the U.S. and Canada.
- We're committed to providing our customers with energy that is affordable, reliable and clean. Since 2001, our investments in infrastructure have saved customers nearly $10 billion by improving the efficiency of our power plants, therefore, using less fuel to generate electricity.
- In 2018, FPL was recognized as one of the nation's most trusted electric utilities by Market Strategies International for the fifth year in a row.
- In 2018, FPL processed more than $27.3 million in ASSIST payments for more than 94,000 customers in need of help paying their electric bills.

care to share

Since 1994, our Care To Share® program has raised more than

$25 million, helping 97,000 families



FPL'S TYPICAL RESIDENTIAL CUSTOMER BILL IS NEARLY **30% BELOW** THE NATIONAL AVERAGE AND LOWER THAN 45 STATES.

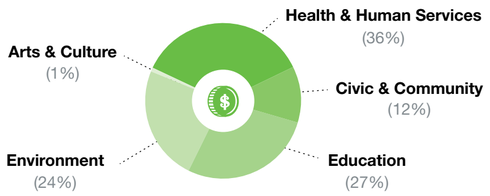
To view our complete sustainability profile, visit **NextEraEnergy.com/Sustainability**.

FPL crews help restore power in the aftermath of Hurricane Michael in Altha, Florida. FPL crews supported four out-of-state restoration efforts in 2018, including Hurricanes Maria, Florence and Michael, as well as the Camp Fire in Northern California.

Sustaining Our Communities

- In 2018, NextEra Energy was America's No. 1 capital investor in energy infrastructure and the fifth largest capital investor across all sectors. We're supporting communities by creating thousands of jobs and, in 2018, we paid $663 million in property taxes across the U.S. and Canada to support local service organizations, governments, schools and more.
- NextEra Energy and its employees contributed more than $13.7 million in 2018 to support wide-ranging initiatives and causes that contribute to the well-being of our communities.
- As part of our Power to Care volunteer program, our employees contributed 85,000 hours in 2018 to their local communities through company-sponsored projects and personal volunteer time.
- We support nearly 120 robotics teams across Florida and partner with the FIRST organization to sponsor a regional tournament in South Florida, as well as a science show for approximately 52,000 grade school students each year.
- NextEra Energy supported four out-of-state restoration efforts in 2018, including Hurricanes Maria, Florence and Michael, as well as the Camp Fire in Northern California.

Charitable Giving in 2018



In 2018, our employees

Raised more than
$4.3 million
for the community

Volunteered
85,000
hours of service

Donated more than
$198,880
in education matching gifts

Served on more than
250
community organization boards

Donated more than
$187,000
worth of **Dollars for Doers** grants

Maintained the CEO Volunteer Circle membership with
252
employees

To view our complete sustainability profile, visit **NextEraEnergy.com/Sustainability**.

As part of NextEra Energy's commitment to supporting education, energy centers often host tours for students, such as this field trip to the Tuscola Bay Wind Energy Center in Tuscola, Michigan.

Investing in Our Team

- The safety of our employees is paramount. And, we believe that all injuries are preventable. Since 2003, our safety performance has improved by 80%.
- Our employees spent more than 1.1 million hours in 2018 growing their skills, completing classroom, field and online courses focused on technical and commercial skills, leadership and career development, personal and professional effectiveness, and process and project management.
- NextEra Energy's Corporate Diversity Council sponsors the company's diversity and inclusion strategy by executing business-unit specific initiatives, which results in a diverse and inclusive culture where employees feel valued and motivated to do their best every day.
- NextEra Energy was named to Forbes' list of America's Best Employers for Diversity for the second consecutive year in 2019, as well as to Forbes' list of America's Best Employers for the fourth consecutive year.

STRIVING TO BE WELL IN 2018

64	on-site fitness centers
11,000	on-site health center visits
7,300	on-site wellness screenings
5,700	employees attended approximately 170 health and wellness presentations
2,600	flu shots provided to employees and their families
8,100	employees use a comprehensive computer program to help address ergonomics needs



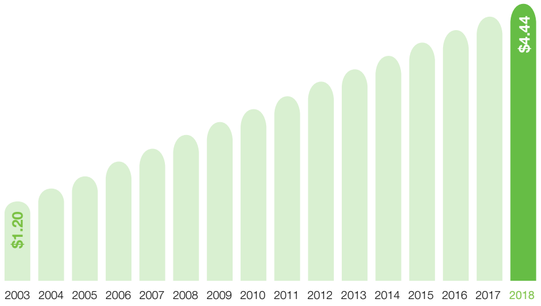
1.1 MILLION

HOURS OF TRAINING COMPLETED

Growing Shareholder Value

- NextEra Energy has a long-term track record of delivering value to shareholders. For the 15 years ending Dec. 31, 2018, NextEra Energy delivered a total shareholder return of approximately 770%, compared to 98% for the S&P 500 Utilities Index and 207% for the S&P 500 Index.
- NextEra Energy achieved a compound annual growth rate in dividends per share of approximately 9.1% from 2003 through Dec. 31, 2018. NextEra Energy also achieved a compound annual growth rate in adjusted earnings per share of approximately 7.8% for the same time period.
- Since 2003, NextEra Energy has outperformed every company in the S&P 500 Utilities Index and 83% of the companies in the S&P 500 Index.
- We continue to have one of the strongest balance sheets and highest credit ratings for electric utilities in the U.S.

DIVIDENDS PER SHARE





To view our complete sustainability profile, visit **NextEraEnergy.com/Sustainability**.

FPL's state-of-the-art Distribution Control Center in Riviera Beach, Florida, is a Category 5-rated facility designed to ensure greater everyday reliability and more efficient communication, collaboration and response during emergency events.



NextEra Energy

Powering America's Energy Era

As America's No. 1 capital investor in energy infrastructure and the fifth largest capital investor across all sectors in 2018, NextEra Energy is helping ensure that the next energy to power our dreams will be American energy.

Leading the industry

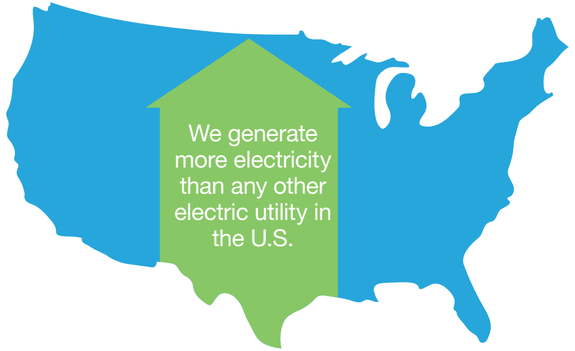
- We generate more electricity than any other electric utility in the U.S., and our market capitalization makes us the largest utility company in the world.
- We're the world's largest generator of renewable energy from the wind and sun. In 2018, we generated more than 18% more wind and solar energy than the next competitor.
- According to Fortune, we are among the top 25 companies in the world, across all industries, for innovation, use of corporate assets, social responsibility and long-term investment value.

Investing in infrastructure

- We were America's No. 1 capital investor in energy infrastructure and the fifth largest capital investor across all sectors in 2018.
- We made capital investments of approximately $83 billion in the U.S. from 2009 to 2018.
- We're planning to make between $50 and $55 billion in new infrastructure investments from 2019 through 2022.

Leading the nation in innovative, clean energy

- We have the largest share of North American wind capacity, an amount that has nearly tripled over the past decade. We're also using the latest technology, including taller towers and wider rotor diameters, which has increased efficiency and lowered costs.
- We have been pioneering universal solar for nearly 30 years. We built the largest U.S. solar photovoltaic (PV) plant of its time, constructed the world's first solar-gas hybrid plant and are currently in the midst of one of the largest solar expansions ever in the U.S. with FPL's plans to install more than 30 million solar panels by 2030.
- We are a world leader in battery storage, and we're continuing to lead the industry with plans to build the world's largest solar-powered battery system and the company's first co-located combined wind, solar and battery storage project.
- We leverage big data, machine learning, artificial intelligence and advanced analytics to make smart decisions that optimize project development, maximize revenues and reduce operational costs.



WE INVESTED $83 BILLION IN U.S. ENERGY INFRASTRUCTURE FROM 2009 THROUGH 2018

NextEra Energy at a Glance (2018)	
Operating in	36 U.S. states, four Canadian provinces
Operating Revenue	~$16.7 billion
Net Generating Capacity	~45,500 megawatts (MW)
Employees	~14,300

Wind Technician Owen Hadley helps maintain the Parry Energy Storage System in Ontario, Canada.



Florida Power & Light Company

Delivering clean, affordable, reliable and smart power

Consistently one of the nation's cleanest and most reliable electric utilities with bills nearly 30% below the national average, FPL is focused on creating innovative solutions to drive down costs and continue to provide tangible benefits for its more than 5 million customers. FPL is more than an energy company – it's a technology company that delivers clean, affordable and reliable power to approximately half the state of Florida.

Increasing efficiency and affordability

- FPL's typical 1,000-kWh residential customer bill is nearly 30% below the national average and lower than 45 states.
- While the cost of everyday items has gone up in recent years, FPL's bills are actually lower than they were a decade ago.
- We've torn down old, oil-fired and coal power plants and replaced them with modern energy centers powered by clean, U.S.-produced natural gas. Since 2001, these investments in more efficient power plants have saved customers nearly $10 billion and prevented 133 million tons of CO_2 emissions by using less fuel to generate electricity. We've also purchased and shut down old, inefficient coal power plants because it is environmentally beneficial and saves customers millions of dollars.
- We offer a variety of smart tools and technologies to help FPL customers monitor their energy use and make their bills even lower.

One of the cleanest utilities in the U.S.

- FPL is the largest electric utility by sales in the U.S. and its highly fuel-efficient power plant fleet is one of the cleanest among all utilities nationwide.
- Our carbon emissions profile is approximately 30% cleaner than the U.S. industry average.
- We're in the midst of one of the largest solar expansions ever in the U.S. with plans to install more than 30 million solar panels by 2030.
- We're continuing to invest in more clean energy sources like zero-emissions solar and high-efficiency natural gas.

Using innovative technology to deliver reliable service

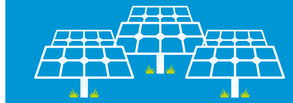
- FPL has installed more than 5 million smart meters and more than 110,000 other intelligent devices across our service area to help monitor and manage the energy grid, detect and prevent power issues, and get life back to normal faster when outages do occur.
- We're integrating predictive analytics and innovative technology, including drones, robots, machine learning and image recognition software to help locate potential issues and fix problems before they affect customers.

Most reliable U.S. electric utility

- FPL's service reliability is approximately 55% better than the national average.
- We've improved our service reliability by more than 30% over the past 10 years.
- Since 2006, we've invested nearly $4 billion to build a stronger, smarter, more storm-resilient energy grid.
- FPL was named the winner of the 2018 ReliabilityOne™ National Reliability Excellence Award presented by PA Consulting for the third time in four years.

30 MILLION

SOLAR PANELS BY 2030



FPL at a Glance (2018)

Service Area	35 counties; 27,000 square miles
Customer Accounts	5 million+
People Served	~10 million
Operating Revenues	~$11.9 billion
Net Generating Capacity	~24,500 MW
Employees	~9,100
Substations	~645
Power Lines	~75,200 circuit miles

The 74.5-MW FPL Sunshine Gateway Solar Energy Center in Columbia County, Florida, came online in January 2019. FPL is in the midst of one of the largest solar expansion ever in the U.S. and is helping to make Florida a global leader in solar energy.



Gulf Power Company

Delivering exceptional value to customers and communities of Northwest Florida

Our team works hard to provide our customers across Northwest Florida with reliable and environmentally responsible energy, offer innovative energy services and solutions, and give back to the communities we call home. Gulf Power Company joined NextEra Energy on Jan. 1, 2019.

Growing our investment in clean energy

- Gulf Power is converting its coal-fired Plant Crist to a clean, highly efficient plant that will run on U.S.-produced natural gas. The conversion is expected to provide net customer savings of approximately $220 million and lower the plant's CO_2 emissions rate by more than 40%.
- Gulf Power has partnered with local military installations to build three large-scale solar energy sites across the Florida Panhandle that produce up to 120 MW from 1.5 million solar panels.
- We're also developing three new 74.5-MW solar energy centers in Escambia and Jackson counties for a total of nearly 225 MW of new solar.
- We're working on plans for additional solar sites, as well as other opportunities to bring more renewable energy options to our customers.

Building a stronger and smarter energy grid

- Strengthening our distribution and transmission systems helps us deliver more reliable energy, in good weather and bad.
- Gulf Power has invested more than $225 million over the last 10 years in infrastructure upgrades across the region, including hardening, substation enhancements and upgrading infrastructure.
- Gulf Power customers are experiencing fewer outages now than ever before. In fact, investments in the energy grid have improved reliability for the company's approximately 460,000 customers by almost 20% since 2010.
- We plan to invest between $650 and $800 million in transmission and distribution projects, including deploying smart grid devices to improve reliability for all Gulf Power customers.

Creating customer value

- Gulf Power has a strong customer brand that we'll continue to improve over the coming years.
- We're measuring and benchmarking customer value metrics to drive performance. For example, we've had a 20% improvement in speed of answering customer calls in the first six months of 2019.
- We're also planning to deploy new customer systems, including billing, call center and customer service support, along with a refreshed website and mobile app.

Supporting economic development in the Panhandle

- Since 2013, Gulf Power has worked with more than 185 companies to help relocate or expand operations in Northwest Florida.
- Our efforts have contributed to the development of more than 60 additional new and expanding businesses and the pledge to create more than 14,000 direct new jobs in the region.
- These additions and expansions are estimated to produce an economic impact to Northwest Florida of more than $1.2 billion in new direct capital investment and generate approximately $14 million in incremental total revenue per year.

Long history of investing in environmental stewardship

- Since 2003, Gulf Power has provided more than $5.8 million in grants to support nearly 100 wildlife and habitat conservation projects through the National Fish and Wildlife Foundation, as well as water restoration projects and recovery efforts of endangered species in Northwest Florida.
- Gulf Power employees also provide hundreds of volunteer hours annually to support habitat restoration and species protection projects.

THREE SOLAR ENERGY CENTERS IN DEVELOPMENT WITH 1.5 MILLION SOLAR PANELS

Gulf Power at a Glance (2018)	
Service Area	8 counties; 7,550 square miles
Customer Accounts	~460,000
Operating Revenues	~1.5 billion
Net Generating Capacity	~2,300 MW
Employees	~1,100
Substations	~135
Power Lines	~9,400 miles

Line Technician Darren Arrington has worked for Gulf Power for nearly 30 years and is committed to delivering reliable service to customers.



NextEra Energy Resources generated more wind energy in 2018 than any other company in the world. The 204-MW New Mexico Wind Energy Center in De Baca and Quay counties began commericial operation in 2003.

NextEra Energy Resources, LLC

Investing in clean energy across America

As the world's largest generator of renewable energy from the wind and sun, NextEra Energy Resources delivers clean energy across North America and provides sustainable solutions to meet evolving energy needs.

A leader in wind energy

- We produced more wind energy in 2018 than any other company in the world and have the largest share of North American wind capacity.
- We operate approximately 120 wind projects in 19 states and four Canadian provinces with a total net generating capacity of approximately 15,000 MW.
- For 2019-2022, we expect to bring online an additional 5,000 to 7,800 MW of clean, emissions-free wind energy.

A leader in solar energy

- NextEra Energy Resources has solar facilities in 22 states, with a total net generating capacity of approximately 2,300 MW.
- We continue to tailor solutions for commercial, utility and public power customers to produce clean solar energy from rooftops, parking structures and vacant land. NextEra Energy Resources develops, builds, finances and operates these projects, called distributed generation, to help customers control costs and meet their renewable energy goals.
- For 2019-2022, we expect to bring online an additional 3,800 to 7,300 MW of clean, emissions-free solar energy.

A world leader in energy storage

- We are a world leader in energy storage with more than 140 MW of battery energy storage systems in operation.
- By storing when energy demand is low and supplying when energy demand is high, we're ensuring Americans have the energy they need, whenever they need it.
- The 20-MW Pinal Central Solar Energy Center in Arizona was NextEra Energy Resources' first project to pair solar energy with an on-site, state-of-the-art 10-MW battery storage system.
- For 2019-2022, we expect to bring online 700 to 1,400 MW of energy storage.

Competitive retail energy solutions

- Gexa Energy, our wholly owned subsidiary, is one of the fastest growing retail electricity providers in the U.S. and a leading provider of affordable energy products and services for residential and commercial customers since 2002.
- Our retail energy brands, Gexa Energy, NextEra Energy Services and Frontier Utilities, serve more than 1.3 million residential and commercial customers in competitive energy markets across North America.

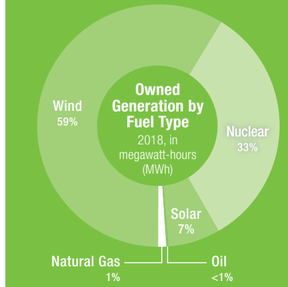
Emissions-free nuclear energy

- NextEra Energy Resources operates emissions-free nuclear power plants in Iowa, New Hampshire and Wisconsin, each of which employs hundreds of highly trained workers in local communities and boosts economic activity by paying millions in state and local taxes each year.
- Nuclear energy is a leading source of electricity in the U.S., providing safe, reliable and low-cost power for homes and businesses. Our nuclear power plant fleet provides the equivalent of more than 5 million homes with clean, safe, reliable electricity.

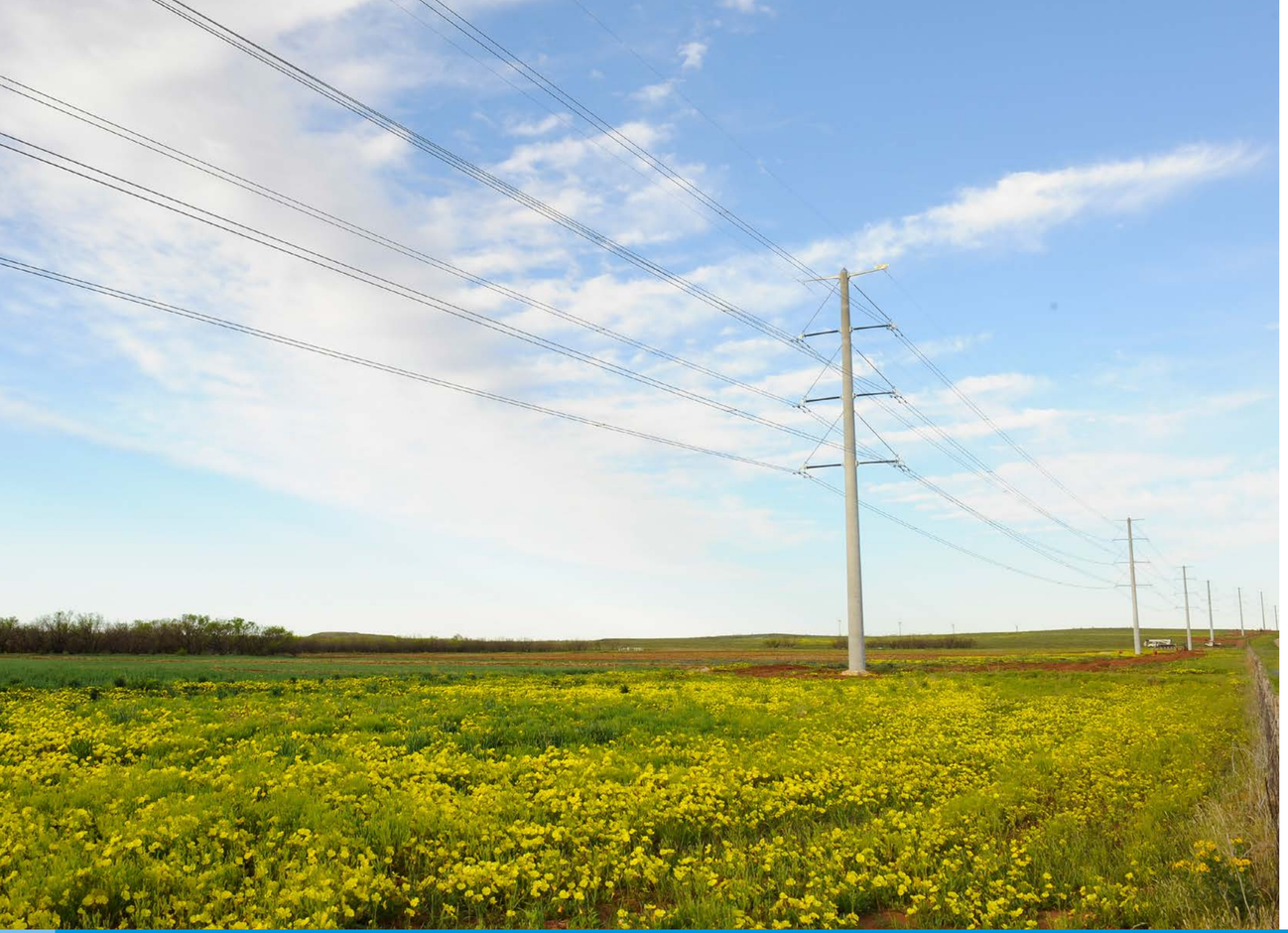
Natural gas infrastructure investor

- NextEra Energy Resources operates natural gas facilities in several states, several of which use combined-cycle technology for increased energy efficiency and lower emissions than conventional fossil-fueled plants.
- We have approximately 8 billion cubic feet of natural gas pipeline capacity in operation or under development.

WORLD'S NO. 1 GENERATOR OF WIND AND SOLAR ENERGY



NextEra Energy Resources at a Glance (2018)	
Operations in	36 U.S. states, four Canadian provinces
Operating Revenues	~$4.9 billion
Net Generating Capacity	~21,000 MW
Employees	~5,100
Substations	~185
Transmission lines	~1,135 miles



North America's No. 1 Competitive Transmission Company

NextEra Energy Transmission

NextEra Energy Transmission is the leading competitive transmission company in North America. We're investing $3 billion in regional utilities to develop, finance, construct, operate and maintain transmission assets across the U.S. and Canada.

NextEra Energy Transmission operates through nine regional subsidiaries to integrate renewable energy and strengthen the electric grid nationwide.

HORIZONWEST TRANSMISSION	The designated developer for two projects in California, including the first competitive transmission project awarded to a non-incumbent in the California Independent System Operator.
LONEstar	Owner and operator of high-voltage transmission lines and associated equipment in Texas, bringing wind power to Central Texas, strengthening the electric grid and enhancing reliability.
NEW HAMPSHIRE TRANSMISSION	The majority owner of Seabrook Substation, which interconnects Seabrook Nuclear Generating Station with three critical high-voltage transmission lines in New England, thereby enhancing reliability.
NEXTera ENERGY TRANSMISSION CANADA	A transmission developer active in Ontario and Alberta, Canada, and through its NextBridge Infrastructure partnership, the selected developer of the first competitive transmission project awarded to a non-incumbent in Ontario.
NEXTera ENERGY TRANSMISSION MIDATLANTIC	A transmission developer active in PJM Interconnection and selected acquirer of transmission assets.
NEXTera ENERGY TRANSMISSION MIDWEST	The designated developer for the largest competitively awarded transmission project in Midcontinent Independent System Operator.
NEXTera ENERGY TRANSMISSION NEW YORK	The designated developer for the first competitively awarded transmission project in the New York Independent System Operator.
NEXTera ENERGY TRANSMISSION SOUTHWEST	A transmission developer operating in Southwest Power Pool and selected acquirer of transmission assets.
TBC Trans Bay Cable	Owner and operator of a high-voltage direct current underwater transmission cable system that can provide more than 40% of the electrical power used in San Francisco.

Lone Star Transmission is located in Central Texas and has 330 miles of double-circuit 345-kV line and six substations.

Delivering Unique Solutions

FPL Energy Services, FPL Services, NextEra Energy Solutions, GEXA Energy Solutions and FPL Home

A leader in providing customer solutions for the toughest energy challenges, FPL Energy Services (FPLES) delivers exceptional customer value and experiences through innovative, convenient and affordable energy solutions that add value and comfort to homes and business.

- **Residential products and services:** FPLES keeps customers running with surge protection (SurgeShield® and Electronics Surge Protection℠), smart home security (MyPlace™), air conditioning filter delivery service (A/C Filter Smart®) and warranties for electrical wiring, plumbing lines, sewer/septic lines, water heaters, appliances and air conditioners. In addition, FPL Home offers licensed and insured technicians who can install and service backup generators, air conditioners, plumbing and electric.
- **Natural gas supply services:** For 20 years, FPLES has been providing Florida businesses with a reliable supply of natural gas at competitive rates, coupled with sophisticated industry analysis and custom consulting services.
- **Commercial lighting solutions:** This program offers lighting upgrades and retrofits for commercial and industrial customers. We install comprehensive energy efficient solutions that reduce costs and improve customers' bottom lines.
- **Energy savings performance contracting:** We develop, design and construct comprehensive, sustainable energy solutions for governments and businesses in Florida, Texas and other states through our family of Energy Service Companies (ESCOs) – FPLES, FPL Services, NextEra Energy Solutions and Gexa Energy Solutions. To date, our ESCO businesses have helped customers save more than $246 million, reducing electricity use by 2.11 million MWh and water use by 5.77 billion gallons. That's enough electricity to power more than 176,000 homes for one year and enough water to fill more than 9,620 Olympic-size swimming pools.

NEXTera ENERGY SOLUTIONS | FPL Services | FPL Energy Services | Gexa ENERGY SOLUTIONS

Florida City Gas

Florida City Gas provides safe, reliable and affordable natural gas service to approximately 110,000 residential and commercial customers in Miami-Dade, Broward, Palm Beach, Brevard, Hendry, Martin, St. Lucie and Indian River counties.

Florida City Gas

NextEra Energy Partners, LP

NextEra Energy Partners, LP is a growth-oriented limited partnership formed by NextEra Energy, Inc. NextEra Energy Partners acquires, manages and owns contracted clean energy projects with stable, long-term cash flows. Headquartered in Juno Beach, Florida, NextEra Energy Partners owns interests in wind and solar projects in the U.S., as well as natural gas infrastructure assets in Texas. The renewable energy projects are contracted, use industry-leading technology and are located in regions that are favorable for generating energy from the wind and sun. The seven natural gas pipelines in the portfolio are all strategically located, serving power producers and municipalities in South Texas, processing plants and producers in the Eagle Ford Shale, and commercial and industrial customers in the Houston area. The NET Mexico Pipeline, the largest pipeline in the portfolio, provides a critical source of natural gas transportation for low-cost, U.S.-sourced shale gas to Mexico.

NEXTera energy PARTNERS

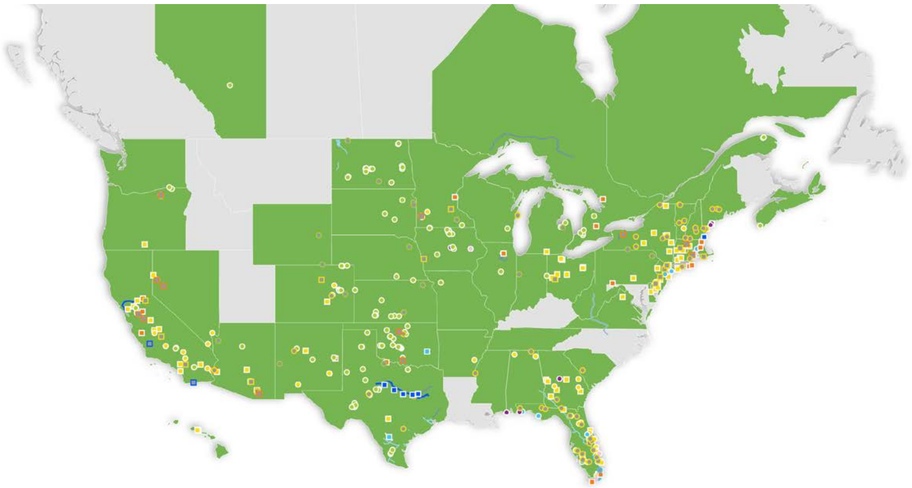


Since 2006, FPL has invested nearly $4 billion to build a stronger, smarter, more storm-resilient energy grid. Engineer Breahna Bean and Business Analyst Kunal Abichandani pictured at the Flagler Service Center in Palm Coast, Florida.

NEXTERA ENERGY IS THE WORLD'S LARGEST UTILITY COMPANY, AND WE'RE PROUD TO BE BUILT AND BASED IN AMERICA.

Our Portfolio

Providing Clean Energy Across North America



LEGEND:

Wind · Natural Gas · Natural Gas (drilling) · Pipeline · Nuclear · Solar (universal) · Solar (DG)
Battery Energy Storage · Transmission · Transmission (substation) · Other · Development/Construction

Locations with more than one facility are illustrated with a single dot; locations are those in operation as of Aug. 1, 2019.

CAUTIONARY STATEMENTS AND RISK FACTORS THAT MAY AFFECT FUTURE RESULTS

This report contains "forward-looking statements" within the meaning of the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. Forward-looking statements are not statements of historical facts, but instead represent the current expectations of NextEra Energy, Inc. (NextEra Energy) and Florida Power & Light Company (FPL) regarding future operating results and other future events, many of which, by their nature, are inherently uncertain and outside of NextEra Energy's and FPL's control. Forward-looking statements in this report include, among others, statements concerning adjusted earnings per share expectations and future operating performance, statements concerning future dividends, and results of acquisitions. In some cases, you can identify the forward-looking statements by words or phrases such as "will," "may result," "expect," "anticipate," "believe," "intend," "plan," "seek," "potential," "projection," "forecast," "predict," "goals," "target," "outlook," "should," "would" or similar words or expressions. You should not place undue reliance on these forward-looking statements, which are not a guarantee of future performance. The future results of NextEra Energy and FPL and their business and financial condition are subject to risks and uncertainties that could cause their actual results to differ materially from those expressed or implied in the forward-looking statements, or may require them to limit or eliminate certain operations. These risks and uncertainties include, but are not limited to, the following: effects of extensive regulation of NextEra Energy's and FPL's business operations; inability of NextEra Energy and FPL to recover in a timely manner any significant amount of costs, a return on certain assets or a reasonable return on invested capital through base rates, cost recovery clauses, other regulatory mechanisms or otherwise; impact of political, regulatory and economic factors on regulatory decisions important to NextEra Energy and FPL; disallowance of cost recovery by FPL based on a finding of imprudent use of derivative instruments; effect of any reductions or modifications to, or elimination of, governmental incentives or policies that support utility scale renewable energy projects of NextEra Energy Resources, LLC and its affiliated entities (NextEra Energy Resources) or the imposition of additional tax laws, policies or assessments on renewable energy; impact of new or revised laws, regulations, interpretations or ballot or regulatory initiatives on NextEra Energy and FPL; capital expenditures, increased operating costs and various liabilities attributable to environmental laws, regulations and other standards applicable to NextEra Energy and FPL; effects on NextEra Energy and FPL of federal or state laws or regulations mandating new or additional limits on the production of greenhouse gas emissions; exposure of NextEra Energy and FPL to significant and increasing compliance costs and substantial monetary penalties and other sanctions as a result of extensive federal regulation of their operations and businesses; effect on NextEra Energy and FPL of changes in tax laws, guidance or policies as well as in judgments and estimates used to determine tax-related asset and liability amounts; impact on NextEra Energy and FPL of adverse results of litigation; effect on NextEra Energy and FPL of failure to proceed with projects under development or inability to complete the construction of (or capital improvements to) electric generation, transmission and distribution facilities, gas infrastructure facilities or other facilities on schedule or within budget; impact on development and operating activities of NextEra Energy and FPL resulting from risks related to project siting, financing, construction, permitting, governmental approvals and the negotiation of project development agreements; risks involved in the operation and maintenance of electric generation, transmission and distribution facilities, gas infrastructure facilities, retail gas distribution system in Florida and other facilities; effect on NextEra Energy and FPL of a lack of growth or slower growth in the number of customers or in customer usage; impact on NextEra Energy and FPL of severe weather and other weather conditions; threats of terrorism and catastrophic events that could result from terrorism, cyber attacks or other attempts to disrupt NextEra Energy's and FPL's business or the businesses of third parties; inability to obtain adequate insurance coverage for protection of NextEra Energy and FPL against significant losses and risk that insurance coverage does not provide protection against all significant losses; a prolonged period of low gas and oil prices could impact NextEra Energy Resources' gas infrastructure business and cause NextEra Energy Resources to delay or cancel certain gas infrastructure projects and could result in certain projects becoming impaired; risk to NextEra Energy Resources of increased operating costs resulting from unfavorable supply costs necessary to provide NextEra Energy Resources' full energy and capacity requirement services; inability or failure by NextEra Energy Resources to manage properly or hedge effectively the commodity risk within its portfolio; effect of reductions in the liquidity of energy markets on NextEra Energy's ability to manage operational risks; effectiveness of NextEra Energy's and FPL's risk management tools associated with their hedging and trading procedures to protect against significant losses, including the effect of unforeseen price variances from historical behavior; impact of unavailability or disruption of power transmission or commodity transportation facilities on sale and delivery of power or natural gas by NextEra Energy, including FPL; exposure of NextEra Energy and FPL to credit and performance risk from customers, hedging counterparties and vendors; failure of NextEra Energy or FPL counterparties to perform under derivative contracts or of requirement for NextEra Energy or FPL to post margin cash collateral under derivative contracts; failure or breach of NextEra Energy's or FPL's information technology systems; risks to NextEra Energy and FPL's retail businesses from compromise of sensitive customer data; losses from volatility in the market values of derivative instruments and limited liquidity in OTC markets; impact of negative publicity; inability of NextEra Energy and FPL to maintain, negotiate or renegotiate acceptable franchise agreements with municipalities and counties in Florida; occurrence of work strikes or stoppages and increasing personnel costs; NextEra Energy's ability to successfully identify, complete and integrate acquisitions, including the effect of increased competition for acquisitions; the inability to realize the anticipated benefits of the Gulf Power Company acquisition; environmental, health and financial risks associated with NextEra Energy Resources' and FPL's ownership and operation of nuclear generation facilities; liability of NextEra Energy and FPL for significant retrospective assessments and/or retrospective insurance premiums in the event of an incident at certain nuclear generation facilities; increased operating and capital expenditures and/or reduced revenues at nuclear generation facilities of NextEra Energy or FPL resulting from orders or new regulations of the Nuclear Regulatory Commission; inability to operate any of NextEra Energy Resources' or FPL's owned nuclear generation units through the end of their respective operating licenses or through expected shutdown; effect of disruptions, uncertainty or volatility in the credit and capital markets or actions by third parties in connection with project-specific or other financing arrangements on NextEra Energy's and FPL's ability to fund their liquidity and capital needs and meet their growth objectives; inability of NextEra Energy, FPL and NextEra Energy Capital Holdings, Inc. to maintain their current credit ratings; impairment of NextEra Energy's and FPL's liquidity from inability of credit providers to fund their credit commitments or to maintain their current credit ratings; poor market performance and other economic factors that could affect NextEra Energy's defined benefit pension plan's funded status; poor market performance and other risks to the asset values of NextEra Energy's and FPL's nuclear decommissioning funds; changes in market value and other risks to certain of NextEra Energy's investments; effect of inability of NextEra Energy subsidiaries to pay upstream dividends or repay funds to NextEra Energy or of NextEra Energy's performance under guarantees of subsidiary obligations on NextEra Energy's ability to meet its financial obligations and to pay dividends on its common stock; the fact that the amount and timing of dividends payable on NextEra Energy's common stock, as well as the dividend policy approved by NextEra Energy's board of directors from time to time, and changes to that policy, are within the sole discretion of NextEra Energy's board of directors and, if declared and paid, dividends may be in amounts that are less than might be expected by shareholders; NEP's inability to access sources of capital on commercially reasonable terms could have an effect on its ability to consummate future acquisitions and on the value of NextEra Energy's limited partner interest in NextEra Energy Operating Partners, LP; and effects of disruptions, uncertainty or volatility in the credit and capital markets on the market price of NextEra Energy's common stock. NextEra Energy and FPL discuss these and other risks and uncertainties in their annual report on Form 10-K for the year ended December 31, 2018 and other SEC filings, and this report should be read in conjunction with such SEC filings made through the date of this report. The forward-looking statements made in this report are made only as of the date of this report and NextEra Energy and FPL undertake no obligation to update any forward-looking statements.

ON THE COVER (clockwise from top left): Pratt Wind Energy Center in Pratt, Kansas; employees at the Distribution Control Center in Riviera Beach, Florida; FPL Coral Farms Solar Energy Center in Putnam County, Florida.



NextEra Energy, Inc.
700 Universe Boulevard, Juno Beach, FL 33408

For more information:

NextEraEnergy.com

FPL.com

NextEraEnergyResources.com

GulfPower.com

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Appendix B

Studies and Assessments

B1. National Telecommunications and Information Administration Notification

B2. Letter U.S. Department of Defense Preliminary Screening Tool

B3. Acoustic Assessment

B4. Shadow Flicker Assessment

B5. Lek and Raptor Nest and Strategy

B6. Dakota Skipper Habitat Assessment

B7. Whooping Crane Habitat Review

B8. Avian Use Report

B9. Northern Long-Eared Bat Habitat Assessment

B1. National Telecommunications and Information Administration Notification Letter

UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

APR 18 2017

Mr. Daniel C. Labate
Resource Modeling Analyst
WindLogics
700 Universe Blvd.
Juno Beach, FL 33408

Re: Burke Project: Burke County, ND

Dear Mr. Labate:

In response to your request on February 17, 2017, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the Burke County Wind Project, located in Burke County, 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

B2. U.S. Department of Defense Preliminary Screening Tool

Federal Aviation Administration

« OE/AAA

DoD Preliminary Screening Tool

DoD Preliminary Screening Tool - Desk Reference Guide V_2018.2.0

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 ▼

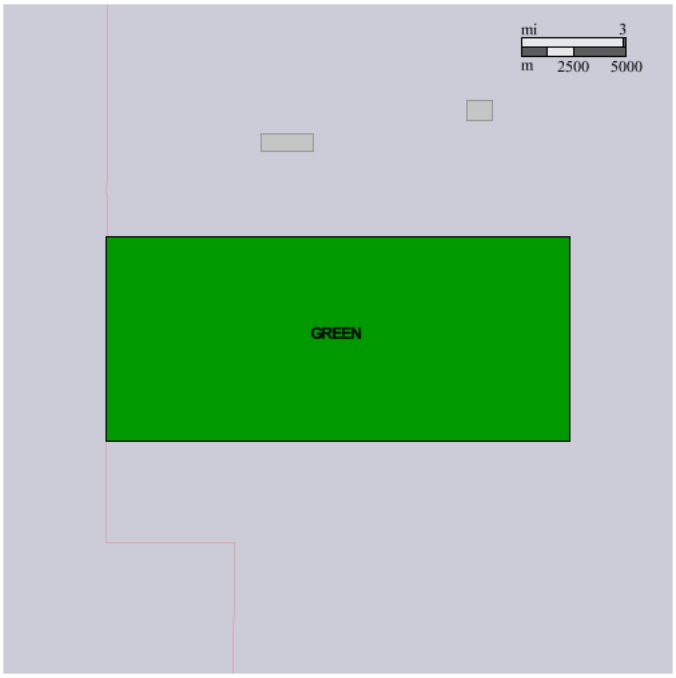
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2	48	51	3	N ▼	102	44	35	W ▼
3	48	45	50	N ▼	102	44	35	W ▼
4	48	45	50	N ▼	102	56	23	W ▼

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

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

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

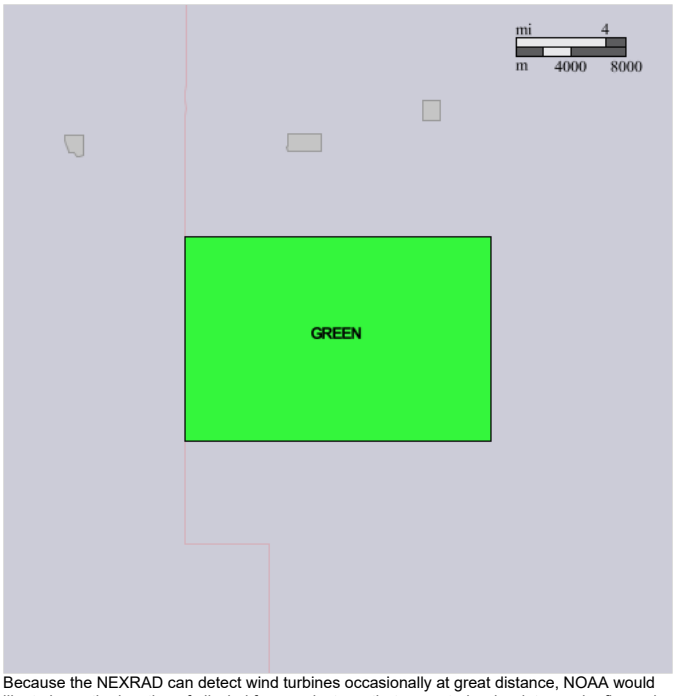
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3	48	45	50	N ▼	102	44	35	W ▼
4	48	45	50	N ▼	102	56	23	W ▼

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

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DoD Preliminary Screening Tool

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

Point	Latitude				Longitude			
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Horizontal Datum: NAD83 ▼

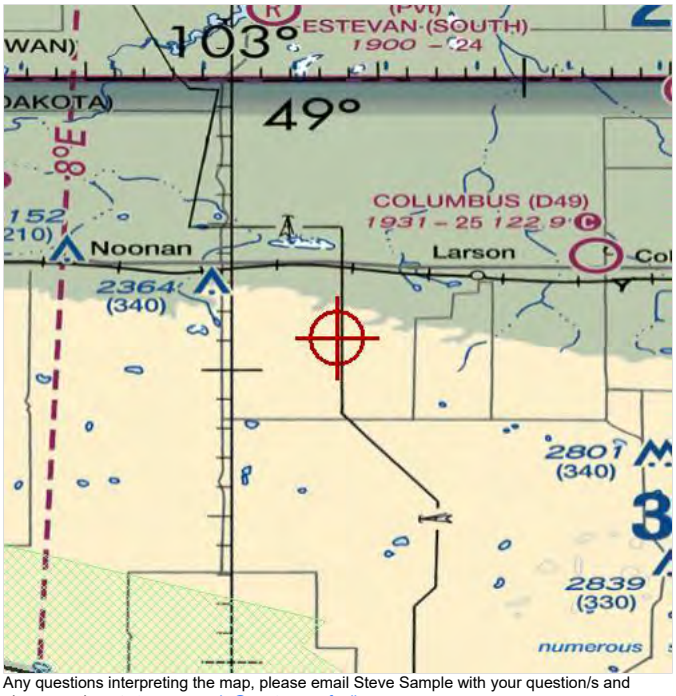
The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact Dr. Thomas (Thom) H. Rennie at the USAF Regional Enviromental Coordinator at (214)767-4678 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact LTC Owen B. Castlemain at the USA Regional Enviromental Coordinator at (817) 222-5921 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact the US Navy Representative, FAA Central Service Area at the USMC Regional Enviromental Coordinator at (817) 222-5930 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact the US Navy Representative, FAA Central Service Area at the USN Regional Enviromental Coordinator at (817) 222-5930 for confirmation and documentation.

This is a preliminary review of your proposal and does not preclude official FAA processes.
Your search data is not retained and the privacy of all your searches is assured.



Any questions interpreting the map, please email Steve Sample with your question/s and phone number at steven.sample@pentagon.af.mil

Federal Aviation Administration

« OE/AAA

DoD Preliminary Screening Tool

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1	48	51	3	N ▼	102	44	35	W ▼

Horizontal Datum: NAD83 ▼

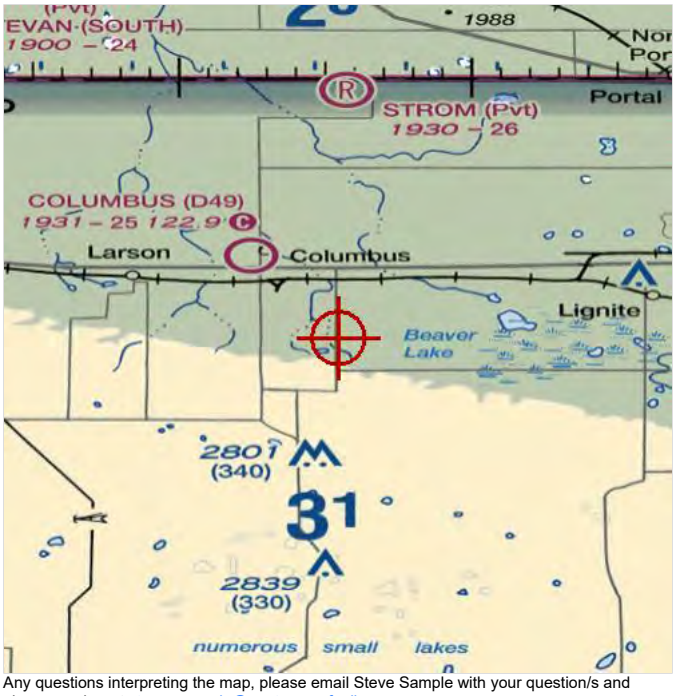
The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact Dr. Thomas (Thom) H. Rennie at the USAF Regional Enviromental Coordinator at (214)767-4678 for confirmation and documentation.

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DoD Preliminary Screening Tool

DoD Preliminary Screening Tool - Desk Reference Guide V_2018.2.0

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

Point	Latitude				Longitude			
	Deg	Min	Sec	Dir	Deg	Min	Sec	Dir
1	48	45	50	N ▼	102	44	35	W ▼

Horizontal Datum: NAD83 ▼

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- Enter either a single point or a polygon and click submit to generate a long range radar analysis map.
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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	48	45	50	N ▼	102	56	23	W ▼

Horizontal Datum: NAD83 ▼

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B3. Acoustic Assessment

Acoustic Assessment

Northern Divide Wind Energy Center
Northern Divide Wind, LLC
Burke County, North Dakota

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November 2019

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EXECUTIVE SUMMARY

An acoustic assessment has been completed by AECOM for the proposed Northern Divide Wind Energy Center (Project) located in Burke County, North Dakota. The Project will consist of 74 wind turbine generators (WTGs) and associated access roads, underground electrical systems, collection substations, laydown yard, operations and maintenance building, meteorological evaluation towers, and concrete batch plant. For the acoustic assessment, two Project WTG layout designs were considered: one with alternates (78 WTGs), and the other without alternates (74 WTGs). The WTGs comprising these layout designs include two General Electric (GE) WTG model types, a 2.72 megawatt (MW) generator, and a 2.32 MW generator. The objective of this assessment was to determine whether nominal operations of the Project would be compliant with the applicable North Dakota Public Service Commission (Commission) 50 dBA sound limit, and where applicable, the County of Burke 49 dBA sound limit and County of Divide 65 dBA property line sound limit.

WTG sound source data was obtained from GE for the proposed GE 2.72 MW and GE 2.32 MW generators. Outdoor sound propagation modeling of aggregate WTG operation sound level was performed with Datakustik CadnaA software, a program that predicts sound levels near industrial sound-generating sources based on the International Organization of Standardization (ISO) 9613-2 standards for outdoor sound propagation calculation (ISO 1996). This software uses industry-accepted propagation algorithms and accepts input of sound reference levels as provided by equipment manufacturers and other sources of relevant information.

Predicted sound levels attributed to aggregate WTG operation were compared with the Commission, Burke County, and Divide County thresholds at each occupied receptor in the Project vicinity. The results of this assessment conclude that the Project will not generate exceedances of any applicable thresholds at any occupied receptor locations. Thus, the Project is compliant with regulatory sound thresholds.

Table of Contents

1.0 INTRODUCTION 1-1

1.1 Study Area and Existing Environment 1-1

1.2 Acoustical Terminology 1-1

2.0 REGULATORY SETTING & ACOUSTIC IMPACT CRITERIA 2-1

2.1 State of North Dakota 2-1

2.2 County Legislation 2-1

2.2.1 Burke County 2-1

2.2.2 Divide County 2-2

3.0 SOUND PREDICTION METHODOLOGY & RESULTS 3-1

3.1 Review of Sound Generated by WTG Facilities 3-1

3.2 Modeling Software and Calculation Methods 3-1

3.3 Modeling Input Parameters 3-1

3.3.1 Meteorological Input and Model Configuration 3-1

3.3.2 Receiver Input 3-2

3.3.3 Source Input 3-2

3.3.4 Modeled Scenarios 3-3

3.4 Modeling Results 3-3

4.0 ADDITIONAL ACOUSTIC ASSESSMENT CONSIDERATIONS 4-1

4.1 Substation Sound 4-1

4.2 Construction Sound ..... **Error! Bookmark not defined.**

4.3 Maintenance Sound ..... **Error! Bookmark not defined.**

5.0 CONCLUSIONS 5-1

6.0 LITERATURE CITED 6-1

LIST OF TABLES

Table 1 A-Weighted Sound Power Levels Correlated with Wind Speed – GE 1.715 MW

Table 2 WTG – Sound Power Level by Octave Band Center Frequency (OBCF)

Table 3 Summary of Predicted Sound Levels, “No Alternates” Layout, Sorted by Receiver ID

Table 4 Summary of Predicted Sound Levels, “No Alternates” Layout, Sorted by Sound Level

Table 5 Summary of Predicted Sound Levels, “With Alternates” Layout, Sorted by Receiver ID

Table 6 Summary of Predicted Sound Levels, “With Alternates” Layout, Sorted by Sound Level

Table 7 Substation Transformer – Sound Power Level by Octave Band Center Frequency (OBCF)

LIST OF FIGURES

Figure 1 No Alternates - Wind Turbines at Maximum Rotational Wind Speed and Typical Meteorological Conditions

Figure 2 With Alternates - Wind Turbines at Maximum Rotational Wind Speed and Typical Meteorological Conditions

1.0 INTRODUCTION

Northern Divide Wind, LLC (Northern Divide Wind), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, proposes to construct and operate the Northern Divide Wind Energy Center (Project) in Burke County, North Dakota. The Project will have a nameplate capacity of approximately 200 megawatts (MW), consisting of up to 74 wind turbines using both GE 2.72 MW and GE 2.32 MW wind turbines. The Project also includes up to four alternate turbine locations to provide siting flexibility based on on-going studies, landowner preferences, and issues identified during construction. Only 74 turbines will be constructed. AECOM has conducted the following acoustic analysis for the Project to support Northern Divide Wind's application for a Certificate of Site Compatibility to the North Dakota Public Service Commission.

1.1 Study Area and Existing Environment

The Northern Divide Wind Project Area encompasses approximately 10,912 acres in Burke County, North Dakota. The acoustic assessment study area encompasses approximately 88,000 acres covering both Burke and Divide Counties, approximately bounded on the north by 100th Street NW, on the east by 104th Avenue NW, on the south by 91st Street NW, and on the west by 91st Avenue NW.

The sound-sensitive receptors in the area include rural farmstead residences, a church, and a campground. A total of 66 receptors, considered either inhabited or capable of habitation, were analyzed for Project-related sound level impacts. Habitation for existing structures was determined using public knowledge and roadside surveys.

Burke and Divide Counties would generally be considered rural agricultural areas and thus would be expected to have reasonably low ambient sound levels. Existing sound sources in the area are likely dominated by distant traffic sound from the nearby arterial roadways, intermittent aircraft overflights, sounds from agricultural operations, and natural wind-generated sounds.

1.2 Acoustical Terminology

Fundamental concepts and terms discussed in this report are summarized in the following paragraphs.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by several variables, including frequency and intensity. Frequency describes the pitch of the sound and is measured in cycles per second or Hertz (Hz), while intensity describes the sound’s loudness and is measured in decibels (dB) using a logarithmic scale.

This report refers to both sound pressure levels (SPL) and sound power levels (PWL). Simply speaking, PWL is the inherent acoustical power generated by the sound source; consider it analogous to the horsepower rating of an engine. SPL is the real-world acoustic emission from a sound source, measured at a reference distance, which accounts for the effects of the acoustical environment surrounding the source.

Due to its definition with respect to a reference sound pressure, a sound level of 0 dB is not the complete absence of sound but instead the approximate threshold of average healthy human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above approximately 110 dB begin to be felt inside the human ear as discomfort and eventually pain at 120 dB and higher levels. The minimum change in the sound level of individual events that an average human ear can detect under laboratory conditions is about 1 to 2 dB. Changes of 3 to 5 dB, on the other hand, are readily perceived under most circumstances. A change in sound level of about

10 dB is usually perceived by the average person as a doubling (or if decreased by 10 dB, halving) of the sound's loudness, even though the actual change in sound energy is an order of magnitude.

Due to the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly. If a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example: 60 dB + 60 dB = 63 dB, and 80 dB + 80 dB = 83 dB.

Hertz is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second, it generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived by the ear/brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the best human ear.

Sound from a tuning fork contains a single frequency (a pure tone); however, most sounds one hears in the environment do not consist of a single frequency but rather a broad band of frequencies differing in sound level. The method commonly used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that represents human hearing, which is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This is called "A-weighting," and the decibel level measured is called the A-weighted sound level (dBA). When sound data is collected, the sound level of a source is measured using a sound level meter that includes a filter corresponding to the dBA curve of frequency-dependent adjustments.

Although dBA may adequately indicate the level of environmental sound at any instant in time, community sound levels vary continuously. Most environmental sounds include a mixture of sounds from distant sources that creates a relatively steady background sound in which no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) may be used to describe sound that is changing in level. L_{eq} is the energy-mean dBA during a measured time interval. It is the "equivalent" constant sound level that would have to be produced by a given source to equal the acoustic energy contained in the fluctuating sound level measured. In addition to the energy-average level, it is often desirable to know the acoustic range of the sound source being measured. This is accomplished through the maximum (L_{max}) and minimum (L_{min}) indicators that represent the root-mean-square maximum and minimum sound levels measured during the monitoring interval. The L_{min} value obtained for a particular monitoring location is often called the "acoustic floor" for that location.

2.0 REGULATORY SETTING & ACOUSTIC IMPACT CRITERIA

A review was conducted of Federal, State, and Local laws, ordinances, regulations, and standards (LORS), applicable to sound levels generated by Project construction and operation. This review did not identify any applicable LORS at the federal level. At the state level, exclusion areas provided in North Dakota Administrative Code (N.D. Admin. Code) Section 69-06-08-01(4) establishes sound limits which apply to wind energy conversion facilities. At the local level, both Burke County and Divide County maintain zoning regulations with established sound level limits applicable to any sound source type.

2.1 State of North Dakota

The N.D. Admin. Code Section 69-06-08-01(4) reads as follows:

> *A wind energy conversion facility site must not include a geographic area where, due to operation of the facility, the sound 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.*

Project aerial mapping was reviewed to identify all structures, including residential and community buildings, within the Project vicinity. Sound levels produced by the Project were predicted at a minimum distance of 100-feet from all inhabitable structures and assessed for compliance against the exclusion area maximum sound level of 50 dBA. All receptors in the study area, regardless of County jurisdiction, are held to this maximum sound level limit.

2.2 County Legislation

2.2.1 Burke County

A total of 51 of the 66 studied receptors are located within Burke County. The Burke County Zoning Regulations (Burke 1996) include special provisions for the siting, construction and operation of wind energy facilities with respect to sound levels in Article 11 Wind Turbine Regulations, Section 11 Part J, as follows:

This ordinance adopts EPA guidelines on noise levels. The guidelines are contained in the EPA publication, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety. Operation of the wind energy facility must not cause any EPA level for activity interference or hearing loss to be exceeded either inside or within 50 feet of an occupied structure

The U.S. Environmental Protection Agency (EPA) publication referenced in the Burke County Zoning Regulations addresses issues of community noise (EPA 1974). Commonly referred to as the “Levels Document,” this federal guidance recommends a 24-hour day-night sound level (Ldn) limit of 55 dBA at the exterior and 45 dBA at the interior of studied residential receptors. The Levels Document states that exterior-to-interior sound levels are generally reduced by approximately 15 dBA assuming standard building construction and partly-open windows. On account of this characteristic, exterior sound level impacts would occur well-before interior sound level impacts arise. Therefore, only exterior sound levels are analyzed.

When converted to the standardized energy equivalent level (Leq) metric used in this assessment, the Burke County exterior sound level limit of 55 dBA Ldn equates to a 24-hour continuous sound level of 49 dBA, Leq.

Therefore, modeled receptors in Burke County were assessed for Project sound level impacts using the exterior sound level limit of 49 dBA. Although the Burke County Zoning Regulations stipulate that the sound level limit applies out to a distance of 50 feet from the receptor, modeled receiver points were placed at a more-conservative 100-foot minimum distance from each receptor to conform with N.D. Admin. Code Section 69-06-08-01(4) requirements.

2.2.2 Divide County

The western extent of the Project borders Divide County. The Divide County Zoning Ordinance (Divide 1996) includes special provisions for the siting, construction, and operation of wind energy facilities with respect to sound levels in Section 7.14.4 Part J, as follows:

The noise level caused by the operation of the project shall be measured at 5 feet above ground level at the property line coincident with or outside the project boundary and shall not exceed 65 decibels (A-weighted). If it is determined that a pure tone noise is generated by the project, the noise shall not exceed 50 decibels (A-weighted). This level may be exceeded during short term events such as utility outages and/or severe wind storms.

The Project cannot exceed 65 dBA at the nearest property boundary for any land use located in Divide County. Pure tone noise is not expected to be generated. To assess this impact threshold, the Burke-Divide county line has been included on report figures to visualize the sound levels generated by Project operations in relation to Divide County.

3.0 SOUND PREDICTION METHODOLOGY & RESULTS

3.1 Review of Sound Generated by WTG Facilities

Sound generated by the operation of a modern downwind-mast (*i.e.*, the supporting tower is downstream of the spinning bladed rotor) WTG is a combination of the following sound sources:

- Blade sounds created by trailing edge pressure fluctuations and turbulence, leading edge inflow turbulence, and tip vortex structures; and
- The mechanical equipment housed within the nacelle just behind the WTG bladed rotor hub, which includes a gearbox, generator, and cooling fan(s).

For large, utility-scale WTGs currently engineered and offered by leading manufacturers, such as the 2.72 MW models considered for this Project, mechanical sounds from the nacelle tend to be much less than the sound produced from aerodynamic effects caused by rotor interaction with the incoming wind.

At rest when there is little or no wind energy to convert, a WTG produces negligible sound. As wind speeds rise up to a "cut-in" magnitude, the WTG bladed rotor begins rotation and generates power. WTG energy conversion and corresponding aerodynamic sound then increases with increasingly greater received wind speed up to a maximum rotational speed when the WTG maximum power capacity is attained. Although the WTG may experience elevated wind speeds that exceed what is necessary for maximum power capacity, the rotor rotational speed would not increase further and would produce an essentially constant sound power level.

3.2 Modeling Software and Calculation Methods

The DataKustik CadnaA® Noise Prediction Model (Version 2020) was used to estimate the aggregate SPL from proposed Project operation at the identified sound-sensitive receptors. CadnaA® is a Windows® based software program that predicts sound levels near sound sources based on ISO 9613-2 standard for outdoor sound propagation calculation. The model uses these industry-accepted propagation algorithms and accepts full-octave band (1/1) and one-third octave band (1/3) PWL (in dB re: one picoWatt) provided by the equipment manufacturer and other sources.

The software's calculations account for classical sound wave geometric divergence, reflection off of surfaces, source directivity, meteorological effects, and attenuation factors resulting from air absorption, basic ground effects, and barrier/shielding from structures and/or topography. Topographical information was imported into the model using the official United States Geological Survey (USGS) National Elevation Dataset (NED) to accurately represent existing topography in the Project area.

3.3 Modeling Input Parameters

3.3.1 Meteorological Input and Model Configuration

The sound propagation prediction model developed for this analysis assumed an outdoor air temperature of 50-degrees Fahrenheit (ºF) and a relative humidity of 70%, consistent with modeling recommendations from the Institute of Acoustics (IOA 2013).

The average ground absorption coefficient, which can range from zero (0, for acoustically reflective surfaces, such as water or pavement) to unity (1, for acoustically absorptive ground coverings, such as loose, porous soils or snow), was set to an average of 0.5 for consistency with modeling recommendations from the Institute of Acoustics (IOA 2013). This input parameter is notably conservative in comparison to actual site conditions which are expected to exhibit higher ground

absorption coefficients of 0.7 to 0.9 due to the prevalence of natural grasslands, agricultural soils, and seasonal snow cover.

As sounds waves propagate from the source, their energy is continuously degraded by atmospheric absorption. Atmospheric absorption rates improve as acoustical frequency increases and vary with temperature and moisture content. While acoustical energy loss due to this environmental factor is generally modest at distances less than 1,000 feet, over greater distances the result will be a substantial reduction of high frequency sound and the apparent preservation of low frequency sound that attenuates (due to ground and atmospheric absorption) at much lower rates.

With respect to wind speed and direction, the ISO 9613-2 standard conservatively assumes that all receptors are located downwind from the sound-producing source. Acknowledged as a physical impossibility (i.e., because wind is experienced as having direction), this downwind assumption is intended to represent worst-case meteorological conditions, such as moderate temperature inversions. Such conditions are assumed to be valid for the study of WTG operation sound, which assumes operation under wind conditions at which the "maximum [rotor] rotational speed" is expected, coinciding with maximum power production per tower.

3.3.2 Receiver Input

Representative receiver points were modeled at each identified residential structure in the study area. To consider sound from multiple WTG locations arriving from different angles and paths, each receptor was assigned a circular array of twelve equally-spaced receivers at 30-degree steps. Receivers were modeled at a height of 4 meters (relative to ground), which could be typical of the height of a second-story listener and is recommended for wind turbine sound modeling as it reduces the influence of ground absorption factors that may be misrepresented in prediction results. Per the Commission sound limit regulation, sound levels from Project operations are to be assessed "within 100 feet of an inhabited residence," thus, the modeled receiver arrays were plotted in a manner to ensure a minimum 100-foot distance from each studied receptor façade.

A total of 66 receptors were identified within the study area, resulting in a grand total of 792 modeled receiver points.

3.3.3 Source Input

The Project plans to install GE 2.72 MW and GE 2.32 MW WTG units throughout the Project vicinity. Sources in the model were located at each discrete proposed WTG pole location as a single, omnidirectional point source, with a relative hub height of 295 and 263 feet (specified hub heights of the GE 2.72 MW and GE 2.32 MW WTG models, respectively). The Project will incorporate low-noise trailing edge, or "LNTE" blade technology at 85% of the WTG units, effectively reducing each WTG unit sound emission by up to 2 dBA.

Performance specifications and proprietary sound data for the selected WTG units and LNTE variants were provided by the manufacturer for the purpose of this study. **Tables 1** and **2** display the various A-weighted sound power level ratings for the GE 2.72 MW, GE 2.72 MW with LNTE, and GE 2.32 MW with LNTE units at various wind speeds.

In addition to anticipated sound levels at various wind speeds and blade types, these specifications also reported the spectral content of the WTGs in one-third octave band center frequency (OBCF) resolution. These documents report that source measurements were conducted in accordance with the International Electrotechnical Commission standard 61400-11 for acoustic measurement techniques. Specified one-third OBCF sound power levels provided by the manufacturer for both WTG models are presented in **Table 2**. Since no power level uncertainty values were provided in the

manufacturer specifications, a typical +2 dB adjustment was applied across all frequency bands for each WTG source.

3.3.4 Modeled Scenarios

The predictive acoustic assessment reviewed two Project WTG layouts: one with additional WTG locations ("With Alternates"), and one without the additional WTGs ("No Alternates").

3.4 Modeling Results

Each predictive operations model assumed that all WTGs would be operating concurrently in a maximum rotational wind speed scenario. Predicted levels in this section are presented in both tabulated form (**Tables 3 through 6**) and as sound level contour plots (**Figures 1 and 2**), which depict the operational sound in the Project area as color-coded isopleths (Project-attributed sound level "contours," reminiscent of topographical contours that depict equivalent grade elevation). While aggregate WTG operation sound levels may be compliant with the Commission and County requirements, under the right meteorological conditions, it may be possible for WTG sound to be audible at a sound-sensitive receptor.

Predicted operational sound levels associated with the "No Alternates" layout are provided in **Tables 3 and 4**. Predicted operational sound levels associated with the "With Alternates" layout are provided in **Tables 5 and 6**.

Figures 1 and 2 display predicted sound level contours associated with each layout scenario.

As shown in **Tables 4 and 6**, Project-generated sound levels will range from 18 to 48 dBA, Leq. Operation of Project WTG units will not exceed the Commission 50 dBA limit at any receptors. For receptors located in Burke County, Project WTG units will not exceed the Burke County 49 dBA limit. No receptors in Divide County will experience Project-generated noise levels greater than the Divide County limit of 65 dBA.

4.0 ADDITIONAL ACOUSTIC ASSESSMENT CONSIDERATIONS

4.1 Collection Substation Sound

There will be one 354 kilovolt (kV) collection substation constructed within the Project Area featuring one 225 megavolt-amperes (MVA) transformer. Sound generated by the substation would be dominated by a "humming" sound from the main transformer. The transformer sound power level and OBCF data were provided by the manufacturer, who tested the unit according to the Institute of Electrical and Electronics Engineers Standards Association (IEEE) standards C57.12.00-2015 and C57.12.90-2015. The maximum OBCF sound power levels for the transformer are provided shown in **Table 7**. The 345 kV collection substation is located near the southeastern corner of the intersection of 93rd Street NW and County Road 40/94th Avenue NW and is approximately 5,420 feet from the closest occupied receptor: R58 to the north. At this distance, sound levels from the operating transformer would be far less than 49 dBA and thus compliant with Commission and County requirements.

At distances of no less than 113 feet from the 345 kV collection substation, the 49 dBA threshold would still be met with a standard transformer. While compliant with this assessment criterion, under the right conditions it may be possible for transformer sound to be audible at a sound-sensitive receptor.

5.0 CONCLUSIONS

Project operational sound has been predicted and assessed against the 50 dBA Commission sound limit, and where applicable, the 49 dBA Burke County limit, and the 65 dBA Divide County property line limit. The predictive operational acoustical modeling, performed with CadnaA software (and its algorithm basis per ISO 9613-2) to include conservative parameter assumptions and uncertainty corrections, demonstrates that the Project will not generate exceedances of any applicable thresholds at any sound-sensitive receptors.

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Tables

Table 1. A-Weighted Sound Power Levels Correlated with Wind Speed – GE 2.5 MW

WTG Model	WTG Lmax Sound Power Level (PWL, dBA) at Reference 10m Elevation Wind Speed											
	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
GE 2.72 MW with LNTE	95	95	98	101	104	107	108	108	108	108	108	108 (Cut-Out)
GE 2.32 MW with LNTE	94	94	97	100	103	104	106	106	106	106	106 (Cut-Out)	N/A

Table 2. WTG – Sound Power Level by One-Third Octave Band Center Frequency (1/3 OBCF)

WTG Model	Wind Speed	One-Third OBCF, Hz (bold) and Respective A-Weighted Sound Power Level, dBA									Total PWL
GE 2.72 MW with LNTE	15 m/s	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	108
		69	74	78	81	84	87	88	89	90	
		200	**250**	**315**	**400**	**500**	**630**	**800**	**1k**	**1.25k**	
		91	92	94	94	96	97	98	99	99	
		1.6k	**2k**	**2.5k**	**3.15k**	**4k**	**5k**	**6.3k**	**8k**	**10k**	
		98	96	94	92	87	82	75	65	54	
GE 2.32 MW with LNTE	14 m/s	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	106
		69	73	77	81	84	87	89	91	93	
		200	**250**	**315**	**400**	**500**	**630**	**800**	**1k**	**1.25k**	
		94	94	95	94	95	95	95	95	96	
		1.6k	**2k**	**2.5k**	**3.15k**	**4k**	**5k**	**6.3k**	**8k**	**10k**	
		95	94	93	90	85	80	71	58	43	

Table 3. Summary of Predicted Aggregate WTG Operation Sound Levels, "No Alternates" Layout, Sorted by Receiver ID

Receiver ID	Participation Status		Nearest WTG ID	Distance to Nearest WTG (ft)	Modeled Receiver Coordinates (UTM Zone 14, NAD 83)		Predicted Sound Level (dBA, SPL)
	Parcel	Landowner			Easting (m)	Northing (m)	
R2	YES	YES	8	2,365	652035	5410613	47
R5	NO	NO	29	3,453	655931	5410862	43
R10	NO	NO	30	3,191	655956	5409992	45
R15	NO	NO	5	2,806	650755	5408157	43
R16	YES	YES	17	2,040	652243	5408243	48
R17	NO	YES	17	2,389	652645	5407991	46
R21	YES	YES	3	3,783	652976	5406830	41
R22	NO	NO	2	3,625	650650	5406347	40
R23	YES	YES	30	2,812	655427	5408263	46
R30	NO	NO	43	2,736	657754	5407269	47
R31	NO	NO	4	9,825	648547	5407642	31
R34	YES	YES	50	2,677	659187	5408405	48
R39	YES	YES	61	3,307	660889	5406976	44
R41	NO	NO	74	3,983	665501	5408968	38
R42	YES	YES	74	2,757	665364	5408405	41
R43	NO	NO	74	4,347	665845	5408472	37
R49	NO	NO	3	3,101	652832	5405741	41
R51	YES	YES	1	2,713	652051	5404420	40
R52	NO	NO	1	3,754	652470	5404234	37
R53	NO	NO	47	2,725	657657	5405624	44
R58	YES	YES	68	3,712	664035	5405725	41
R82	NO	NO	8	7,254	649729	5410764	36
R83	NO	NO	4	5,801	649781	5407767	37
R100	NO	YES	72	3,537	663694	5409329	40
R103	NO	NO	4	7,053	649545	5406802	35
R105	NO	YES	5	9,590	648581	5408305	33
R139	NO	NO	13	13,249	649720	5414060	29
R328	NO	NO	5	11,913	647885	5408157	30
R334	NO	NO	1	14,198	648272	5402906	23
R358	NO	NO	1	12,826	650214	5401718	23
R616	NO	NO	4	5,812	649790	5407868	37
R626	NO	NO	73	7,846	665562	5405750	35
R627	YES	YES	73	14,465	668093	5405439	26
R628	NO	NO	73	10,902	667128	5405949	30
R641	YES	YES	70	16,872	668970	5404153	18
R644	NO	NO	51	10,137	656413	5403288	32
R645	YES	YES	51	9,207	656960	5403208	32
R646	YES	YES	58	6,660	659168	5403422	36
R648	NO	NO	63	4,120	662517	5409251	41
R649	NO	NO	63	5,630	662731	5409933	38
R655	YES	YES	3	4,062	652937	5407022	42
R656	NO	NO	35	4,523	655243	5407457	42
R657	YES	YES	35	2,853	656051	5407035	43
R659	YES	YES	74	13,877	668511	5406754	24
R696	YES	YES	1	10,245	653078	5402337	26
R722	YES	YES	70	10,539	664631	5400858	25
R724	YES	YES	70	14,701	667370	5401221	21
R1029	YES	YES	70	6,358	664485	5402145	32
R1033	YES	YES	51	14,384	658424	5401140	27
R1034	YES	YES	58	14,866	658589	5400977	26
R1051	NO	NO	8	12,548	648221	5411338	30
R1053	NO	NO	23	11,239	655358	5414754	31

Receiver ID	Participation Status		Nearest WTG ID	Distance to Nearest WTG (ft)	Modeled Receiver Coordinates (UTM Zone 14, NAD 83)		Predicted Sound Level (dBA, SPL)
	Parcel	Landowner			Easting (m)	Northing (m)	
R1054	NO	NO	31	14,810	657815	5414966	27
R1055	NO	NO	31	14,726	657960	5414914	27
R1056	NO	NO	31	14,693	657989	5414898	27
R1057	NO	NO	42	11,059	660371	5413225	31
R1058	NO	NO	74	12,444	666987	5411122	25
R1059	NO	NO	74	9,911	666909	5410100	29
R1060	NO	NO	74	9,851	666914	5410064	29
R1061	NO	NO	1	7,913	649647	5404425	31
R1063	NO	NO	1	15,948	648885	5401438	21
R1067	NO	NO	70	13,903	661773	5400265	25
R1068	YES	YES	70	13,268	665619	5400342	22
R1069	YES	YES	74	11,095	667755	5409281	27
R1070	NO	NO	74	10,250	667411	5409462	28
R1084	NO	NO	63	2,743	661812	5409658	41

Table 4. Summary of Predicted Aggregate WTG Operation Sound Levels, "No Alternates" Layout, Sorted by Sound Level

Receiver ID	Participation Status		Nearest WTG ID	Distance to Nearest WTG (ft)	Modeled Receiver Coordinates (UTM Zone 14, NAD 83)		Predicted Sound Level (dBA, SPL)
	Parcel	Landowner			Easting (m)	Northing (m)	
R34	YES	YES	50	2,677	659187	5408405	48
R16	YES	YES	17	2,040	652243	5408243	48
R2	YES	YES	8	2,365	652035	5410613	47
R30	NO	NO	43	2,736	657754	5407269	47
R17	NO	YES	17	2,389	652645	5407991	46
R23	YES	YES	30	2,812	655427	5408263	46
R10	NO	NO	30	3,191	655956	5409992	45
R39	YES	YES	61	3,307	660889	5406976	44
R53	NO	NO	47	2,725	657657	5405624	44
R15	NO	NO	5	2,806	650755	5408157	43
R5	NO	NO	29	3,453	655931	5410862	43
R657	YES	YES	35	2,853	656051	5407035	43
R656	NO	NO	35	4,523	655243	5407457	42
R655	YES	YES	3	4,062	652937	5407022	42
R49	NO	NO	3	3,101	652832	5405741	41
R42	YES	YES	74	2,757	665364	5408405	41
R21	YES	YES	3	3,783	652976	5406830	41
R58	YES	YES	68	3,712	664035	5405725	41
R1084	NO	NO	63	2,743	661812	5409658	41
R648	NO	NO	63	4,120	662517	5409251	41
R51	YES	YES	1	2,713	652051	5404420	40
R100	NO	YES	72	3,537	663694	5409329	40
R22	NO	NO	2	3,625	650650	5406347	40
R41	NO	NO	74	3,983	665501	5408968	38
R649	NO	NO	63	5,630	662731	5409933	38
R616	NO	NO	4	5,812	649790	5407868	37
R83	NO	NO	4	5,801	649781	5407767	37
R52	NO	NO	1	3,754	652470	5404234	37
R43	NO	NO	74	4,347	665845	5408472	37
R646	YES	YES	58	6,660	659168	5403422	36
R82	NO	NO	8	7,254	649729	5410764	36
R103	NO	NO	4	7,053	649545	5406802	35
R626	NO	NO	73	7,846	665562	5405750	35
R105	NO	YES	5	9,590	648581	5408305	33
R645	YES	YES	51	9,207	656960	5403208	32
R644	NO	NO	51	10,137	656413	5403288	32
R1029	YES	YES	70	6,358	664485	5402145	32
R1061	NO	NO	1	7,913	649647	5404425	31
R31	NO	NO	4	9,825	648547	5407642	31
R1053	NO	NO	23	11,239	655358	5414754	31
R1057	NO	NO	42	11,059	660371	5413225	31
R328	NO	NO	5	11,913	647885	5408157	30
R1051	NO	NO	8	12,548	648221	5411338	30
R628	NO	NO	73	10,902	667128	5405949	30
R139	NO	NO	13	13,249	649720	5414060	29
R1059	NO	NO	74	9,911	666909	5410100	29
R1060	NO	NO	74	9,851	666914	5410064	29
R1070	NO	NO	74	10,250	667411	5409462	28
R1056	NO	NO	31	14,693	657989	5414898	27
R1055	NO	NO	31	14,726	657960	5414914	27
R1054	NO	NO	31	14,810	657815	5414966	27
R1033	YES	YES	51	14,384	658424	5401140	27

Receiver ID	Participation Status		Nearest WTG ID	Distance to Nearest WTG (ft)	Modeled Receiver Coordinates (UTM Zone 14, NAD 83)		Predicted Sound Level (dBA, SPL)
	Parcel	Landowner			Easting (m)	Northing (m)	
R1069	YES	YES	74	11,095	667755	5409281	27
R627	YES	YES	73	14,465	668093	5405439	26
R1034	YES	YES	58	14,866	658589	5400977	26
R696	YES	YES	1	10,245	653078	5402337	26
R1058	NO	NO	74	12,444	666987	5411122	25
R722	YES	YES	70	10,539	664631	5400858	25
R1067	NO	NO	70	13,903	661773	5400265	25
R659	YES	YES	74	13,877	668511	5406754	24
R358	NO	NO	1	12,826	650214	5401718	23
R334	NO	NO	1	14,198	648272	5402906	23
R1068	YES	YES	70	13,268	665619	5400342	22
R724	YES	YES	70	14,701	667370	5401221	21
R1063	NO	NO	1	15,948	648885	5401438	21
R641	YES	YES	70	16,872	668970	5404153	18

Table 5. Summary of Predicted Aggregate WTG Operation Sound Levels, "With Alternates" Layout, Sorted by Receiver ID

Receiver ID	Participation Status		Nearest WTG ID	Distance to Nearest WTG (ft)	Modeled Receiver Coordinates (UTM Zone 14, NAD 83)		Predicted Sound Level (dBA, SPL)
	Parcel	Landowner			Easting (m)	Northing (m)	
R2	YES	YES	8	2,365	652035	5410613	47
R5	NO	NO	29	3,453	655931	5410862	43
R10	NO	NO	30	3,191	655956	5409992	45
R15	NO	NO	5	2,806	650755	5408157	43
R16	YES	YES	17	2,040	652243	5408243	48
R17	NO	YES	17	2,389	652645	5407991	46
R21	YES	YES	3	3,783	652976	5406830	41
R22	NO	NO	2	3,625	650650	5406347	40
R23	YES	YES	30	2,812	655427	5408263	46
R30	NO	NO	43	2,736	657754	5407269	47
R31	NO	NO	4	9,825	648547	5407642	31
R34	YES	YES	50	2,677	659187	5408405	48
R39	YES	YES	61	3,307	660889	5406976	47
R41	NO	NO	74	3,983	665501	5408968	38
R42	YES	YES	74	2,757	665364	5408405	41
R43	NO	NO	74	4,347	665845	5408472	37
R49	NO	NO	3	3,101	652832	5405741	41
R51	YES	YES	1	2,713	652051	5404420	40
R52	NO	NO	1	3,754	652470	5404234	37
R53	NO	NO	47	2,725	657657	5405624	44
R58	YES	YES	68	3,712	664035	5405725	41
R82	NO	NO	8	7,254	649729	5410764	36
R83	NO	NO	4	5,801	649781	5407767	37
R100	NO	YES	72	3,537	663694	5409329	41
R103	NO	NO	4	7,053	649545	5406802	35
R105	NO	YES	5	9,590	648581	5408305	33
R139	NO	NO	13	13,249	649720	5414060	29
R328	NO	NO	5	11,913	647885	5408157	30
R334	NO	NO	1	14,198	648272	5402906	23
R358	NO	NO	1	12,826	650214	5401718	23
R616	NO	NO	4	5,812	649790	5407868	37
R626	NO	NO	73	7,846	665562	5405750	35
R627	YES	YES	73	14,465	668093	5405439	26
R628	NO	NO	73	10,902	667128	5405949	30
R641	YES	YES	70	16,872	668970	5404153	18
R644	NO	NO	51	10,137	656413	5403288	32
R645	YES	YES	51	9,207	656960	5403208	32
R646	YES	YES	58	6,660	659168	5403422	36
R648	NO	NO	63	4,120	662517	5409251	41
R649	NO	NO	63	5,630	662731	5409933	38
R655	YES	YES	3	4,062	652937	5407022	42
R656	NO	NO	35	4,523	655243	5407457	42
R657	YES	YES	35	2,853	656051	5407035	43
R659	YES	YES	74	13,877	668511	5406754	24
R696	YES	YES	1	10,245	653078	5402337	26
R722	YES	YES	70	10,539	664631	5400858	25
R724	YES	YES	70	14,701	667370	5401221	21
R1029	YES	YES	70	6,358	664485	5402145	32
R1033	YES	YES	51	14,384	658424	5401140	27
R1034	YES	YES	58	14,866	658589	5400977	27
R1051	NO	NO	8	12,548	648221	5411338	30
R1053	NO	NO	23	11,239	655358	5414754	31

Receiver ID	Participation Status		Nearest WTG ID	Distance to Nearest WTG (ft)	Modeled Receiver Coordinates (UTM Zone 14, NAD 83)		Predicted Sound Level (dBA, SPL)
	Parcel	Landowner			Easting (m)	Northing (m)	
R1054	NO	NO	31	14,810	657815	5414966	27
R1055	NO	NO	31	14,726	657960	5414914	27
R1056	NO	NO	31	14,693	657989	5414898	27
R1057	NO	NO	42	11,059	660371	5413225	31
R1058	NO	NO	74	12,444	666987	5411122	25
R1059	NO	NO	74	9,911	666909	5410100	29
R1060	NO	NO	74	9,851	666914	5410064	29
R1061	NO	NO	1	7,913	649647	5404425	31
R1063	NO	NO	1	15,948	648885	5401438	21
R1067	NO	NO	70	13,903	661773	5400265	25
R1068	YES	YES	70	13,268	665619	5400342	22
R1069	YES	YES	74	11,095	667755	5409281	27
R1070	NO	NO	74	10,250	667411	5409462	28
R1084	NO	NO	63	2,743	661812	5409658	41

Table 6. Summary of Predicted Aggregate WTG Operation Sound Levels, "With Alternates" Layout, Sorted by Sound Level

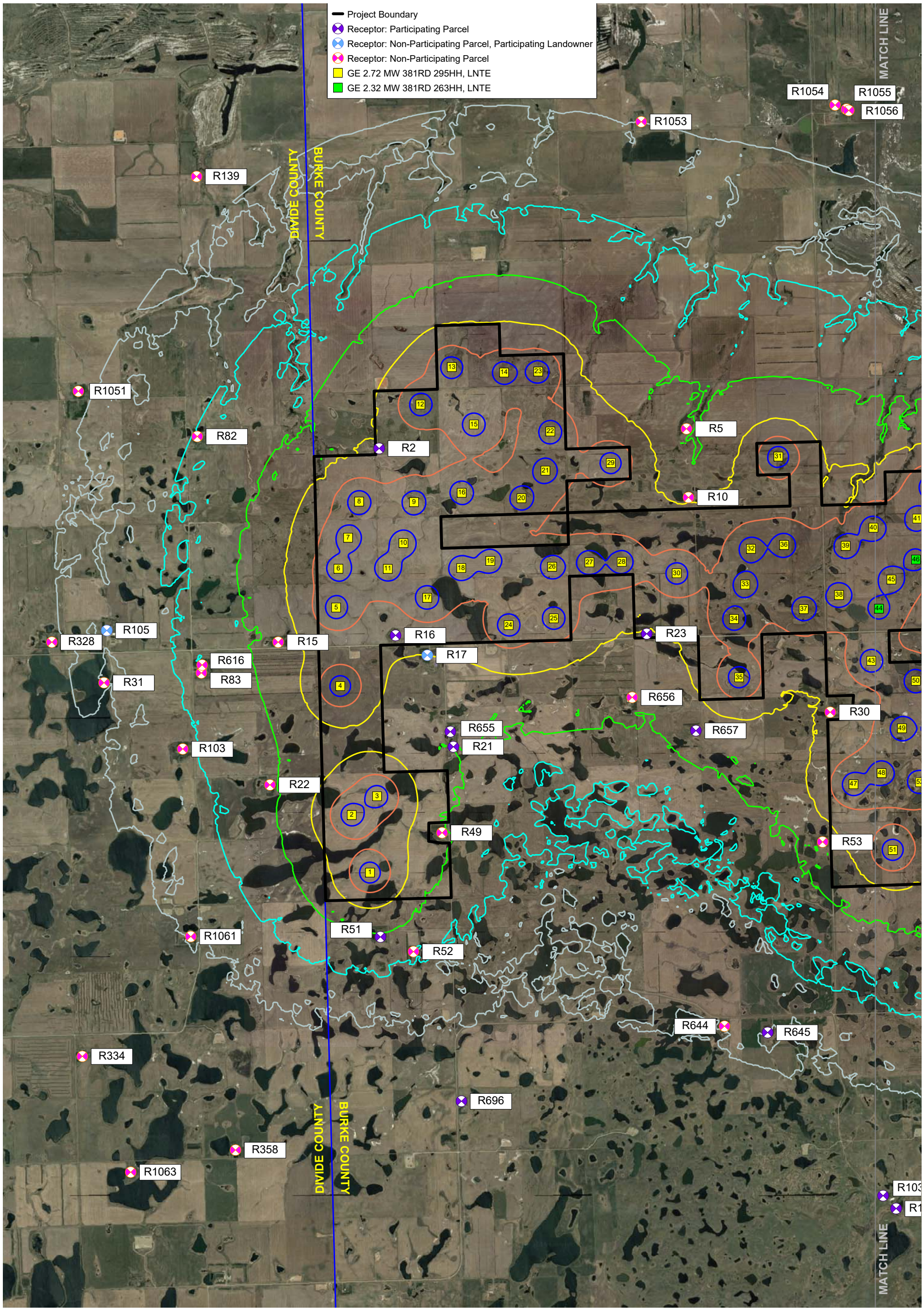
Receiver ID	Participation Status		Nearest WTG ID	Distance to Nearest WTG (ft)	Modeled Receiver Coordinates (UTM Zone 14, NAD 83)		Predicted Sound Level (dBA, SPL)
	Parcel	Landowner			Easting (m)	Northing (m)	
R34	YES	YES	50	2,677	659187	5408405	48
R16	YES	YES	17	2,040	652243	5408243	48
R2	YES	YES	8	2,365	652035	5410613	47
R39	YES	YES	Alt3	2,732	660889	5406976	47
R30	NO	NO	43	2,736	657754	5407269	47
R17	NO	YES	17	2,389	652645	5407991	46
R23	YES	YES	30	2,812	655427	5408263	46
R10	NO	NO	30	3,191	655956	5409992	45
R53	NO	NO	47	2,725	657657	5405624	44
R15	NO	NO	5	2,806	650755	5408157	43
R657	YES	YES	35	2,853	656051	5407035	43
R5	NO	NO	29	3,453	655931	5410862	43
R656	NO	NO	35	4,523	655243	5407457	42
R655	YES	YES	3	4,062	652937	5407022	42
R49	NO	NO	3	3,101	652832	5405741	41
R42	YES	YES	74	2,757	665364	5408405	41
R648	NO	NO	63	4,120	662517	5409251	41
R1084	NO	NO	63	2,743	661812	5409658	41
R58	YES	YES	68	3,712	664035	5405725	41
R21	YES	YES	3	3,783	652976	5406830	41
R100	NO	YES	72	3,537	663694	5409329	41
R51	YES	YES	1	2,713	652051	5404420	40
R22	NO	NO	2	3,625	650650	5406347	40
R649	NO	NO	63	5,630	662731	5409933	38
R41	NO	NO	74	3,983	665501	5408968	38
R616	NO	NO	4	5,812	649790	5407868	37
R83	NO	NO	4	5,801	649781	5407767	37
R52	NO	NO	1	3,754	652470	5404234	37
R43	NO	NO	74	4,347	665845	5408472	37
R646	YES	YES	58	6,660	659168	5403422	36
R82	NO	NO	8	7,254	649729	5410764	36
R103	NO	NO	4	7,053	649545	5406802	35
R626	NO	NO	73	7,846	665562	5405750	35
R105	NO	YES	5	9,590	648581	5408305	33
R645	YES	YES	51	9,207	656960	5403208	32
R644	NO	NO	51	10,137	656413	5403288	32
R1029	YES	YES	70	6,358	664485	5402145	32
R1061	NO	NO	1	7,913	649647	5404425	31
R31	NO	NO	4	9,825	648547	5407642	31
R1057	NO	NO	42	11,059	660371	5413225	31
R1053	NO	NO	23	11,239	655358	5414754	31
R328	NO	NO	5	11,913	647885	5408157	30
R1051	NO	NO	8	12,548	648221	5411338	30
R628	NO	NO	73	10,902	667128	5405949	30
R139	NO	NO	13	13,249	649720	5414060	29
R1059	NO	NO	74	9,911	666909	5410100	29
R1060	NO	NO	74	9,851	666914	5410064	29
R1070	NO	NO	74	10,250	667411	5409462	28
R1056	NO	NO	31	14,693	657989	5414898	27
R1055	NO	NO	31	14,726	657960	5414914	27
R1033	YES	YES	51	14,384	658424	5401140	27
R1054	NO	NO	31	14,810	657815	5414966	27

Receiver ID	Participation Status		Nearest WTG ID	Distance to Nearest WTG (ft)	Modeled Receiver Coordinates (UTM Zone 14, NAD 83)		Predicted Sound Level (dBA, SPL)
	Parcel	Landowner			Easting (m)	Northing (m)	
R1069	YES	YES	74	11,095	667755	5409281	27
R1034	YES	YES	58	14,866	658589	5400977	27
R627	YES	YES	73	14,465	668093	5405439	26
R696	YES	YES	1	10,245	653078	5402337	26
R1058	NO	NO	74	12,444	666987	5411122	25
R722	YES	YES	70	10,539	664631	5400858	25
R1067	NO	NO	70	13,903	661773	5400265	25
R659	YES	YES	74	13,877	668511	5406754	24
R358	NO	NO	1	12,826	650214	5401718	23
R334	NO	NO	1	14,198	648272	5402906	23
R1068	YES	YES	70	13,268	665619	5400342	22
R724	YES	YES	70	14,701	667370	5401221	21
R1063	NO	NO	1	15,948	648885	5401438	21
R641	YES	YES	70	16,872	668970	5404153	18

Table 7. Substation Transformer – Sound Power Level by Octave Band Center Frequency (OBCF)

Transformer Rating	OBCF A-weighted Power Level, dB									Total A-Weighted PWL, dBA
	31.5	63	125	250	500	1k	2k	4k	8k	
225 MVA	37	51	88	85	89	78	68	56	46	93

Figures



N	Date Created: 11/22/2019	**Figure 1a** **No Alternates** **Wind Turbines at Maximum Rotational Wind Speed**
	Created by: CK	
AECOM Imagine it. Delivered. Acoustics & Noise Control Practice	**Predicted Project Operation Noise Contours** **Northern Divide Wind Energy Center** **Divide and Burke Counties, ND**	**Sound Level Contour Ranges (dBA)** 30 35 40 45 50 55

658000 659000 660000 661000 662000 663000 664000 665000 666000 667000 668000 669000

5415000 5414000 5413000 5412000 5411000 5410000 5409000 5408000 5407000 5406000 5405000 5404000 5403000 5402000 5401000

MATCH LINE

Project Boundary
Receptor: Participating Parcel
Receptor: Non-Participating Parcel, Participating Landowner
Receptor: Non-Participating Parcel
GE 2.72 MW 381RD 295HH, LNTE
GE 2.32 MW 381RD 263HH, LNTE

R1055 R1056 R1057 R1058 R1059 R1060 R649 R1084 R1070 R1069 R648 R100 R41 R43 R42 R34 R30 R39 R659 R628 R626 R58 R53 R627 R646 R641 R1029 R1033 R1034 R724 R722 R1067 R1068

MATCH LINE

N

Date Created: 11/22/2019

Created by: CK

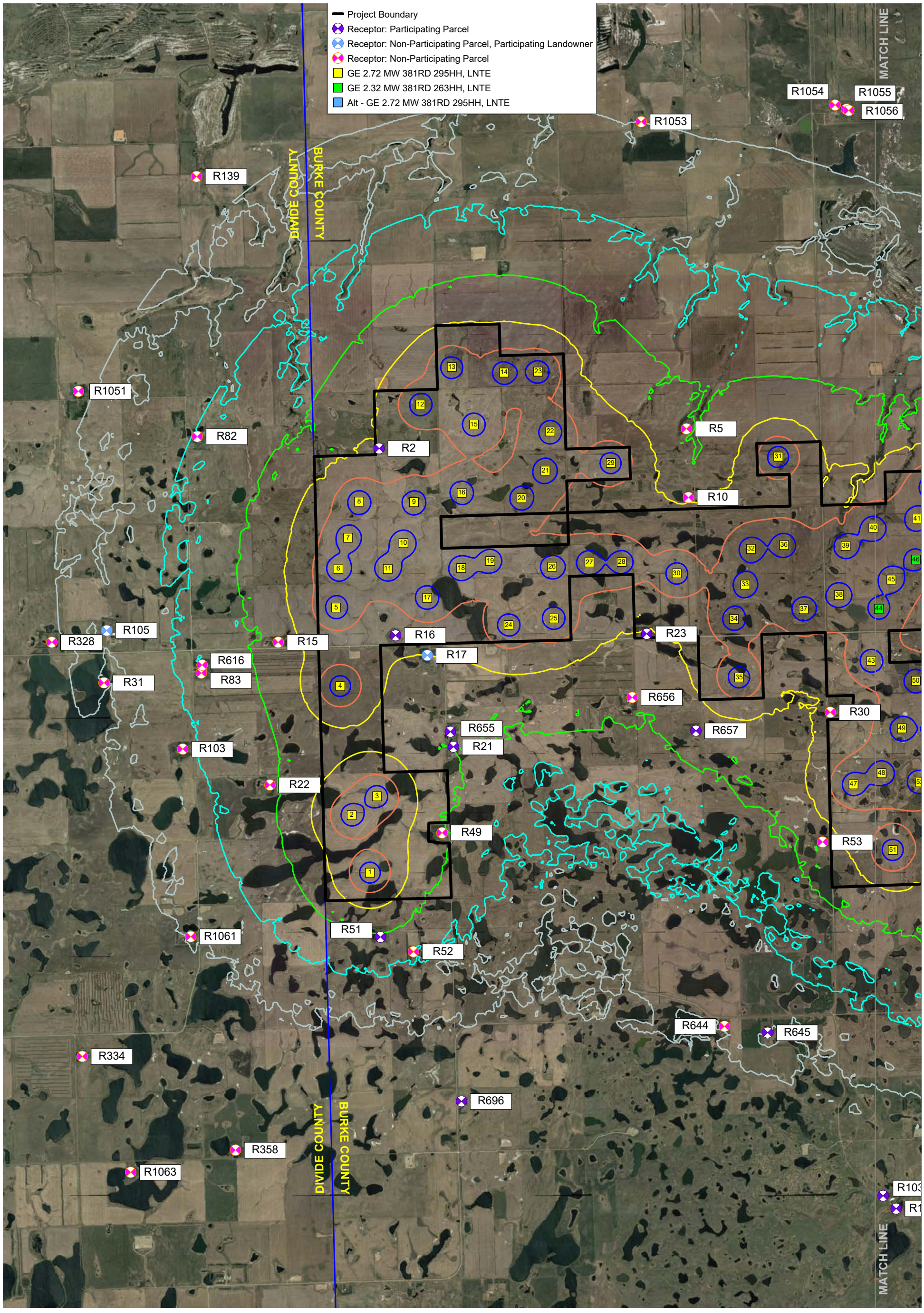
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Acoustics & Noise Control Practice

Figure 1b
No Alternates
Wind Turbines at Maximum Rotational Wind Speed

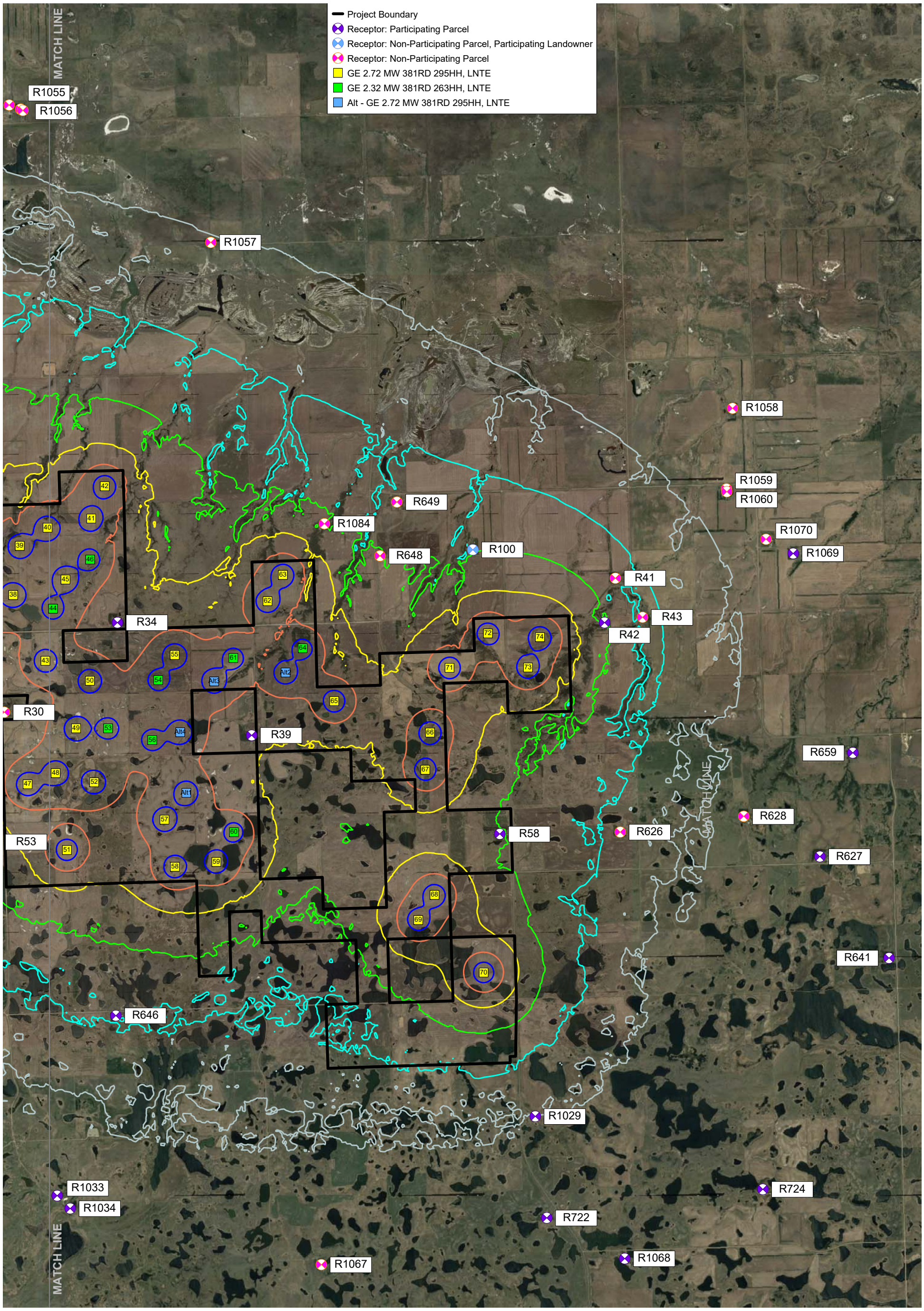
Predicted Project Operation Noise Contours
Northern Divide Wind Energy Center
Divide and Burke Counties, ND

Sound Level Contour Ranges (dBA)

30
35
40
45
50
55



N	Date Created: 11/22/2019	**Figure 2a** **With Alternates** **Wind Turbines at Maximum Rotational Wind Speed**	**Sound Level Contour Ranges (dBA)** 30 35 40 45 50 55
	Created by: CK		
AECOM Imagine it. Delivered. Acoustics & Noise Control Practice		**Predicted Project Operation Noise Contours** **Northern Divide Wind Energy Center** **Divide and Burke Counties, ND**	



N	Date Created: 11/22/2019 Created by: CK	**Figure 2b** **With Alternates** **Wind Turbines at Maximum Rotational Wind Speed**
AECOM Imagine it. Delivered. Acoustics & Noise Control Practice		**Predicted Project Operation Noise Contours** **Northern Divide Wind Energy Center** **Divide and Burke Counties, ND**

Sound Level Contour Ranges (dBA)

30
35
40
45
50
55

B4. Shadow Flicker Assessment

Shadow Flicker Assessment

Northern Divide Wind Energy Center
Northern Divide Wind, LLC
Burke County, North Dakota

Prepared for:

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November 2019

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Table of Contents

1.0 INTRODUCTION 1

2.0 PROJECT COMPONENTS 1

3.0 SHADOW FLICKER BACKGROUND 1

4.0 SHADOW FLICKER ANALYSIS 2

5.0 SHADOW FLICKER ANALYSIS RESULTS 3

5.1 Scenario A Results 3

5.2 Scenario B Results 3

6.0 CONCLUSIONS 4

7.0 LITERATURE CITED 4

LIST OF TABLES

Table 1. Wind Turbine Locations 6
Table 2. Percent of Possible Sunshine 7
Table 3. Scenario A Statistical Summary of Predicted Shadow Flicker at Receptors 7
Table 4. Scenario A Results by Modeled Receptor 8
Table 5. Scenario A Results by Modeled Receptor (Sorted by Hours/Year) 10
Table 6. Scenario B Results by Modeled Receptor 12
Table 7. Scenario B Results by Modeled Receptor (Sorted by Hours/Year) 14
Table 8. Scenario B Statistical Summary of Predicted Shadow Flicker at Receptors 16

LIST OF FIGURES

Figure 1 Wind Turbine and Receptor Locations
Figure 2 Predicted Shadow Flicker for Scenario A
Figure 3 Predicted Shadow Flicker for Scenario B

LIST OF APPENDICES

Appendix A Detailed Shadow Flicker Results

1.0 INTRODUCTION

Northern Divide Wind, LLC (Northern Divide Wind), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, proposes to construct and operate the Northern Divide Wind Energy Center (Project) in northwestern Burke County, North Dakota. The Project will have a nameplate capacity of approximately 200 megawatts (MW), consisting of up to 74 wind turbines using both General Electric (GE) 2.72 MW and GE 2.32 MW models. The Project also includes up to four alternative turbine locations to provide siting flexibility based on on-going studies, landowner preferences, and issues identified during construction. Only 74 turbines will be constructed. AECOM conducted the following shadow flicker analysis for the Project to support Northern Divide Wind's application for a Certificate of Site Compatibility to the North Dakota Public Service Commission (Commission).

2.0 PROJECT COMPONENTS

The Project will consist of up to 74 wind turbines, currently expected to consist of 66 GE 2.72 MW and eight GE 2.32 MW models (**Figure 1**). The turbine technology is 3-bladed, upwind, and horizontal-axis. Each GE 2.72 MW model will have a 90-meter (295 feet) hub height and a 116-meter (381 feet) rotor diameter with a swept area of 10,568 m^2 (2.61 ac). The GE 2.32 MW model has an 80-meter hub height (262.5 feet), and a 116-meter (381 feet) rotor diameter with a swept area of 10,568 m^2 (2.61 ac). Both turbines begin operation in wind speeds of 3.0 meters per second (m/s), or 6.7 miles per hour (mph), and are designed to operate in wind speeds of up to 20 m/s (45 mph). The coordinates for the 78 (74 proposed and four alternate locations) turbines are listed in **Table 1**.

3.0 SHADOW FLICKER BACKGROUND

Shadow flicker is a temporary condition resulting from the sun casting intermittent shadows from the rotating blades of a wind turbine onto a sensitive receptor such as a building window. The flicker is due to alternating light intensity between the direct beam of sunlight and the shadow from the turbine blades. For shadow flicker to occur, the following criteria must be met:

1. The sun must be shining and unobscured.

2. The wind turbine blades must be between the sun and the shadow receptor. The wind turbine must be facing directly towards (or away from) the sun such that the rotational plane of the blades is perpendicular to the azimuth of incident sun rays (i.e. the sun, turbine and receptor are aligned and the turbine blades are perpendicular to receptor). For this to occur, the wind direction would have to perpetually be parallel to the azimuth of the incident sun rays throughout the day.

3. The line of sight between the turbine and the shadow receptor must be clear. Light impermeable obstacles, such as trees, buildings or other structures, will prevent or reduce shadow flicker from occurring at the receptor. Terrain can also affect the exposure at a receptor.

4. The receptor has to be close enough to the turbine to be in the shadow. The shadow from a turbine extends furthest when the sun is low in the sky (sunrise and sunset) such that receptors to the east or west of a turbine will be exposed more than receptors to the north and south of a turbine.

5. The turbine is operational and not stationary due to a lack of wind or maintenance activities.

The frequency of shadow flicker is dependent on the wind turbine's rotor blade speed and the number of blades on the rotor. 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.

Although shadow flicker does not impact health it can be a nuisance to neighboring properties if not kept to a reasonable number of hours a year (Knopper et al., 2014). There have been public concerns that flickering light from wind turbines could trigger seizures in people with epilepsy, but these concerns are unfounded. The UK Epilepsy Society states that turbine blades would need to rotate at speeds greater than 3 Hertz (flashes per second) to potentially cause seizures in persons with photosensitive epilepsy (Epilepsy Society 2016); however, turbines on commercial wind farms rotate at speeds of 2 Hertz or less. The Project turbine models have a maximum rotational speed of 15.7 revolutions per minute (rpm), which corresponds to a shadow flicker frequency of 0.26 Hertz. Therefore, the Project turbines will result in a flash frequency well below that which would cause photosensitive epileptic seizures.

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. However, a widely used industry standard of 30 hours per year has been used for this shadow flicker impact analysis. The Commission requires effects from the impact upon light-sensitive land uses to be managed and maintained at an acceptable minimum.[1] The Commission has recognized the 30 hour per year standard and historically evaluates shadow flicker impacts pursuant to this standard.

4.0 SHADOW FLICKER ANALYSIS

The shadow flicker analysis for the Project was completed using the WindPRO Version 3.3 modelling software. As discussed above, the Project will install up to 74 wind turbines. The 74 proposed locations as well as four alternate locations have been assessed in two scenarios:

- Scenario A: 74 wind turbines (proposed locations only)
- Scenario B: 78 wind turbines (proposed and alternate locations)

WindPRO considers the terrain features determined by U.S. Geological Survey (USGS) Digital Elevation Model (DEM) data, receptor, and turbine locations in the modelling analysis. It is generally accepted that shadow flicker from wind turbines does not occur beyond a certain distance from a wind turbine (Department of Energy and Climate Change 2011). The *Update of UK Shadow Flicker Evidence Base* by Parsons Brinckerhoff, on behalf of the Department of Energy and Climate Change, states this distance is equivalent to 10 rotor diameters. AECOM calculated a maximum distance of 3,806 feet (381-foot rotor diameter times 10) for all turbines. WindPRO also assumes the sun is shining during all daytime hours and that the turbines are always operating. This method produces a theoretical worst-case astronomical prediction at each receptor. Five years of hourly meteorological data from the Estevan, Saskatchewan Regional Airport, approximately 27 miles north-northwest of the Project area shows that the wind blows predominantly from the northwest or east-southeast and that receptors directly to the east or west of a turbine are less likely to experience shadow flicker. The meteorological data also shows that up to two percent of the hours when flicker is likely to occur, the wind speed would be less than the cut-in speed of the turbine and the blades would not be rotating.

WindPRO was run in “greenhouse mode” such that the wind turbine blades are always perpendicular to the receptor with a direct line of sight where the window is one meter by one meter and the height above ground to the middle of the window is 1.5 meters to determine the maximum exposure. The amount of bright sunshine can also affect the frequency and duration of exposure to shadow flicker. **Table 2**

[1] N.D. Admin. Code § 69-06-08-01(5)(c)(3).

summarizes the percentage of possible sunshine (classified as zero or few clouds) by month at Sloulin Field International Airport, Williston, North Dakota based on 19-year climatological data (1965 – 1983) from the National Climatic Data Center (NCDC 2018). Williston is the closest station in the database to the project. These monthly values were input to WindPRO to adjust the number of hours when shadow flicker occurs on a monthly basis.

The analysis is inherently conservative by assuming 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. Adding to the conservatism, both the primary and alternate turbines (for a total of 78 turbines) are modeled cumulatively for Scenario B, even though Northern Divide Wind will only construct no more than 74 turbines.

A total of 66 receptors were identified within and near the Project that are considered either inhabited or capable of habitation or follow the Burke County Zoning Regulations definition of an occupied structure (Columbus Park District - WildWood Park Campground and Bethany Church). Determination of habitation for existing structures was limited to public knowledge and roadside surveys in order to reduce disturbances to land owners. For purposes of conservatism in this analysis, all structures that were identified as capable of habitation were considered active residential structures.

5.0 SHADOW FLICKER ANALYSIS RESULTS

The shadow flicker analysis accounts for the placement of turbines, receptors, and sun angle such that the time when the turbine is in between the sun and the receptor is included in the total hours per year that shadow flicker could occur. However, this is a conservative analysis that does not account for maintenance time, wind speeds less than three meters per second (m/s) when the turbines will not operate, light permeable obstacles such as trees and other structures, or that the turbine will rarely be directly facing the sun, which will shorten the shadow from the turbine blades. It was assumed that the receptor is always perpendicular (facing) to the turbine and a window measuring one meter by one meter at each receptor is located 1.5 meters high off the ground.

5.1 Scenario A Results

The results of the Scenario A analysis are summarized in **Table 3**, **Table 4,** and **Table 5** and shown on **Figure 2**. The maximum shadow flicker per year at a participating landowner's residence is 22 hours per year. It is based on monthly percent possible of sunshine in **Table 2** and estimated hours during which the wind speed would be less than the cut-in speed of 3 m/s or the turbine is down for maintenance. This analysis is conservative as it assumes that there is a window facing the turbine at all times ("greenhouse mode"). Even using this conservative analysis, no receptors were predicted to have shadow flicker values of 30 hours or greater each year.

5.2 Scenario B Results

The results of the Scenario B analysis are summarized in **Table 6, Table 7** and **Table 8** and shown on **Figure 3**. Similar to Scenario A, the maximum shadow flicker per year at a participating landowner's residence is 22 hours per year. It is based on monthly percent possible of sunshine in **Table 2** and estimated hours during which the wind speed would be less than the cut-in speed of three m/s or the turbine is down for maintenance. This analysis is conservative as it assumes that there is a window facing the turbine at all times ("greenhouse mode"). Even using this conservative analysis, no receptors were predicted to have shadow flicker values of 30 hours or greater each year.

6.0 CONCLUSIONS

As expected, the analysis predicts that shadow flicker impacts will be greatest at receptors nearer to the wind turbines. Northern Divide Wind applied the Burke County Zoning Regulations wind turbine setback distance of one-half mile (2,640 feet) from any occupied structure, assuming all identified receptors are occupied, which results in less shadow flicker at receptors. 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. The predicted shadow flicker impacts are less than the Commission-recognized 30 hours per year industry standard at all receptors.

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 that may block sunlight. In reality, the windows of some houses will not face the sun directly for the key shadow flicker impact times. Adding to the conservatism, both the primary and alternate turbines were modeled cumulatively in Scenario B. Northern Divide Wind will only construct up to 74 turbines, which is fewer wind turbines than were included in the Scenario B modeled results.

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Tables

Table 1. Wind Turbine Locations

Turbine ID	UTM Coordinates		Turbine ID	UTM Coordinates		Turbine ID	UTM Coordinates	
	X	Y		X	Y		X	Y
1	651918	5405236	27	654701	5409169	53(1)	659069	5407065
2	651687	5405966	28	655110	5409175	54(1)	659705	5407675
3	652008	5406204	29	654972	5410429	55	659913	5407995
4	651541	5407600	30	655807	5409031	56(1)	659629	5406915
5	651489	5408596	31	657096	5410510	57	659784	5405907
6	651518	5409088	32	656749	5409340	58	659916	5405309
7	651641	5409481	33	656676	5408887	59	660442	5405371
8	651780	5409939	34	656534	5408450	60(1)	660664	5405748
9	652477	5409932	35	656598	5407711	61(1)	660658	5407957
10	652343	5409413	36	657168	5409389	62	661091	5408677
11	652144	5409087	37	657417	5408576	63	661285	5409009
12	652558	5411169	38	657865	5408755	64(1)	661537	5408080
13	652956	5411645	39	657949	5409378	65	661936	5407409
14	653618	5411575	40	658301	5409608	66	663150	5407011
15	653235	5410917	41	658856	5409724	67	663090	5406539
16	653081	5410051	42	659027	5410134	68	663208	5404953
17	652643	5408719	43	658274	5407921	69	663002	5404634
18	653075	5409097	44(1)	658372	5408581	70	663831	5403969
19	653444	5409187	45	658529	5408951	71	663398	5407831
20	653839	5409981	46(1)	658841	5409204	72	663885	5408268
21	654143	5410331	47	658049	5406356	73	664393	5407836
22	654204	5410828	48	658404	5406497	74	664544	5408221
23	654051	5411588	49	658663	5407065	Alt1	660061	5406247
24	653676	5408373	50	658839	5407667	Alt2	661319	5407772
25	654249	5408459	51	658547	5405522	Alt3	660414	5407660
26	654228	5409113	52	658892	5406381	Alt4	659984	5407016

(1) GE 2.32 MW turbines. All others are GE 2.72 MW turbines.

Table 2. Percent of Possible Sunshine

Month	% Possible Sunshine (Sloulin Field International Airport, Williston, ND)
January	51
February	57
March	61
April	59
May	63
June	68
July	77
August	75
September	67
October	56
November	43
December	47
Source: National Climatic Data Center (2018)	

Table 3. Scenario A Statistical Summary of Predicted Shadow Flicker at Receptors

Total Shadow Flicker Time (predicted)	Number of Receptors
Total	66
= 0 Hours	50
> 0 Hours < 10 Hours	11
> 10 Hours < 20 Hours	4
> 20 Hours < 30 Hours	1

Table 4. Scenario A Results by Modeled Receptor

Receiver ID	Participation Status		Nearest Turbine ID	Distance to Nearest Turbine (ft)	Receptor Coordinates (UTM Zone 14, NAD 83)		Predicted Shadow Flicker Hours/Year
	Parcel	Landowner			Easting (m)	Northing (m)	
R2	YES	YES	8	2365	652035	5410613	0
R5	NO	NO	29	3453	655931	5410862	3
R10	NO	NO	30	3191	655956	5409992	14
R15	NO	NO	5	2806	650755	5408157	17
R16	YES	YES	17	2040	652243	5408243	22
R17	NO	YES	17	2389	652645	5407991	2
R21	YES	YES	3	3783	652976	5406830	3
R22	NO	NO	2	3625	650650	5406347	2
R23	YES	YES	30	2812	655427	5408263	1
R30	NO	NO	43	2736	657754	5407269	7
R31	NO	NO	4	9825	648547	5407642	0
R34	YES	YES	50	2677	659187	5408405	12
R39	YES	YES	Alt3	2732	660889	5406976	3
R41	NO	NO	74	3983	665501	5408968	0
R42	YES	YES	74	2757	665364	5408405	5
R43	NO	NO	74	4347	665845	5408472	0
R49	NO	NO	3	3101	652832	5405741	10
R51	YES	YES	1	2713	652051	5404420	0
R52	NO	NO	1	3754	652470	5404234	0
R53	NO	NO	47	2725	657657	5405624	1
R58	YES	YES	68	3712	664035	5405725	7
R82	NO	NO	8	7254	649729	5410764	0
R83	NO	NO	4	5801	649781	5407767	0
R100	NO	YES	72	3537	663694	5409329	0
R103	NO	NO	4	7053	649545	5406802	0
R105	NO	YES	5	9590	648581	5408305	0
R139	NO	NO	13	13249	649720	5414060	0
R328	NO	NO	5	11913	647885	5408157	0
R334	NO	NO	1	14198	648272	5402906	0
R358	NO	NO	1	12826	650214	5401718	0
R616	NO	NO	4	5812	649790	5407868	0
R626	NO	NO	73	7846	665562	5405750	0
R627	YES	YES	73	14465	668093	5405439	0
R628	NO	NO	73	10902	667128	5405949	0
R641	YES	YES	70	16872	668970	5404153	0
R644	NO	NO	51	10137	656413	5403288	0

Receiver ID	Participation Status		Nearest Turbine ID	Distance to Nearest Turbine (ft)	Receptor Coordinates (UTM Zone 14, NAD 83)		Predicted Shadow Flicker Hours/Year
	Parcel	Landowner			Easting (m)	Northing (m)	
R645	YES	YES	51	9207	656960	5403208	0
R646	YES	YES	58	6660	659168	5403422	0
R648(2)	NO	NO	63	4120	662517	5409251	0
R649	NO	NO	63	5630	662731	5409933	0
R655	YES	YES	3	4062	652937	5407022	0
R656	NO	NO	35	4523	655243	5407457	0
R657	YES	YES	35	2853	656051	5407035	0
R659	YES	YES	74	13877	668511	5406754	0
R696	YES	YES	1	10245	653078	5402337	0
R722	YES	YES	70	10539	664631	5400858	0
R724	YES	YES	70	14701	667370	5401221	0
R1029	YES	YES	70	6358	664485	5402145	0
R1033	YES	YES	51	14384	658424	5401140	0
R1034	YES	YES	58	14866	658589	5400977	0
R1051	NO	NO	8	12548	648221	5411338	0
R1053	NO	NO	23	11239	655358	5414754	0
R1054	NO	NO	31	14810	657815	5414966	0
R1055	NO	NO	31	14726	657960	5414914	0
R1056	NO	NO	31	14693	657989	5414898	0
R1057	NO	NO	42	11059	660371	5413225	0
R1058	NO	NO	74	12444	666987	5411122	0
R1059	NO	NO	74	9911	666909	5410100	0
R1060	NO	NO	74	9851	666914	5410064	0
R1061	NO	NO	1	7913	649647	5404425	0
R1063	NO	NO	1	15948	648885	5401438	0
R1067	NO	NO	70	13903	661773	5400265	0
R1068	YES	YES	70	13268	665619	5400342	0
R1069	YES	YES	74	11095	667755	5409281	0
R1070	NO	NO	74	10250	667411	5409462	0
R1084(1)	NO	NO	63	2743	661812	5409658	13

(1) Columbus Park District - WildWood Park Campground
(2) Bethany Church

Table 5. Scenario A Results by Modeled Receptor (Sorted by Hours/Year)

Receiver ID	Participation Status		Nearest Turbine ID	Distance to Nearest Turbine (ft)	Receptor Coordinates (UTM Zone 14, NAD 83)		Predicted Shadow Flicker Hours/Year
	Parcel	Landowner			Easting (m)	Northing (m)	
R16	YES	YES	17	2040	652243	5408243	22
R15	NO	NO	5	2806	650755	5408157	17
R10	NO	NO	30	3191	655956	5409992	14
R1084[(1)]	NO	NO	63	2743	661812	5409658	13
R34	YES	YES	50	2677	659187	5408405	12
R49	NO	NO	3	3101	652832	5405741	10
R30	NO	NO	43	2736	657754	5407269	7
R58	YES	YES	68	3712	664035	5405725	7
R42	YES	YES	74	2757	665364	5408405	5
R5	NO	NO	29	3453	655931	5410862	3
R21	YES	YES	3	3783	652976	5406830	3
R39	YES	YES	Alt3	2732	660889	5406976	3
R17	NO	YES	17	2389	652645	5407991	2
R22	NO	NO	2	3625	650650	5406347	2
R53	NO	NO	47	2725	657657	5405624	1
R23	YES	YES	30	2812	655427	5408263	1
R2	YES	YES	8	2365	652035	5410613	0
R31	NO	NO	4	9825	648547	5407642	0
R41	NO	NO	74	3983	665501	5408968	0
R43	NO	NO	74	4347	665845	5408472	0
R51	YES	YES	1	2713	652051	5404420	0
R52	NO	NO	1	3754	652470	5404234	0
R82	NO	NO	8	7254	649729	5410764	0
R83	NO	NO	4	5801	649781	5407767	0
R100	NO	YES	72	3537	663694	5409329	0
R103	NO	NO	4	7053	649545	5406802	0
R105	NO	YES	5	9590	648581	5408305	0
R139	NO	NO	13	13249	649720	5414060	0
R328	NO	NO	5	11913	647885	5408157	0
R334	NO	NO	1	14198	648272	5402906	0
R358	NO	NO	1	12826	650214	5401718	0
R616	NO	NO	4	5812	649790	5407868	0
R626	NO	NO	73	7846	665562	5405750	0
R627	YES	YES	73	14465	668093	5405439	0
R628	NO	NO	73	10902	667128	5405949	0
R641	YES	YES	70	16872	668970	5404153	0

Receiver ID	Participation Status		Nearest Turbine ID	Distance to Nearest Turbine (ft)	Receptor Coordinates (UTM Zone 14, NAD 83)		Predicted Shadow Flicker Hours/Year
	Parcel	Landowner			Easting (m)	Northing (m)	
R644	NO	NO	51	10137	656413	5403288	0
R645	YES	YES	51	9207	656960	5403208	0
R646	YES	YES	58	6660	659168	5403422	0
R648[(2)]	NO	NO	63	4120	662517	5409251	0
R649	NO	NO	63	5630	662731	5409933	0
R655	YES	YES	3	4062	652937	5407022	0
R656	NO	NO	35	4523	655243	5407457	0
R657	YES	YES	35	2853	656051	5407035	0
R659	YES	YES	74	13877	668511	5406754	0
R696	YES	YES	1	10245	653078	5402337	0
R722	YES	YES	70	10539	664631	5400858	0
R724	YES	YES	70	14701	667370	5401221	0
R1029	YES	YES	70	6358	664485	5402145	0
R1033	YES	YES	51	14384	658424	5401140	0
R1034	YES	YES	58	14866	658589	5400977	0
R1051	NO	NO	8	12548	648221	5411338	0
R1053	NO	NO	23	11239	655358	5414754	0
R1054	NO	NO	31	14810	657815	5414966	0
R1055	NO	NO	31	14726	657960	5414914	0
R1056	NO	NO	31	14693	657989	5414898	0
R1057	NO	NO	42	11059	660371	5413225	0
R1058	NO	NO	74	12444	666987	5411122	0
R1059	NO	NO	74	9911	666909	5410100	0
R1060	NO	NO	74	9851	666914	5410064	0
R1061	NO	NO	1	7913	649647	5404425	0
R1063	NO	NO	1	15948	648885	5401438	0
R1067	NO	NO	70	13903	661773	5400265	0
R1068	YES	YES	70	13268	665619	5400342	0
R1069	YES	YES	74	11095	667755	5409281	0
R1070	NO	NO	74	10250	667411	5409462	0

(1) Columbus Park District - WildWood Park Campground
(2) Bethany Church

Table 6. Scenario B Results by Modeled Receptor

Receiver ID	Participation Status		Nearest Turbine ID	Distance to Nearest Turbine (ft)	Receptor Coordinates (UTM Zone 14, NAD 83)		Predicted Shadow Flicker Hours/Year
	Parcel	Landowner			Easting (m)	Northing (m)	
R2	YES	YES	8	2365	652035	5410613	0
R5	NO	NO	29	3453	655931	5410862	3
R10	NO	NO	30	3191	655956	5409992	14
R15	NO	NO	5	2806	650755	5408157	17
R16	YES	YES	17	2040	652243	5408243	22
R17	NO	YES	17	2389	652645	5407991	2
R21	YES	YES	3	3783	652976	5406830	3
R22	NO	NO	2	3625	650650	5406347	2
R23	YES	YES	30	2812	655427	5408263	1
R30	NO	NO	43	2736	657754	5407269	7
R31	NO	NO	4	9825	648547	5407642	0
R34	YES	YES	50	2677	659187	5408405	12
R39	YES	YES	Alt3	2732	660889	5406976	10
R41	NO	NO	74	3983	665501	5408968	0
R42	YES	YES	74	2757	665364	5408405	5
R43	NO	NO	74	4347	665845	5408472	0
R49	NO	NO	3	3101	652832	5405741	10
R51	YES	YES	1	2713	652051	5404420	0
R52	NO	NO	1	3754	652470	5404234	0
R53	NO	NO	47	2725	657657	5405624	1
R58	YES	YES	68	3712	664035	5405725	7
R82	NO	NO	8	7254	649729	5410764	0
R83	NO	NO	4	5801	649781	5407767	0
R100	NO	YES	72	3537	663694	5409329	0
R103	NO	NO	4	7053	649545	5406802	0
R105	NO	YES	5	9590	648581	5408305	0
R139	NO	NO	13	13249	649720	5414060	0
R328	NO	NO	5	11913	647885	5408157	0
R334	NO	NO	1	14198	648272	5402906	0
R358	NO	NO	1	12826	650214	5401718	0
R616	NO	NO	4	5812	649790	5407868	0
R626	NO	NO	73	7846	665562	5405750	0
R627	YES	YES	73	14465	668093	5405439	0
R628	NO	NO	73	10902	667128	5405949	0
R641	YES	YES	70	16872	668970	5404153	0
R644	NO	NO	51	10137	656413	5403288	0

Receiver ID	Participation Status		Nearest Turbine ID	Distance to Nearest Turbine (ft)	Receptor Coordinates (UTM Zone 14, NAD 83)		Predicted Shadow Flicker Hours/Year
	Parcel	Landowner			Easting (m)	Northing (m)	
R645	YES	YES	51	9207	656960	5403208	0
R646	YES	YES	58	6660	659168	5403422	0
R648(2)	NO	NO	63	4120	662517	5409251	0
R649	NO	NO	63	5630	662731	5409933	0
R655	YES	YES	3	4062	652937	5407022	0
R656	NO	NO	35	4523	655243	5407457	0
R657	YES	YES	35	2853	656051	5407035	0
R659	YES	YES	74	13877	668511	5406754	0
R696	YES	YES	1	10245	653078	5402337	0
R722	YES	YES	70	10539	664631	5400858	0
R724	YES	YES	70	14701	667370	5401221	0
R1029	YES	YES	70	6358	664485	5402145	0
R1033	YES	YES	51	14384	658424	5401140	0
R1034	YES	YES	58	14866	658589	5400977	0
R1051	NO	NO	8	12548	648221	5411338	0
R1053	NO	NO	23	11239	655358	5414754	0
R1054	NO	NO	31	14810	657815	5414966	0
R1055	NO	NO	31	14726	657960	5414914	0
R1056	NO	NO	31	14693	657989	5414898	0
R1057	NO	NO	42	11059	660371	5413225	0
R1058	NO	NO	74	12444	666987	5411122	0
R1059	NO	NO	74	9911	666909	5410100	0
R1060	NO	NO	74	9851	666914	5410064	0
R1061	NO	NO	1	7913	649647	5404425	0
R1063	NO	NO	1	15948	648885	5401438	0
R1067	NO	NO	70	13903	661773	5400265	0
R1068	YES	YES	70	13268	665619	5400342	0
R1069	YES	YES	74	11095	667755	5409281	0
R1070	NO	NO	74	10250	667411	5409462	0
R1084(1)	NO	NO	63	2743	661812	5409658	13

(1) Columbus Park District - WildWood Park Campground
(2) Bethany Church

Table 7. Scenario B Results by Modeled Receptor (Sorted by Hours/Year)

Receiver ID	Participation Status		Nearest Turbine ID	Distance to Nearest Turbine (ft)	Receptor Coordinates (UTM Zone 14, NAD 83)		Predicted Shadow Flicker Hours/Year
	Parcel	Landowner			Easting (m)	Northing (m)	
R16	YES	YES	17	2040	652243	5408243	22
R15	NO	NO	5	2806	650755	5408157	17
R10	NO	NO	30	3191	655956	5409992	14
R1084[(1)]	NO	NO	63	2743	661812	5409658	13
R34	YES	YES	50	2677	659187	5408405	12
R39	YES	YES	Alt3	2732	660889	5406976	10
R49	NO	NO	3	3101	652832	5405741	10
R30	NO	NO	43	2736	657754	5407269	7
R58	YES	YES	68	3712	664035	5405725	7
R42	YES	YES	74	2757	665364	5408405	5
R5	NO	NO	29	3453	655931	5410862	3
R21	YES	YES	3	3783	652976	5406830	3
R17	NO	YES	17	2389	652645	5407991	2
R22	NO	NO	2	3625	650650	5406347	2
R53	NO	NO	47	2725	657657	5405624	1
R23	YES	YES	30	2812	655427	5408263	1
R2	YES	YES	8	2365	652035	5410613	0
R31	NO	NO	4	9825	648547	5407642	0
R41	NO	NO	74	3983	665501	5408968	0
R43	NO	NO	74	4347	665845	5408472	0
R51	YES	YES	1	2713	652051	5404420	0
R52	NO	NO	1	3754	652470	5404234	0
R82	NO	NO	8	7254	649729	5410764	0
R83	NO	NO	4	5801	649781	5407767	0
R100	NO	YES	72	3537	663694	5409329	0
R103	NO	NO	4	7053	649545	5406802	0
R105	NO	YES	5	9590	648581	5408305	0
R139	NO	NO	13	13249	649720	5414060	0
R328	NO	NO	5	11913	647885	5408157	0
R334	NO	NO	1	14198	648272	5402906	0
R358	NO	NO	1	12826	650214	5401718	0
R616	NO	NO	4	5812	649790	5407868	0
R626	NO	NO	73	7846	665562	5405750	0
R627	YES	YES	73	14465	668093	5405439	0
R628	NO	NO	73	10902	667128	5405949	0
R641	YES	YES	70	16872	668970	5404153	0

Receiver ID	Participation Status		Nearest Turbine ID	Distance to Nearest Turbine (ft)	Receptor Coordinates (UTM Zone 14, NAD 83)		Predicted Shadow Flicker Hours/Year
	Parcel	Landowner			Easting (m)	Northing (m)	
R644	NO	NO	51	10137	656413	5403288	0
R645	YES	YES	51	9207	656960	5403208	0
R646	YES	YES	58	6660	659168	5403422	0
R648[(2)]	NO	NO	63	4120	662517	5409251	0
R649	NO	NO	63	5630	662731	5409933	0
R655	YES	YES	3	4062	652937	5407022	0
R656	NO	NO	35	4523	655243	5407457	0
R657	YES	YES	35	2853	656051	5407035	0
R659	YES	YES	74	13877	668511	5406754	0
R696	YES	YES	1	10245	653078	5402337	0
R722	YES	YES	70	10539	664631	5400858	0
R724	YES	YES	70	14701	667370	5401221	0
R1029	YES	YES	70	6358	664485	5402145	0
R1033	YES	YES	51	14384	658424	5401140	0
R1034	YES	YES	58	14866	658589	5400977	0
R1051	NO	NO	8	12548	648221	5411338	0
R1053	NO	NO	23	11239	655358	5414754	0
R1054	NO	NO	31	14810	657815	5414966	0
R1055	NO	NO	31	14726	657960	5414914	0
R1056	NO	NO	31	14693	657989	5414898	0
R1057	NO	NO	42	11059	660371	5413225	0
R1058	NO	NO	74	12444	666987	5411122	0
R1059	NO	NO	74	9911	666909	5410100	0
R1060	NO	NO	74	9851	666914	5410064	0
R1061	NO	NO	1	7913	649647	5404425	0
R1063	NO	NO	1	15948	648885	5401438	0
R1067	NO	NO	70	13903	661773	5400265	0
R1068	YES	YES	70	13268	665619	5400342	0
R1069	YES	YES	74	11095	667755	5409281	0
R1070	NO	NO	74	10250	667411	5409462	0

(1) Columbus Park District WildWood Park Campground
(2) Bethany Church

Table 8. Scenario B Statistical Summary of Predicted Shadow Flicker at Receptors

Total Shadow Flicker Time (predicted)	Number of Receptors
Total	66
= 0 Hours	50
> 0 Hours < 10 Hours	10
> 10 Hours < 20 Hours	5
> 20 Hours < 30 Hours	1

Figures

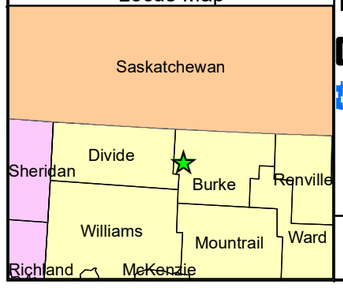
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5414000 5412000 5410000 5408000 5406000 5404000 5402000 5400000

R1053 R1055 R1056 R1054 R139 R1057 R1051 R82 R5 R2 R10 R1058 R1059 R1060 R649 R1084 R648 R100 R1070 R1069 R41 R42 R43 R328 R105 R15 R16 R17 R23 R34 R31 R616 R83 R656 R657 R30 R39 R659 R655 R21 R103 R22 R49 R53 R58 R626 R628 R627 R1061 R51 R52 R641 R644 R645 R646 R334 R696 R1029 R358 R1063 R1033 R1034 R724 R722 R1068 R1067

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Locus Map



Legend

- Project Boundary
- County Boundary
- GE 2.72 MW 381RD 295HH, LNTE
- GE 2.32 MW 381RD 263HH, LNTE
- Receptor: Participating Parcel
- Receptor: Non-Participating Parcel
- Receptor: Non-Participating Parcel, Participating Landowner

Scale 0 1 2 4 6 8 Miles

Northern Divide Wind Energy Center
Burke County, ND

Figure 1
Wind Turbine and Receptor Locations

N

AECOM

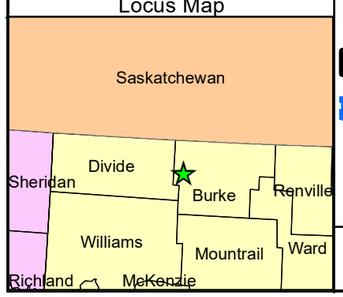
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5414000 5412000 5410000 5408000 5406000 5404000 5402000 5400000

R1053 R1055 R1056 R1054 R139 R1057 R1051 R82 R2 R5 R10 R1058 R1059 R1060 R649 R1084 R648 R100 R1070 R1069 R41 R42 R43 R328 R105 R31 R616 R83 R15 R16 R17 R23 R34 R656 R657 R30 R39 R659 R103 R655 R21 R22 R49 R53 R58 R626 R628 R627 R1061 R51 R52 R641 R644 R645 R646 R334 R696 R1029 R358 R1063 R1033 R1034 R724 R722 R1068 R1067

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Locus Map



Legend

- Project Boundary
- County Boundary
- GE 2.72 MW 381RD 295HH, LNTE
- GE 2.32 MW 381RD 263HH, LNTE
- Receptor: Participating Parcel
- Receptor: Non-Participating Parcel
- Receptor: Non-Participating Parcel, Participating Landowner

Shadow Flicker

- 0 hours/year
- 10 hours/year
- 30 hours/year

Scale 0 1 2 4 6 8 Miles

Northern Divide Wind Energy Center
Burke County, ND

Figure 2
Predicted Shadow Flicker
Without Alternates

N

AECOM

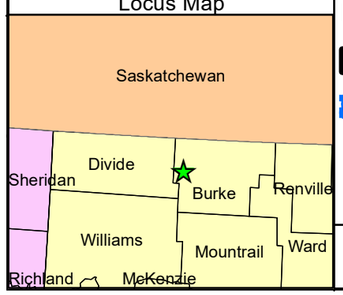
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5414000 5412000 5410000 5408000 5406000 5404000 5402000 5400000

R1053 R1055 R1056 R1054 R139 R1057 R1051 R82 R5 R2 R10 R1058 R1059 R1060 R649 R1084 R648 R100 R1070 R1069 R41 R42 R43 R328 R105 R31 R616 R83 R15 R16 R17 R23 R34 R656 R657 R30 R39 R659 R103 R655 R21 R22 R49 R53 R58 R626 R628 R627 R1061 R51 R52 R641 R644 R645 R646 R334 R696 R358 R1063 R1029 R724 R722 R1033 R1034 R1067 R1068

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Locus Map



Legend

- Project Boundary
- County Boundary
- GE 2.72 MW 381RD 295HH, LNTE
- GE 2.32 MW 381RD 263HH, LNTE
- Receptor: Participating Parcel
- Receptor: Non-Participating Parcel
- Receptor: Non-Participating Parcel, Participating Landowner

Shadow Flicker

- 0 hours/year
- 10 hours/year
- 30 hours/year

Scale 0 1 2 4 6 8 Miles

Northern Divide Wind Energy Center
Burke County, ND

Figure 3
Predicted Shadow Flicker With Alternates

N

AECOM

Appendix A

Licensed user:
AECOM
250 APOLLO DR, AECOM
US-01824-3627 Chelmsford
+1 9789 052 260
Mary Kaplan / mary.kaplan@aecom.com

Calculated:
10/29/2019 10:36 AM/3.3.261

SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array without Alternates 10*RD

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

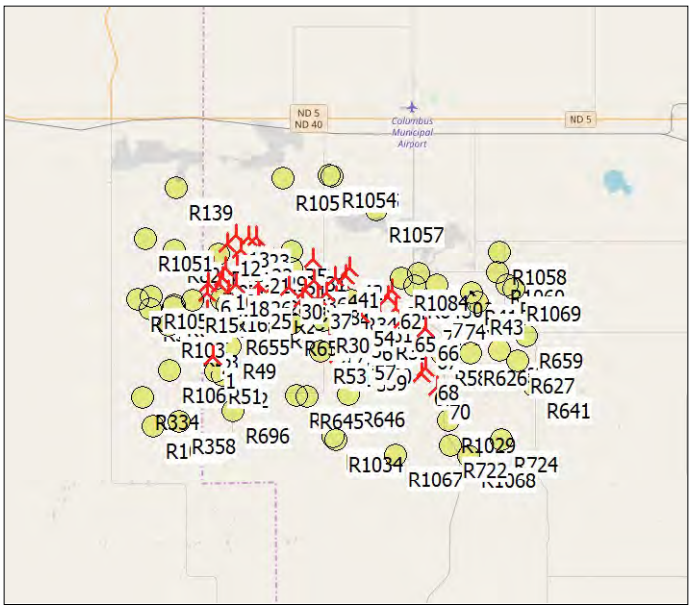
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.51	0.57	0.61	0.59	0.63	0.68	0.77	0.75	0.67	0.56	0.43	0.47

Operational time

0	Sum
8,760	8,760

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Project Wizard Elevation Data Grid (US NED 1/3 arc-second)
Obstacles used in calculation
Eye height for map: 1.5 m
Grid resolution: 1.0 m
Topographic shadow included in calculation

All coordinates are in
UTM (north)-WGS84 Zone: 13



Scale 1:400,000

New WTG Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	651,918	5,405,236	737.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
2	651,687	5,405,966	736.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
3	652,008	5,406,204	735.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
4	651,541	5,407,600	731.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
5	651,489	5,408,596	719.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
6	651,518	5,409,088	714.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
7	651,641	5,409,481	707.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
8	651,780	5,409,939	698.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
9	652,477	5,409,932	692.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
10	652,343	5,409,413	707.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
11	652,144	5,409,087	716.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
12	652,558	5,411,169	674.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
13	652,956	5,411,645	675.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
14	653,618	5,411,575	675.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
15	653,235	5,410,917	681.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
16	653,081	5,410,051	692.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
17	652,643	5,408,719	719.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
18	653,075	5,409,097	714.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
19	653,444	5,409,187	714.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
20	653,839	5,409,981	699.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
21	654,143	5,410,331	694.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
22	654,204	5,410,828	685.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
23	654,051	5,411,588	671.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
24	653,676	5,408,373	720.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
25	654,249	5,408,459	722.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
26	654,228	5,409,113	710.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
27	654,701	5,409,169	710.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
28	655,110	5,409,175	712.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
29	654,972	5,410,429	695.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
30	655,807	5,409,031	715.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
31	657,096	5,410,510	673.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
32	656,749	5,409,340	709.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
33	656,676	5,408,887	714.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
34	656,534	5,408,450	714.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0

To be continued on next page...

SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array without Alternates 10*RD

...continued from previous page

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
35	656,598	5,407,711	717.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
36	657,168	5,409,389	708.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
37	657,417	5,408,576	707.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
38	657,865	5,408,755	708.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
39	657,949	5,409,378	702.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
40	658,301	5,409,608	694.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
41	658,856	5,409,724	677.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
42	659,027	5,410,134	668.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
43	658,274	5,407,921	716.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
44	658,372	5,408,581	708.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
45	658,529	5,408,951	706.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
46	658,841	5,409,204	696.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
47	658,049	5,406,356	736.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
48	658,404	5,406,497	733.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
49	658,663	5,407,065	723.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
50	658,839	5,407,667	716.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
51	658,547	5,405,522	739.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
52	658,892	5,406,381	730.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
53	659,069	5,407,065	725.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
54	659,705	5,407,675	719.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
55	659,913	5,407,995	709.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
56	659,629	5,406,915	726.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
57	659,784	5,405,907	733.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
58	659,916	5,405,309	737.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
59	660,442	5,405,371	733.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
60	660,664	5,405,748	733.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
61	660,658	5,407,957	710.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
62	661,091	5,408,677	694.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
63	661,285	5,409,009	684.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
64	661,537	5,408,080	708.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
65	661,936	5,407,409	723.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
66	663,150	5,407,011	715.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
67	663,090	5,406,539	725.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
68	663,208	5,404,953	746.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
69	663,002	5,404,634	745.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
70	663,831	5,403,969	744.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
71	663,398	5,407,831	709.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
72	663,885	5,408,268	689.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
73	664,393	5,407,836	693.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
74	664,544	5,408,221	679.0	GE WIND ENERGY GE 2.72-116 2720 116...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
R10	655,956	5,409,992	696.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R100	663,694	5,409,329	652.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1029	664,485	5,402,145	753.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R103	649,545	5,406,802	726.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1033	658,424	5,401,140	726.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1034	658,589	5,400,977	723.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R105	648,581	5,408,305	711.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1051	648,221	5,411,338	673.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1053	655,358	5,414,754	600.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1054	657,815	5,414,966	597.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1055	657,960	5,414,914	599.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1056	657,989	5,414,898	600.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1057	660,371	5,413,225	603.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1058	666,987	5,411,122	616.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1059	666,909	5,410,100	630.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1060	666,914	5,410,064	630.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1061	649,647	5,404,425	732.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1063	648,885	5,401,438	726.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array without Alternates 10*RD

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
R1067	661,773	5,400,265	755.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1068	665,619	5,400,342	750.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1069	667,755	5,409,281	637.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1070	667,411	5,409,462	635.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1084	661,812	5,409,658	646.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R139	649,720	5,414,060	633.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R15	650,755	5,408,157	721.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R16	652,243	5,408,243	728.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R17	652,645	5,407,991	732.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R2	652,035	5,410,613	684.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R21	652,976	5,406,830	736.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R22	650,650	5,406,347	731.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R23	655,427	5,408,263	720.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R30	657,754	5,407,269	717.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R31	648,547	5,407,642	708.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R328	647,885	5,408,157	708.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R334	648,272	5,402,906	741.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R34	659,187	5,408,405	705.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R358	650,214	5,401,718	734.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R39	660,889	5,406,976	727.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R41	665,501	5,408,968	651.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R42	665,364	5,408,405	666.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R43	665,845	5,408,472	654.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R49	652,832	5,405,741	737.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R5	655,931	5,410,862	675.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R51	652,051	5,404,420	741.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R52	652,470	5,404,234	742.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R53	657,657	5,405,624	738.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R58	664,035	5,405,725	741.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R616	649,790	5,407,868	720.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R626	665,562	5,405,750	738.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R627	668,093	5,405,439	744.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R628	667,128	5,405,949	735.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R641	668,970	5,404,153	741.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R644	656,413	5,403,288	729.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R645	656,960	5,403,208	735.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R646	659,168	5,403,422	735.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R648	662,517	5,409,251	671.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R649	662,731	5,409,933	642.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R655	652,937	5,407,022	735.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R656	655,243	5,407,457	736.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R657	656,051	5,407,035	738.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R659	668,511	5,406,754	683.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R696	653,078	5,402,337	744.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R722	664,631	5,400,858	755.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R724	667,370	5,401,221	738.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R82	649,729	5,410,764	681.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R83	649,781	5,407,767	720.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

Calculation Results

Shadow receptor

No.	Shadow, worst case: Shadow hours per year [h/year]	Shadow, worst case: Shadow days per year [days/year]	Shadow, worst case: Max shadow hours per day [h/day]	Shadow, expected values: Shadow hours per year [h/year]
R10	47:57	152	0:28	14:47
R100	0:00	0	0:00	0:00
R1029	0:00	0	0:00	0:00
R103	0:00	0	0:00	0:00
R1033	0:00	0	0:00	0:00
R1034	0:00	0	0:00	0:00
R105	0:00	0	0:00	0:00
R1051	0:00	0	0:00	0:00
R1053	0:00	0	0:00	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array without Alternates 10*RD

...continued from previous page

No.	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow, expected values Shadow hours per year [h/year]
R1054	0:00	0	0:00	0:00
R1055	0:00	0	0:00	0:00
R1056	0:00	0	0:00	0:00
R1057	0:00	0	0:00	0:00
R1058	0:00	0	0:00	0:00
R1059	0:00	0	0:00	0:00
R1060	0:00	0	0:00	0:00
R1061	0:00	0	0:00	0:00
R1063	0:00	0	0:00	0:00
R1067	0:00	0	0:00	0:00
R1068	0:00	0	0:00	0:00
R1069	0:00	0	0:00	0:00
R1070	0:00	0	0:00	0:00
R1084	37:06	73	0:35	13:43
R139	0:00	0	0:00	0:00
R15	51:08	127	0:35	16:54
R16	68:15	165	0:35	21:58
R17	9:51	39	0:24	2:20
R2	0:00	0	0:00	0:00
R21	9:37	38	0:24	2:35
R22	9:17	33	0:25	1:48
R23	7:49	30	0:23	0:51
R30	31:10	107	0:29	7:25
R31	0:00	0	0:00	0:00
R328	0:00	0	0:00	0:00
R334	0:00	0	0:00	0:00
R34	52:26	111	0:57	11:48
R358	0:00	0	0:00	0:00
R39	11:07	42	0:24	2:56
R41	0:00	0	0:00	0:00
R42	28:09	77	0:32	5:32
R43	0:00	0	0:00	0:00
R49	31:16	96	0:28	9:51
R5	11:33	35	0:26	2:41
R51	0:00	0	0:00	0:00
R52	0:00	0	0:00	0:00
R53	13:34	39	0:30	0:58
R58	22:00	70	0:25	7:09
R616	0:00	0	0:00	0:00
R626	0:00	0	0:00	0:00
R627	0:00	0	0:00	0:00
R628	0:00	0	0:00	0:00
R641	0:00	0	0:00	0:00
R644	0:00	0	0:00	0:00
R645	0:00	0	0:00	0:00
R646	0:00	0	0:00	0:00
R648	0:00	0	0:00	0:00
R649	0:00	0	0:00	0:00
R655	0:00	0	0:00	0:00
R656	0:00	0	0:00	0:00
R657	0:00	0	0:00	0:00
R659	0:00	0	0:00	0:00
R696	0:00	0	0:00	0:00
R722	0:00	0	0:00	0:00
R724	0:00	0	0:00	0:00
R82	0:00	0	0:00	0:00
R83	0:00	0	0:00	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (237)	11:06	2:55
2	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (238)	9:17	1:48

To be continued on next page...

SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array without Alternates 10*RD

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
3	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (239)	29:47	9:31
4	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (240)	49:48	15:04
5	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (241)	69:35	22:39
6	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (242)	0:00	0:00
7	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (243)	0:00	0:00
8	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (271)	0:00	0:00
9	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (245)	0:00	0:00
10	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (246)	0:00	0:00
11	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (247)	0:00	0:00
12	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (268)	0:00	0:00
13	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (248)	0:00	0:00
14	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (249)	0:00	0:00
15	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (250)	0:00	0:00
16	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (251)	0:00	0:00
17	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (244)	0:00	0:00
18	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (275)	0:00	0:00
19	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (283)	0:00	0:00
20	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (252)	0:00	0:00
21	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (253)	0:00	0:00
22	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (254)	0:00	0:00
23	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (255)	0:00	0:00
24	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (290)	9:51	2:20
25	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (291)	0:00	0:00
26	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (284)	0:00	0:00
27	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (285)	0:00	0:00
28	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (286)	0:00	0:00
29	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (256)	32:00	8:33
30	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (287)	0:00	0:00
31	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (257)	0:00	0:00
32	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (277)	27:30	8:18
33	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (276)	0:00	0:00
34	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (289)	7:49	0:51
35	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (258)	0:00	0:00
36	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (278)	0:00	0:00
37	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (280)	0:00	0:00
38	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (281)	0:00	0:00
39	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (279)	0:00	0:00
40	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (273)	0:00	0:00
41	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (274)	0:00	0:00
42	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (259)	0:00	0:00
43	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (288)	12:15	3:10
44	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (313)	19:01	2:42
45	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (314)	0:00	0:00
46	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (282)	0:00	0:00
47	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (304)	0:00	0:00
48	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (305)	8:12	2:58
49	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (296)	13:05	1:42
50	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (292)	9:53	2:20
51	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (309)	13:34	0:58
52	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (300)	0:00	0:00
53	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (297)	0:00	0:00
54	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (293)	0:00	0:00
55	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (270)	21:10	5:26
56	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (260)	0:00	0:00
57	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (302)	0:00	0:00
58	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (307)	0:00	0:00
59	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (308)	0:00	0:00
60	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (303)	0:00	0:00
61	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (294)	0:00	0:00
62	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (272)	0:00	0:00
63	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (262)	37:06	13:43
64	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (263)	0:00	0:00
65	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (298)	11:07	2:56
66	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (299)	0:00	0:00
67	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (306)	0:00	0:00
68	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (310)	22:00	7:09

To be continued on next page...

SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array without Alternates 10*RD

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
69	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (311)	0:00	0:00
70	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (312)	0:00	0:00
71	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (264)	0:00	0:00
72	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (265)	0:00	0:00
73	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (266)	11:24	3:06
74	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (267)	16:45	2:16

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array with Alternates 10*RD

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

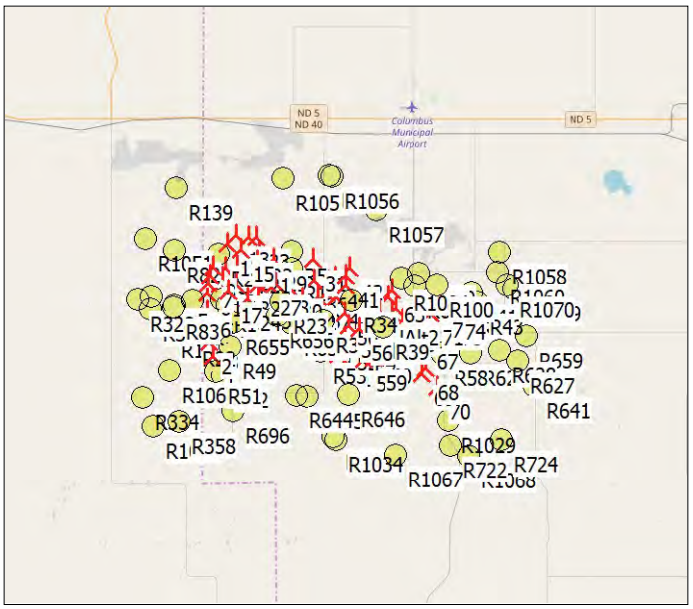
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.51	0.57	0.61	0.59	0.63	0.68	0.77	0.75	0.67	0.56	0.43	0.47

Operational time

0	Sum
8,760	8,760

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Project Wizard Elevation Data Grid (US NED 1/3 arc-second)
Obstacles used in calculation
Eye height for map: 1.5 m
Grid resolution: 1.0 m
Topographic shadow included in calculation

All coordinates are in
UTM (north)-WGS84 Zone: 13



Scale 1:400,000

New WTG Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	651,918	5,405,236	737.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
10	652,343	5,409,413	707.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
11	652,144	5,409,087	716.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
12	652,558	5,411,169	674.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
13	652,956	5,411,645	675.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
14	653,618	5,411,575	675.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
15	653,235	5,410,917	681.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
16	653,081	5,410,051	692.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
17	652,643	5,408,719	719.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
18	653,075	5,409,097	714.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
19	653,444	5,409,187	714.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
2	651,687	5,405,966	736.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
20	653,839	5,409,981	699.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
21	654,143	5,410,331	694.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
22	654,204	5,410,828	685.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
23	654,051	5,411,588	671.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
24	653,676	5,408,373	720.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
25	654,249	5,408,459	722.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
26	654,228	5,409,113	710.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
27	654,701	5,409,169	710.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
28	655,110	5,409,175	712.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
29	654,972	5,410,429	695.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
3	652,008	5,406,204	735.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
30	655,807	5,409,031	715.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
31	657,096	5,410,510	673.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
32	656,749	5,409,340	709.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
33	656,676	5,408,887	714.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
34	656,534	5,408,450	714.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
35	656,598	5,407,711	717.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
36	657,168	5,409,389	708.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
37	657,417	5,408,576	707.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
38	657,865	5,408,755	708.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
39	657,949	5,409,378	702.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
4	651,541	5,407,600	731.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0

To be continued on next page...

SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array with Alternates 10*RD

...continued from previous page

					WTG type						Shadow data	
	Easting	Northing	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
40	658,301	5,409,608	694.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
41	658,856	5,409,724	677.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
42	659,027	5,410,134	668.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
43	658,274	5,407,921	716.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
44	658,372	5,408,581	708.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
45	658,529	5,408,951	706.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
46	658,841	5,409,204	696.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
47	658,049	5,406,356	736.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
48	658,404	5,406,497	733.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
49	658,663	5,407,065	723.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
5	651,489	5,408,596	719.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
50	658,839	5,407,667	716.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
51	658,547	5,405,522	739.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
52	658,892	5,406,381	730.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
53	659,069	5,407,065	725.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
54	659,705	5,407,675	719.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
55	659,913	5,407,995	709.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
56	659,629	5,406,915	726.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
57	659,784	5,405,907	733.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
58	659,916	5,405,309	737.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
59	660,442	5,405,371	733.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
6	651,518	5,409,088	714.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
60	660,664	5,405,748	733.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
61	660,658	5,407,957	710.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
62	661,091	5,408,677	694.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
63	661,285	5,409,009	684.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
64	661,537	5,408,080	708.0	GE WIND ENERGY GE 2.32 2320 116.0 !...	No	GE WIND ENERGY	GE 2.32-2,320	2,320	116.0	80.0	1,160	14.9
65	661,936	5,407,409	723.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
66	663,150	5,407,011	715.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
67	663,090	5,406,539	725.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
68	663,208	5,404,953	746.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
69	663,002	5,404,634	745.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
7	651,641	5,409,481	707.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
70	663,831	5,403,969	744.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
71	663,398	5,407,831	709.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
72	663,885	5,408,268	689.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
73	664,393	5,407,836	693.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
74	664,544	5,408,221	679.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
8	651,780	5,409,939	698.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
9	652,477	5,409,932	692.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
Alt1	660,061	5,406,247	730.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
Alt2	661,319	5,407,772	716.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
Alt3	660,414	5,407,660	714.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0
Alt4	659,984	5,407,016	723.0	GE WIND ENERGY GE 2.72-116 2720 11...	Yes	GE WIND ENERGY	GE 2.72-116-2,720	2,720	116.0	90.0	1,160	0.0

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
R10	655,956	5,409,992	696.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R100	663,694	5,409,329	652.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1029	664,485	5,402,145	753.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R103	649,545	5,406,802	726.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1033	658,424	5,401,140	726.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1034	658,589	5,400,977	723.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R105	648,581	5,408,305	711.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1051	648,221	5,411,338	673.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1053	655,358	5,414,754	600.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1054	657,815	5,414,966	597.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1055	657,960	5,414,914	599.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1056	657,989	5,414,898	600.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1057	660,371	5,413,225	603.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1058	666,987	5,411,122	616.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1059	666,909	5,410,100	630.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

To be continued on next page...

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10/29/2019 10:14 AM/3.3.261

SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array with Alternates 10*RD

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
R1060	666,914	5,410,064	630.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1061	649,647	5,404,425	732.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1063	648,885	5,401,438	726.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1067	661,773	5,400,265	755.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1068	665,619	5,400,342	750.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1069	667,755	5,409,281	637.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1070	667,411	5,409,462	635.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R1084	661,812	5,409,658	646.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R139	649,720	5,414,060	633.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R15	650,755	5,408,157	721.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R16	652,243	5,408,243	728.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R17	652,645	5,407,991	732.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R2	652,035	5,410,613	684.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R21	652,976	5,406,830	736.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R22	650,650	5,406,347	731.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R23	655,427	5,408,263	720.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R30	657,754	5,407,269	717.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R31	648,547	5,407,642	708.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R328	647,885	5,408,157	708.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R334	648,272	5,402,906	741.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R34	659,187	5,408,405	705.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R358	650,214	5,401,718	734.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R39	660,889	5,406,976	727.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R41	665,501	5,408,968	651.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R42	665,364	5,408,405	666.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R43	665,845	5,408,472	654.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R49	652,832	5,405,741	737.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R5	655,931	5,410,862	675.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R51	652,051	5,404,420	741.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R52	652,470	5,404,234	742.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R53	657,657	5,405,624	738.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R58	664,035	5,405,725	741.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R616	649,790	5,407,868	720.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R626	665,562	5,405,750	738.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R627	668,093	5,405,439	744.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R628	667,128	5,405,949	735.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R641	668,970	5,404,153	741.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R644	656,413	5,403,288	729.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R645	656,960	5,403,208	735.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R646	659,168	5,403,422	735.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R648	662,517	5,409,251	671.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R649	662,731	5,409,933	642.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R655	652,937	5,407,022	735.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R656	655,243	5,407,457	736.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R657	656,051	5,407,035	738.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R659	668,511	5,406,754	683.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R696	653,078	5,402,337	744.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R722	664,631	5,400,858	755.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R724	667,370	5,401,221	738.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R82	649,729	5,410,764	681.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R83	649,781	5,407,767	720.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

Calculation Results

Shadow receptor

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
R10	47:57	152	0:28	14:47
R100	0:00	0	0:00	0:00
R1029	0:00	0	0:00	0:00
R103	0:00	0	0:00	0:00
R1033	0:00	0	0:00	0:00
R1034	0:00	0	0:00	0:00

To be continued on next page...

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10/29/2019 10:14 AM/3.3.261

SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array with Alternates 10*RD

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
R105	0:00	0	0:00	0:00
R1051	0:00	0	0:00	0:00
R1053	0:00	0	0:00	0:00
R1054	0:00	0	0:00	0:00
R1055	0:00	0	0:00	0:00
R1056	0:00	0	0:00	0:00
R1057	0:00	0	0:00	0:00
R1058	0:00	0	0:00	0:00
R1059	0:00	0	0:00	0:00
R1060	0:00	0	0:00	0:00
R1061	0:00	0	0:00	0:00
R1063	0:00	0	0:00	0:00
R1067	0:00	0	0:00	0:00
R1068	0:00	0	0:00	0:00
R1069	0:00	0	0:00	0:00
R1070	0:00	0	0:00	0:00
R1084	37:06	73	0:35	13:43
R139	0:00	0	0:00	0:00
R15	51:08	127	0:35	16:54
R16	68:15	165	0:35	21:58
R17	9:51	39	0:24	2:20
R2	0:00	0	0:00	0:00
R21	9:37	38	0:24	2:35
R22	9:17	33	0:25	1:48
R23	7:49	30	0:23	0:51
R30	31:10	107	0:29	7:25
R31	0:00	0	0:00	0:00
R328	0:00	0	0:00	0:00
R334	0:00	0	0:00	0:00
R34	52:26	111	0:57	11:48
R358	0:00	0	0:00	0:00
R39	44:01	159	0:30	10:20
R41	0:00	0	0:00	0:00
R42	28:09	77	0:32	5:32
R43	0:00	0	0:00	0:00
R49	31:16	96	0:28	9:51
R5	11:33	35	0:26	2:41
R51	0:00	0	0:00	0:00
R52	0:00	0	0:00	0:00
R53	13:34	39	0:30	0:58
R58	22:00	70	0:25	7:09
R616	0:00	0	0:00	0:00
R626	0:00	0	0:00	0:00
R627	0:00	0	0:00	0:00
R628	0:00	0	0:00	0:00
R641	0:00	0	0:00	0:00
R644	0:00	0	0:00	0:00
R645	0:00	0	0:00	0:00
R646	0:00	0	0:00	0:00
R648	0:00	0	0:00	0:00
R649	0:00	0	0:00	0:00
R655	0:00	0	0:00	0:00
R656	0:00	0	0:00	0:00
R657	0:00	0	0:00	0:00
R659	0:00	0	0:00	0:00
R696	0:00	0	0:00	0:00
R722	0:00	0	0:00	0:00
R724	0:00	0	0:00	0:00
R82	0:00	0	0:00	0:00
R83	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array with Alternates 10*RD

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (237)	11:06	2:55
10	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (246)	0:00	0:00
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12	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (268)	0:00	0:00
13	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (248)	0:00	0:00
14	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (249)	0:00	0:00
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17	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (244)	0:00	0:00
18	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (275)	0:00	0:00
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2	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (238)	9:17	1:48
20	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (252)	0:00	0:00
21	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (253)	0:00	0:00
22	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (254)	0:00	0:00
23	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (255)	0:00	0:00
24	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (290)	9:51	2:20
25	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (291)	0:00	0:00
26	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (284)	0:00	0:00
27	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (285)	0:00	0:00
28	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (286)	0:00	0:00
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3	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (239)	29:47	9:31
30	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (287)	0:00	0:00
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32	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (277)	27:30	8:18
33	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (276)	0:00	0:00
34	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (289)	7:49	0:51
35	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (258)	0:00	0:00
36	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (278)	0:00	0:00
37	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (280)	0:00	0:00
38	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (281)	0:00	0:00
39	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (279)	0:00	0:00
4	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (240)	49:48	15:04
40	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (273)	0:00	0:00
41	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (274)	0:00	0:00
42	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (259)	0:00	0:00
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46	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (282)	0:00	0:00
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5	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (241)	69:35	22:39
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52	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (300)	0:00	0:00
53	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (297)	0:00	0:00
54	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (293)	0:00	0:00
55	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (270)	21:10	5:26
56	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (260)	0:00	0:00
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59	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (308)	0:00	0:00
6	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (242)	0:00	0:00
60	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (303)	0:00	0:00
61	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (294)	0:00	0:00
62	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (272)	0:00	0:00
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64	GE WIND ENERGY GE 2.32 2320 116.0 !O! hub: 80.0 m (TOT: 138.0 m) (263)	0:00	0:00
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67	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (306)	0:00	0:00
68	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (310)	22:00	7:09
69	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (311)	0:00	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Northern Divide 10/24/19 PSC Array with Alternates 10*RD

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
7	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (243)	0:00	0:00
70	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (312)	0:00	0:00
71	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (264)	0:00	0:00
72	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (265)	0:00	0:00
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Alt1	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (301)	19:38	6:10
Alt2	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (295)	0:00	0:00
Alt3	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (261)	0:00	0:00
Alt4	GE WIND ENERGY GE 2.72-116 2720 116.0 !O! hub: 90.0 m (TOT: 148.0 m) (269)	13:16	0:22

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

B5. 2020 Grouse Lek and Raptor Nest Strategy

RAPTOR NEST AND GROUSE LEK STRATEGY

Northern Divide Wind, LLC (Northern Divide Wind), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC (NextEra), is developing the 200-megawatt Northern Divide Wind Energy Center (NDWEC) and 41-mile 345-kilovolt Transmission Line (NDWEC Transmission), collectively referred to as the NDWEC Project. The NDWEC Project is located largely within an area of a previously proposed and previously studied wind energy center (Previous WEC) and transmission line (Previous WEC Transmission), collectively referred to as the Previous Project (Figures 1 and 2). This memo summarizes the Previous Project's raptor nest and grouse lek data that is applicable to the NDWEC Project as well as a strategy to collect data in spring 2020 to support permitting.

Raptor Nests

Atwell (2018b) completed an aerial raptor nest survey in 2017 for the Previous Project. For non-eagle raptor nests, the survey included the Previous Project area whereas eagle nest surveys also included a 10-mile (mi) buffer. The 2017 non-eagle raptor nest survey encompassed the majority of the NDWEC except for a portion along the western and northern edges (Figure 1). Overall, the 2017 non-eagle raptor nest survey found four red-tailed hawk and two great horned owl nest scattered within or in the vicinity (within one mi) of the Previous WEC.

Aerial raptor nest surveys were conducted in 2018 for the Previous WEC Transmission and a 3-mi buffer on either side (Atwell 2018a). The majority of the NDWEC Transmission was included in the Previous WEC Transmission's survey effort, with the exception of a 5-mi extension running northwesterly to the NDWEC (Extension), which was included in the 2017 survey efforts for the NDWEC (Figure 1). Overall, the 2018 survey found five red-tailed hawk inactive nests within one mi of the Previous WEC Transmission (Atwell 2018a). No active raptor nests were located within the 150 feet construction corridor of the Previous WEC Transmission; however, four active nests belonging to two raptor species (great-horned owl and ferruginous hawk) were located within one mi of the Previous WEC Transmission (Atwell 2018a). No eagle nests were located during 2018 surveys conducted for the Previous WEC Transmission (Figure 1).

As the NDWEC's un-surveyed portions consist mostly of tilled cropland (73%), it is expected to have similarly low non-eagle raptor nest density and species composition. Similarly, nest density and species composition within the NDWEC Transmission is expected to be equal to that observed during previous raptor nest surveys, as the survey areas largely overlap. With the 10-mi buffer, the 2017 eagle nest survey captured the entirety of the NDWEC and the Extension. No eagle nests were located during 2017 or 2018 surveys, and limited potential eagle nesting habitat exists within and near the NDWEC Project in the form of scattered woodlands and trees around wetlands.

To confirm the above conclusion of low non-eagle raptor nest density and no eagle nests, Northern Divide Wind will conduct a raptor nest survey in spring 2020 within the NDWEC Project for non-eagle raptors and eagles, plus a 2-mi buffer for eagles around both the NDWEC and the NDWEC Transmission (Figure 3). Additionally, Northern Divide will request updated eagle nest information from the North Dakota Game and Fish Department prior to spring 2020 surveys. Lastly, all tree areas requiring clearing (e.g., tree rows) will be surveyed immediately ahead of construction for presence of any raptor nests built after the 2020 spring survey or otherwise previously undetected, as is normal operating procedures for all NextEra affiliates. Information from historic surveys, surveys in spring 2020, and surveys immediately ahead of construction will be used to form a strategy that avoids direct impacts to nesting raptors. This will include minimizing construction activities within 0.25 mi of any active non-eagle raptor nest location during the nesting season. If the nest cannot be avoided by more than 0.25 mi, the nest may be removed before or after it is active (i.e., when eggs or chicks are absent from the nests) during construction. No active raptor nests will be removed during construction. Based on existing information it is assumed no eagle nests are located within the

NDWEC Project or vicinity, and any newly found occupied or active eagle nests will be avoided by a minimum of one mi during construction until the nests become inactive.

Grouse Leks

Atwell (2018b) conducted ground- and aerial-based sharp-tailed grouse lek surveys in 2017 within the NDWEC and 0.5-mi buffer (Figure 2). The majority of the NDWEC was included in the 2017 survey effort and resulted in six leks being located within or near the NDWEC. The NDWEC features a smaller proportion of unbroken grassland (approximately 7%) than the Previous WEC (approximately 21%).

Aerial- and ground-based sharp-tailed grouse lek surveys were conducted in 2018 for the Previous WEC Transmission and a 1.5-mi buffer on either side (Atwell 2018a). The majority of the NDWEC Transmission was included in the 2018 survey effort, with the exception of the Extension, which was included in the 2017 survey efforts (Figure 2). Results of the Previous WEC Transmission's grouse survey indicated a total of 10 sharp-tailed grouse leks located within 1.5 mi of the Previous WEC Transmission (Atwell 2018a; Figure 2).

Tilled agriculture and grassland habitats within the survey areas are similar to those found throughout the region; therefore, it is expected that the portions of the NDWEC that were un-surveyed in 2017, which consist mostly of tilled cropland, are unlikely to contain a significant number of leks. Similarly, sharp-tailed grouse lek density within areas adjacent to the NDWEC Transmission are expected to be comparable to that observed during previous surveys as survey areas largely overlap (Figure 2).

To confirm the above conclusion of low lek density, Northern Divide Wind will conduct a full lek survey in 2020 within the NDWEC plus a 0.5-mi buffer around both the NDWEC and the NDWEC Transmission (Figure 4). This survey will result in one full year of survey for the entire NDWEC Project as well as a second year of survey for those portions included in previous efforts.

To minimize and avoid impacts to grouse lek locations, Northern Divide Wind applied a 0.5-mi setback around all leks identified in previous years and will place construction timing stipulations on leks found during 2020 surveys. Timing stipulations include minimization of construction activities within 0.5 mi of leks between one hour before sunrise to two hours after sunrise and again one hour before sunset and two hours after sunset during the lekking and breeding season. Construction could continue during the middle of the day within the 0.5-mi buffer around a newly discovered lek. This would avoid impacts to known leks and minimize impacts to new leks.

References

Atwell. 2018b. Burke County Wind Energy Center – Revised Grouse Lek and Raptor Nest Survey Results for 200 MW Project Area. Prepared for Burke Wind, LLC, Juno Beach, Florida. Prepared by Atwell, LLC. November 30, 2018

Atwell, LLC (Atwell). 2018a. Burke County Transmission Line Grouse Lek and Raptor Nest Survey Results. Technical Avian Data Summary. Prepared for Burke Wind, LLC. Prepared by Atwell. June 22, 2018

USA Topo. 2013. USA Topo Maps. US Geological Survey (USGS) topographical maps for the United States. ArcGIS. ESRI, producers of ArcGIS software. Redlands, California.

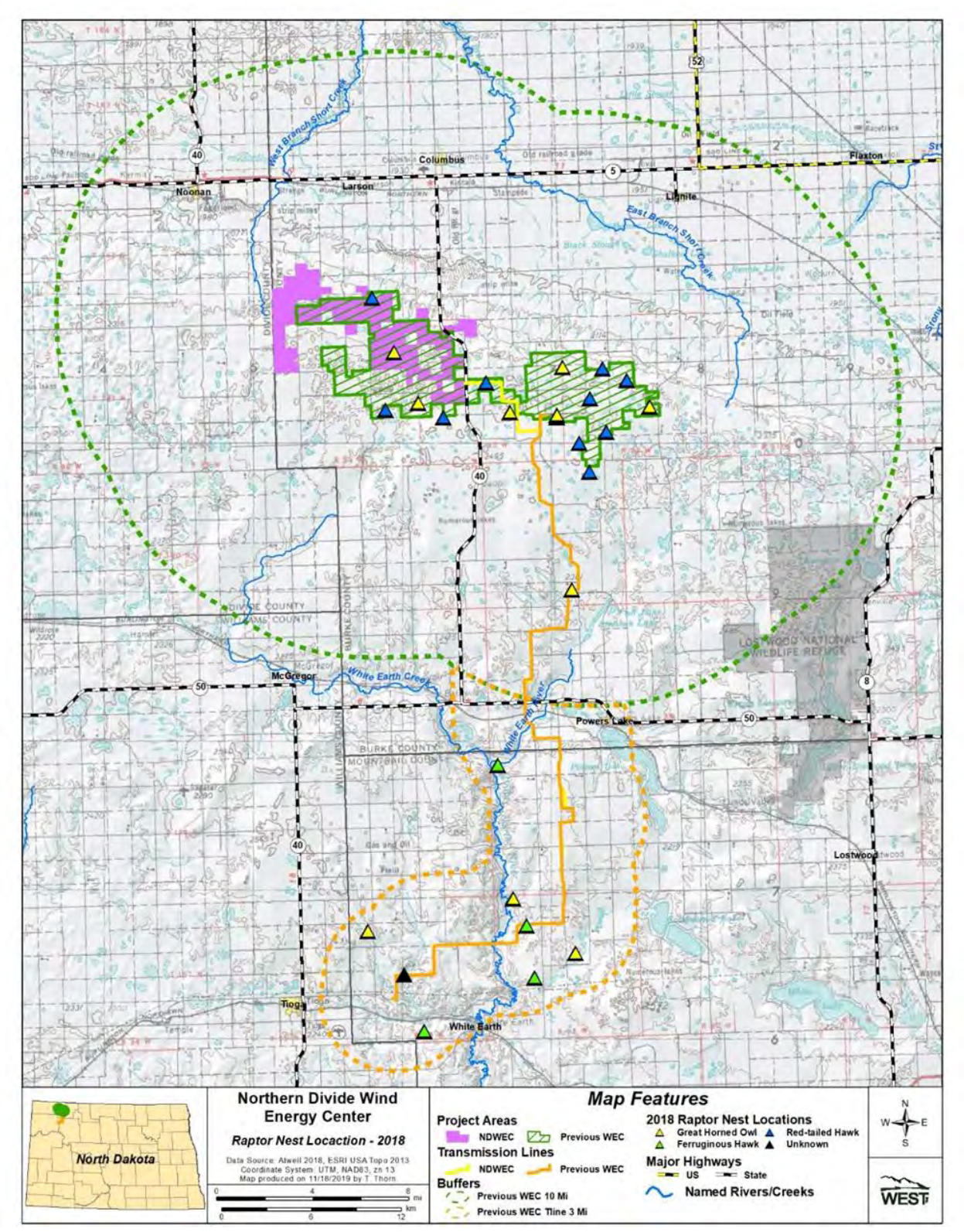


Figure 1. Raptor nest locations from surveys completed for a Previous Wind Energy Center (WEC) and Previous WEC Transmission Line in 2017 and 2018, and proximity to Northern Divide Wind Energy Center (NDWEC) and NDWEC Transmission Line in Burke and Mountrail counties, North Dakota.

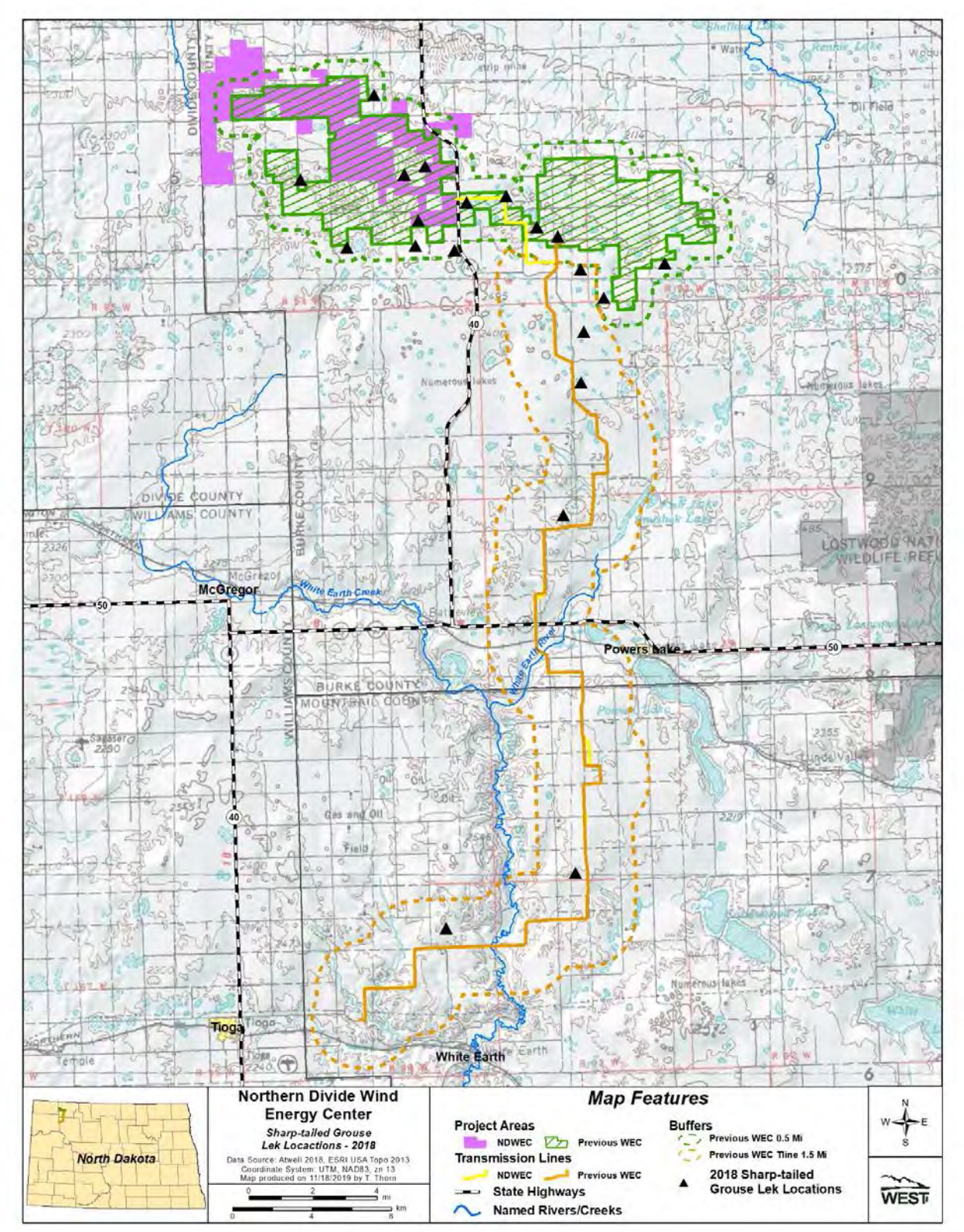


Figure 2. Sharp-tailed grouse lek locations from surveys completed for a Previous Wind Energy Center (WEC) and Previous WEC Transmission Line in 2017 and 2018, and proximity to Northern Divide Wind Energy Center (NDWEC) and NDWEC Transmission Line in Burke and Mountrail counties, North Dakota.

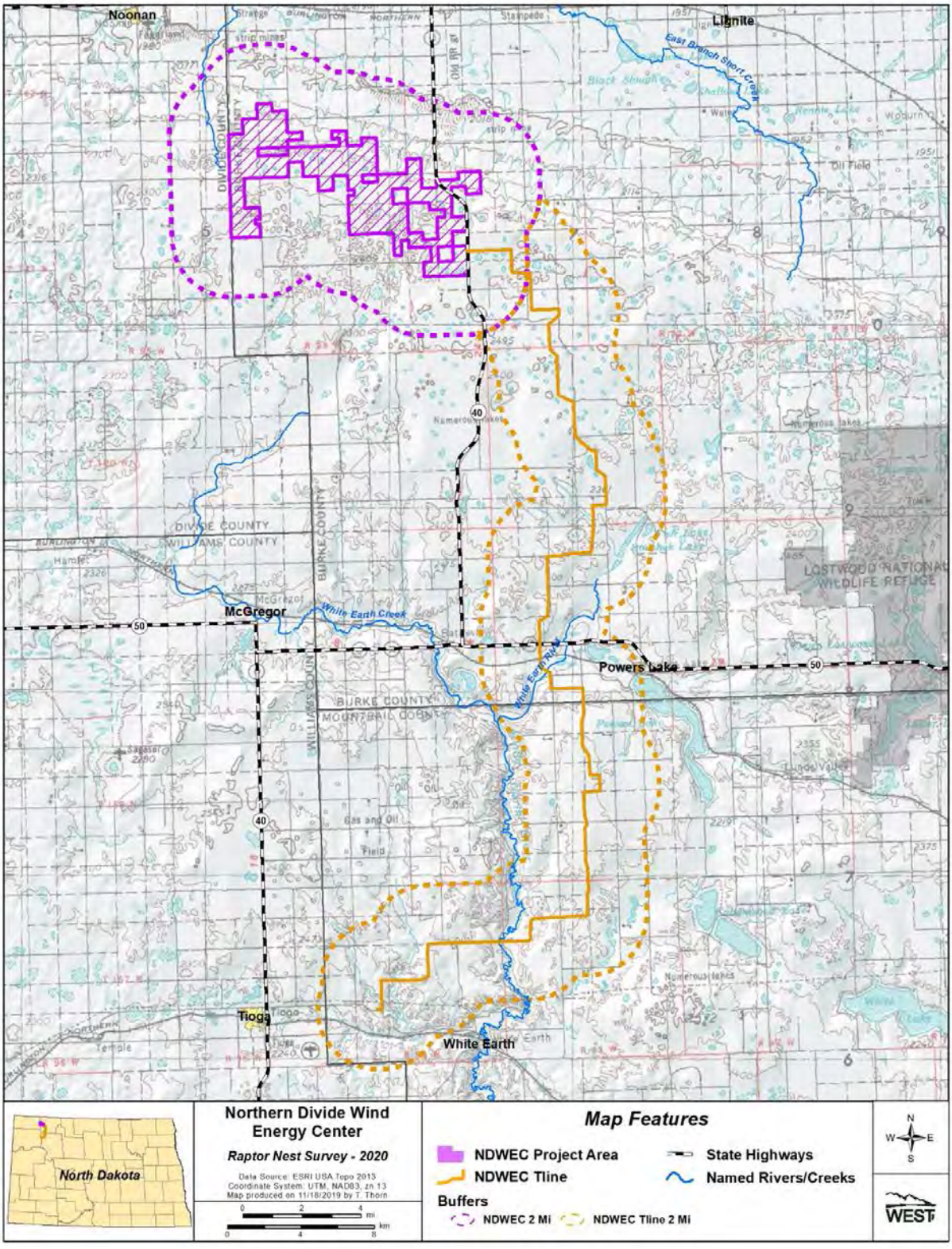


Figure 3. Location of the Northern Divide Wind Energy Center (NDWEC) and NDWEC Transmission Line in Burke and Mountrail counties, North Dakota, and associated buffers for raptor nest surveys proposed for 2020.

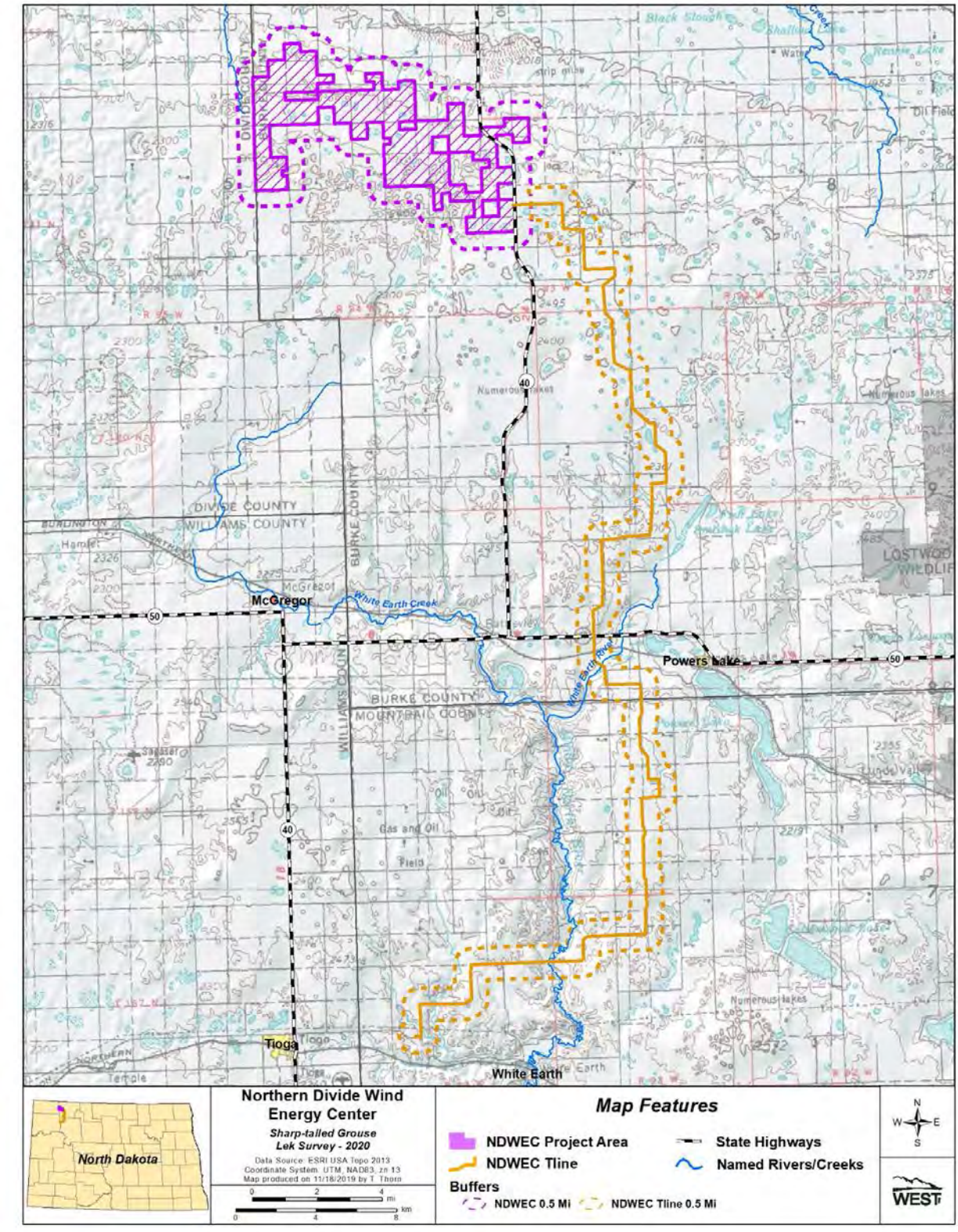


Figure 4. Location of the Northern Divide Wind Energy Center (NDWEC) and NDWEC Transmission Line in Burke and Mountrail counties, North Dakota, and associated buffers for sharp-tailed grouse lek surveys proposed for 2020.

B6. Dakota Skipper Habitat Assessment

Northern Divide Wind Energy Center and 345-kV Transmission Line Dakota Skipper Suitable Habitat Assessment Report

NOVEMBER 2019

PREPARED FOR

Northern Divide Wind, LLC

PREPARED BY

SWCA Environmental Consultants

NORTHERN DIVIDE WIND ENERGY CENTER AND 345-KV TRANSMISSION LINE DAKOTA SKIPPER SUITABLE HABITAT ASSESSMENT REPORT

Prepared for

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November 22, 2019

CONTENTS

1 Introduction 1

2 Methodology 2

2.1 Desktop Analysis 2

2.2 Habitat Field Surveys 2

3 Results 3

4 Literature Cited 6

Appendices

Appendix A. Maps

Figures

Figure 1. Representative suitable habitat within the WEC. Purple coneflower and small areas of little bluestem, with light woody vegetation cover within native prairie is visible. 4

Figure 2. Representative suitable habitat along the transmission line corridor. Little bluestem and abundant purple coneflower within native prairie is visible. 4

Figure 3. Representative unsuitable Dakota skipper habitat in the assessment area. Dominate smooth brome cover with woody vegetation and no nectar species is visible. 5

Tables

Table 1. Field Survey Sessions 3

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1 INTRODUCTION

Northern Divide Wind, LLC (Northern Divide Wind), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, is proposing to construct the 200-MW Northern Divide Wind Energy Center (WEC) and 41-mile 345-kV Transmission Line (the Project). The Project footprint consists of the WEC construction easement, transmission line right-of-way, and temporary transmission line access roads. The WEC is located in Burke County, North Dakota, and the transmission line is located in Burke and Mountrail Counties, North Dakota (see maps in Appendix A). SWCA Environmental Consultants (SWCA) was contracted to assess the presence of Dakota skipper (*Hesperia dacotae*) suitable habitat within the project footprint. Approximately 4,478 acres were assessed within the WEC project boundary and along the transmission line route (see maps in Appendix A).

The assessment included a desktop analysis and subsequent habitat field surveys based on Project information provided by Northern Divide Wind. The desktop analysis identified areas of potential habitat, while the habitat field surveys verified and refined the desktop-identified potential habitat. SWCA conducted multiple field surveys during the growing season of 2017, 2018, and 2019 to account for Project adjustments made by Northern Divide Wind following field surveys to avoid impacts to potential Dakota skipper habitat and other sensitive resources (*e.g.*, wetlands, cultural resources, etc.).

1.1 Dakota Skipper

The U.S. Fish and Wildlife (USFWS) listed the Dakota skipper as threatened under the Endangered Species Act (16 United States Code Chapter 35 § 1531 et seq.) on November 24, 2014 (USFWS 2014). The primary causes for population decline include the loss or fragmentation of high-quality native prairie habitat from overgrazing, conversion to agriculture, invasion by nonnative plants, urbanization, and disruption of natural prairie fire cycles (USFWS 2019a).

The USFWS describes Dakota skipper suitable habitat as those areas that contain and support populations of this species, including any of its life stages, such as larval development and/or adult foraging. The habitat generally occurs in undisturbed native prairie but may also include areas invaded by Kentucky bluegrass (*Poa pratensis*), a non-native, invasive species (USFWS 2016). Suitable habitat includes two types: Type A and Type B (Royer et al. 2014; USFWS 2016, 2018a). The assessment area only contains Type B habitat.

Type B habitat occurs primarily on rolling terrain over gravelly glacial moraine deposits and is dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), and needleandthread (*Hesperostipa comata*) or porcupinegrass (*Hesperostipa spartea*), and often invaded by Kentucky bluegrass. In a western North Dakota variant of Type B habitats, western wheatgrass (*Pascopyrum smithii*) is also typical. Bluebell bellflower (*Campanula rotundifolia*) and prairie lily (*Lilium philadelphicum*) are present in some Type B habitats, but they support more extensive stands of purple coneflower (*Echinacea angustifolia*), prairie coneflower (*Ratibida columnifera*), and common gaillardia (blanketflower; *Gaillardia aristata*). Type B habitat typically supports a high diversity and abundance of native forbs, including purple coneflower, purple prairie clover (*Dalea purpurea*), white prairie clover (*Dalea candida*), yellow sundrops (*Calylophus serrulatus*), prairie groundsel (*Packera plattensis*), groundplum milkvetch (*Astragalus crassicarpus*), eastern pasqueflower (*Pulsatilla patens*), old man's whiskers (prairie smoke; *Geum triflorum*), western silver aster (*Symphyotrichum sericeum*), dotted blazing star (*Liatris punctata*), meadow zizia (heartleaf golden Alexanders; *Zizia aptera*), prairie sagewort (*Artemisia frigida*), and leadplant (*Amorpha canescens*) (USFWS 2016, 2018a).

The flight period is 2 to 4 weeks long, with year-to-year variability due to the weather and forb flowering times that occur between mid-June and mid-July. Flowering forbs must be present in abundant quantity and near suitable larval habitat to provide reliable sources of nectar for adults during their flight period. Dakota skipper are not known to disperse widely (Burke et al. 2011; Swengel 1996) and typically do not travel more than 1 kilometer between habitat patches (USFWS 2018b); however, average movement distances for individuals have been documented as less than 300 meters (Dana 1991).

During the flight period, eggs are laid on broadleaf plants (McCabe 1981) and grasses (Dana 1991). The eggs hatch after incubating for 7 to 20 days, and the larvae then crawl to the bases of grass plants where they form shelters at or below the ground surface (Dana 1991). At night, they emerge from their shelters to forage. For growth and survival, larvae rely on native grasses such as little bluestem, big bluestem, sideoats grama (*Bouteloua curtipendula*), and prairie dropseed (*Sporobolus heterolepis*) (USFWS 2016). Dakota skippers have six to seven larval stages (instars). They overwinter in their ground-level or subsurface shelters during either the fourth or fifth instar and resume feeding the following spring. One generation is completed per year.

The USFWS considers the Dakota skipper possibly extirpated in Burke County and present in Mountrail County (USFWS 2018a). Occurrences have been documented in one township in Burke County (Township [T] 160 North [N], Range [R] 91 West [W]) and three townships in Mountrail County (T158N, R91W; T156N, R91W; T154N, R93W) (USFWS 2019b). The closest township with previously documented occurrences is located approximately 13 miles from the WEC and approximately 8 miles from the transmission line.

2 METHODOLOGY

2.1 Desktop Analysis

SWCA evaluated the presence of potential undisturbed native prairie using geographic information system (GIS) layers and aerial imagery interpretation. Areas considered unsuitable habitat included cultivated lands, forest, planted tree rows, crown and ditch constructed roads, wetlands, open water, farmsteads, industrial sites, and agricultural and livestock operation sites (e.g. corrals, water tanks, grain bins, etc.). LANDFIRE 30-meter resolution data (LANDFIRE 2017) were used to eliminate unsuitable habitat types. Additionally, an SWCA biologist experienced with Dakota skipper habitat interpreted aerial imagery (North Dakota GIS Technical Committee 2019), with oversight and review completed by Mr. Jake Powell, an SWCA Senior Ecologist who holds a USFWS Dakota skipper scientific recovery permit (Permit No. TE64070B-1). The aerial imagery interpretation, as well as USFWS National Wetlands Inventory data (USFWS 2017), supported land use and land cover determinations. The desktop analysis resulted in GIS layers that identified areas of potential habitat that were then carried forward for habitat field surveys.

2.2 Habitat Field Surveys

SWCA field biologists experienced with Dakota skipper habitat completed pedestrian surveys of the desktop-identified potential habitat during the growing season when vegetation would be identifiable. These surveys verified whether the potential habitat was suitable or unsuitable. SWCA based suitable habitat determinations on characteristics outlined in the published literature (Rigney 2013; Royer and Marrone 1992; USFWS 2014, 2016, 2018a). Mr. Powell, SWCA Senior Ecologist, was responsible for quality control and oversight of the field teams.

The pedestrian field surveys occurred over multiple mobilizations from 2017 through 2019 to capture Project changes to avoid sensitive environmental and cultural resources and meet engineering efficiency standards and regulatory requirements. Table 1 outlines the dates of field surveys. Some parts of the survey area surveyed during these dates are not reflected on the results maps (Appendix A) or in the survey acreage due to those areas being outside of the final Project footprint.

Table 1. Field Survey Sessions

Field Session Dates	Survey Area
September 7–13, 2017	Eastern side of WEC (old construction easement layout)
March 30–June 1, 2018	Eastern side of WEC (old construction easement layout)
June 11–13, 2018	Transmission line ROW survey area
August 20–23, 2018	Eastern side of WEC (old construction easement layout)
May 23–25, 2019	WEC construction easement, proposed substation location, and transmission line access roads
July 30–August 2, 2019	Transmission line access road reroutes
August 15–17, 2019	Transmission line ROW reroute and access roads
September 20, 2019	WEC construction easement
October 1, 2019	WEC construction easement

3 RESULTS

SWCA assessed approximately 4,478 acres within the WEC project boundary and along the transmission line route. Approximately 5 acres of suitable habitat within the WEC and approximately 214 acres suitable habitat along the transmission line route were identified during the assessment.

The WEC project area contained only two suitable habitat areas, one near turbine 64 and the other near turbine 72 (see map page 3 through 10 in Appendix A). These areas contained an abundance of purple coneflower, with occasional prairie coneflower and little bluestem. Figure 1 is a representative view of suitable habitat within the WEC assessment area.

The suitable habitat along the transmission line route occurs in several areas but is concentrated in the southern portion (see map pages 3 through 10 in Appendix A). The suitable habitat consisted of purple coneflower, with the occasional presence of prairie coneflower and native thistles (*Cirsium* spp.). Little bluestem was more prevalent in Mountrail County than in the Burke County. Kentucky bluegrass, smooth brome (*Bromus inermis*), and western snowberry (*Symphoricarpus occidentalis*) were present in some areas. Figure 2 is a representative view of the suitable habitat in these areas.

Unsuitable habitat had low native plant diversity and was primarily dominated by non-native species, such as Kentucky bluegrass and smooth brome. Sandier areas had extensive wolf willow (silverberry; *Elaeagnus commutata*) populations. Figure 3 is a representative view of unsuitable habitat in the assessment area.



Figure 1. Representative suitable habitat within the WEC. Purple coneflower and small areas of little bluestem, with light woody vegetation cover within native prairie is visible.



Figure 2. Representative suitable habitat along the transmission line corridor. Little bluestem and abundant purple coneflower within native prairie is visible.



Figure 3. Representative unsuitable Dakota skipper habitat in the assessment area. Dominate smooth brome cover with woody vegetation and no nectar species is visible.

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APPENDIX A

Maps

Northern Divide Wind Project Dakota Skipper Assessment

- Turbine
- Transmission Line Pole
- Transmission Line Guy Easement
- Transmission Line Pulling Easement
- Dakota Skipper Assessment Area
- Dakota Skipper Field-verfied Suitable Habitat
- Wind Energy Center Construction Easement
- Transmission Line ROW
- Wind Energy Center Project Boundary
- County Boundary
- Township/Range Boundary
- Section Boundary



Miles
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Kilometers

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Base Map: 2018 Aerial Imagery
Source: USDA/FSA - Aerial Photography Field Office
Inset Source: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Burke and Mountrail Counties, North Dakota

Projection: NAD 1983 UTM Zone 13N

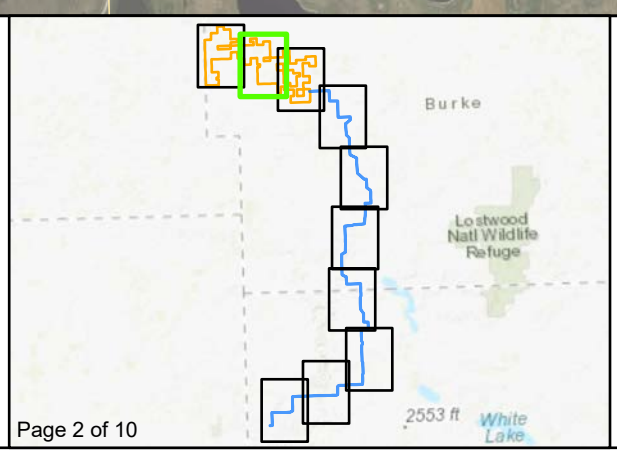
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11/22/2019

T162N, R094W
T162N, R093W
T161N, R094W
T161N, R093W
Burke County

Northern Divide Wind Project Dakota Skipper Assessment

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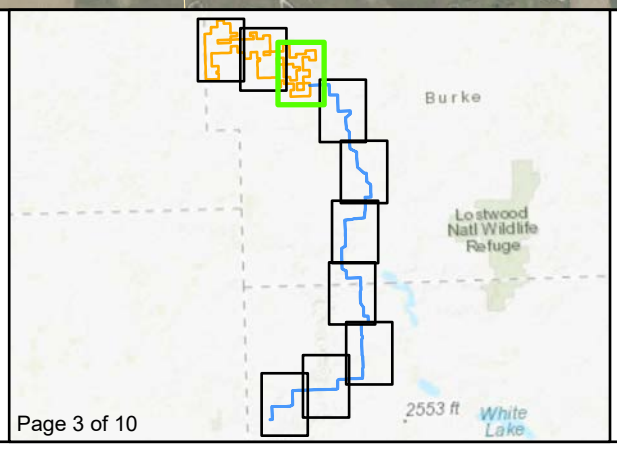
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Burke County
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Northern Divide Wind Project Dakota Skipper Assessment

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Burke and Mountrail Counties, North Dakota

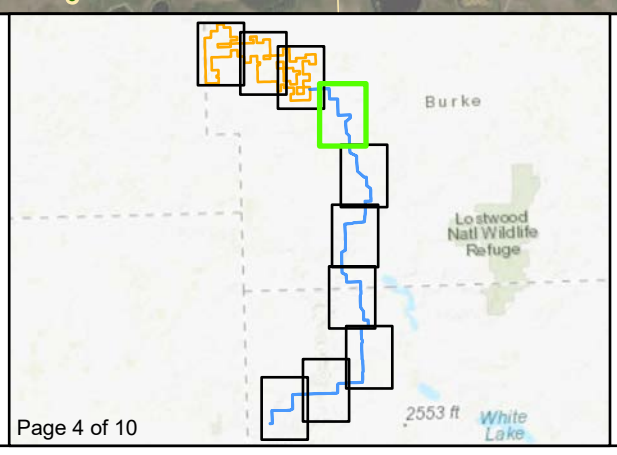
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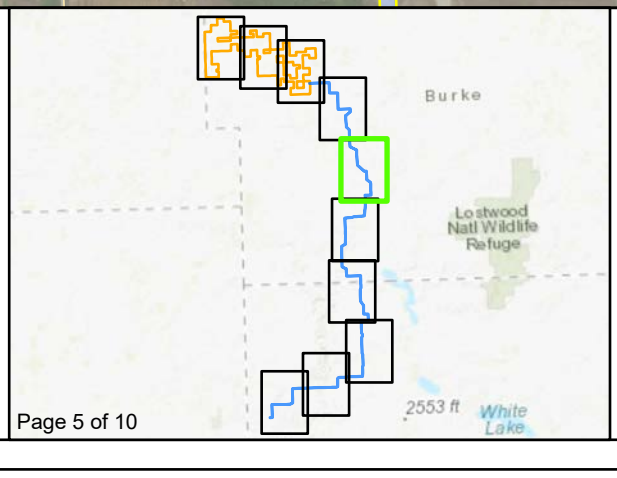
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T160N, R093W

Burke County

Northern Divide Wind Project Dakota Skipper Assessment

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- Transmission Line Pole
- Transmission Line Guy Easement
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- Dakota Skipper Assessment Area
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- Wind Energy Center Construction Easement
- Transmission Line ROW
- Wind Energy Center Project Boundary
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- Township/Range Boundary
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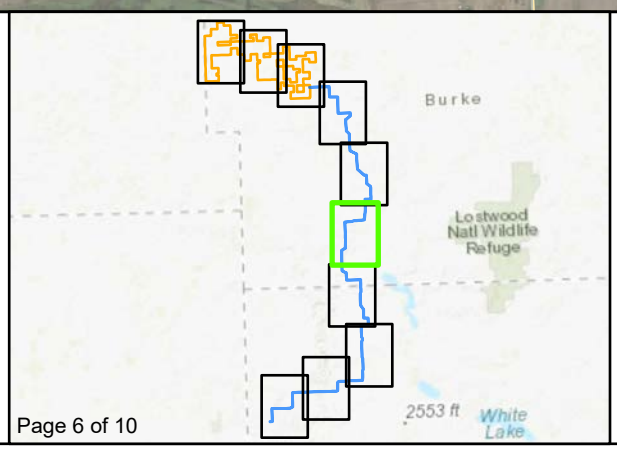
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Burke County

T159N, R093W

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- Turbine
- Transmission Line Pole
- Transmission Line Guy Easement
- Transmission Line Pulling Easement
- Dakota Skipper Assessment Area
- Dakota Skipper Field-verfied Suitable Habitat
- Wind Energy Center Construction Easement
- Transmission Line ROW
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- Township/Range Boundary
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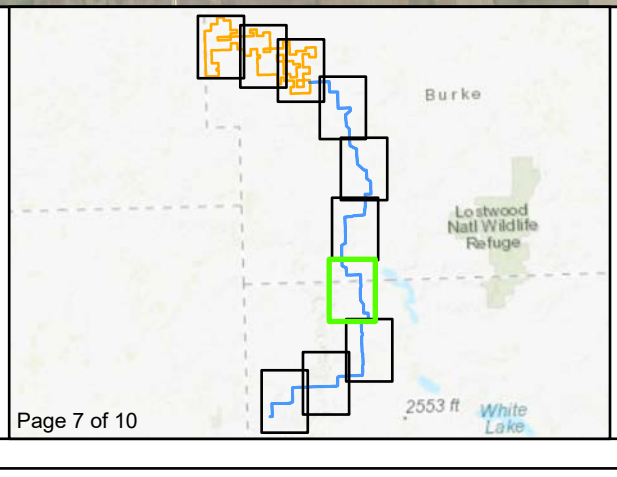
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Northern Divide Wind Project Dakota Skipper Assessment

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- Turbine
- Transmission Line Pole
- Transmission Line Guy Easement
- Transmission Line Pulling Easement
- Dakota Skipper Assessment Area
- Dakota Skipper Field-verfied Suitable Habitat
- Wind Energy Center Construction Easement
- Transmission Line ROW
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Burke and Mountrail Counties, North Dakota

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T158N, R093W

T157N, R093W

Mountrail County

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- Transmission Line Pole
- Transmission Line Guy Easement
- Transmission Line Pulling Easement
- Dakota Skipper Assessment Area
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- Wind Energy Center Construction Easement
- Transmission Line ROW
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- County Boundary
- Township/Range Boundary
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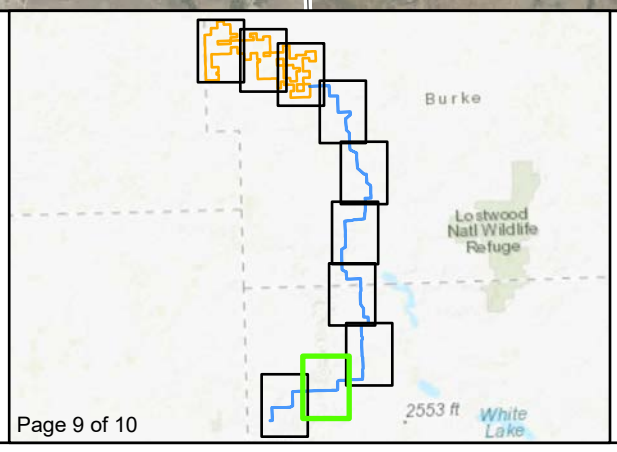
Mountrail County

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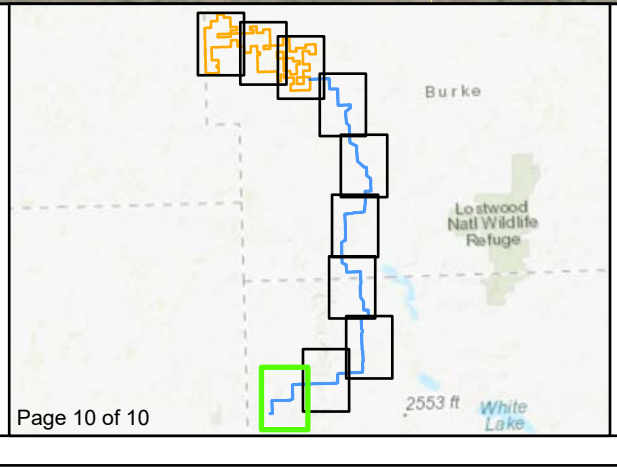
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- Transmission Line Pole
- Transmission Line Guy Easement
- Transmission Line Pulling Easement
- Dakota Skipper Assessment Area
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Burke and Mountrail Counties, North Dakota

Projection: NAD 1983 UTM Zone 13N

SWCA ENVIRONMENTAL CONSULTANTS

11/22/2019

B7. Whooping Crane Habitat Review

Whooping Crane Habitat Review
Northern Divide Wind Energy Center
Burke County, North Dakota

Final Report

Prepared for:

Northern Divide Wind, LLC

Prepared by:

Clayton Derby, Terri Thorn, and Sofia Agudelo

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

November 20, 2019

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STUDY PARTICIPANTS

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Terri Thorn	GIS Specialist, Report Writer
Sofia Agudelo	Peer Reviewer, Technical Editor

REPORT REFERENCE

Derby, C., T. Thorn, and S. Agudelo. 2019. Whooping Crane Habitat Review, Northern Divide Wind Energy Center, Burke County, North Dakota. Final Report. Prepared for Northern Divide Wind, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 20, 2019.

TABLE OF CONTENTS

INTRODUCTION 1
SITE DESCRIPTION 1
METHODS 3
RESULTS 3
DISCUSSION 7
LITERATURE CITED 9

LIST OF TABLES

Table 1. Area (acres) and percent total cover (%) of 2016 National Land Cover Database (NLCD)[1] land use/land cover types in the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota. 4
Table 2. Potential whooping crane use, broken out by deciles, for the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, based on all acres in North Dakota. 4
Table 3. Relative probability of use for whooping cranes within the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, and the North, East, South, and West reference areas[1]. 5

LIST OF FIGURES

Figure 1. Location of the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, in relation to other wind energy projects within the whooping crane migration corridor, confirmed sightings through spring 2018, and potential whooping crane use deciles (Source: Niemuth et al. 2018). 2
Figure 2. Whooping crane relative probability of use[1] for the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, and four reference areas (Source: Niemuth et al. 2018). 6

LIST OF ATTACHMENTS

Attachment 1. Studies Conducted for the Previous Project

INTRODUCTION

Northern Divide Wind, LLC (Northern Divide Wind), a wholly-owned, indirect subsidiary of NextEra Energy Resources, LLC proposes to develop the Northern Divide Wind Energy Center (Project) in an area encompassing about 10,897 acres (Project Area) in northwestern Burke County, North Dakota (Figure 1). Northern Divide Wind requested that Western EcoSystems Technology, Inc. (WEST) conduct a desktop review of potential whooping crane (*Grus americana*) use within the Project Area. Historically, these reviews have consisted of a qualitative and quantitative review of potential roosting and foraging habitats (i.e., wetlands, croplands, and grasslands), wetland types and densities, disturbance features, and other factors that are known to or believed to impact use by whooping cranes. These reviews often include an analysis of a proposed project area as well as comparative areas in the vicinity of a proposed project. However, at the direction of the North Dakota Game and Fish Department and the U.S. Fish and Wildlife Service (USFWS), this review focuses on the analysis and models developed by Niemuth et al. (2018).

The Project includes a 345-kilovolt transmission line that extends into Mountrail County, North Dakota (Figure 1). Northern Divide Wind will install bird flight diverts on the entire transmission line, a practice commonly recommended by wildlife agencies and contained in the Avian Power Line Interaction Committee (APLIC) guidance in "Reducing Avian Collisions with Power Lines" (APLIC 2012). Given that the entire transmission line will be marked, as recommended, this evaluation focuses on the Project Area.

SITE DESCRIPTION

The Project Area is located in an area that has been largely converted to agricultural, with crop production the primary land use (mainly corn, soybeans, sunflowers, canola, and alfalfa; Griffith 2010, Sayler 2016). Trees and shrubs can be found around farmsteads, within planted shelterbelts, and along/within drainages; natural wetlands are present and scattered throughout the region (Bryce et al. 1996). Topography is generally rolling to flat; elevations range from approximately 2,118–2,483 feet (ft) above sea level and generally decrease from south to north (U.S. Geological Survey [USGS] 2019).

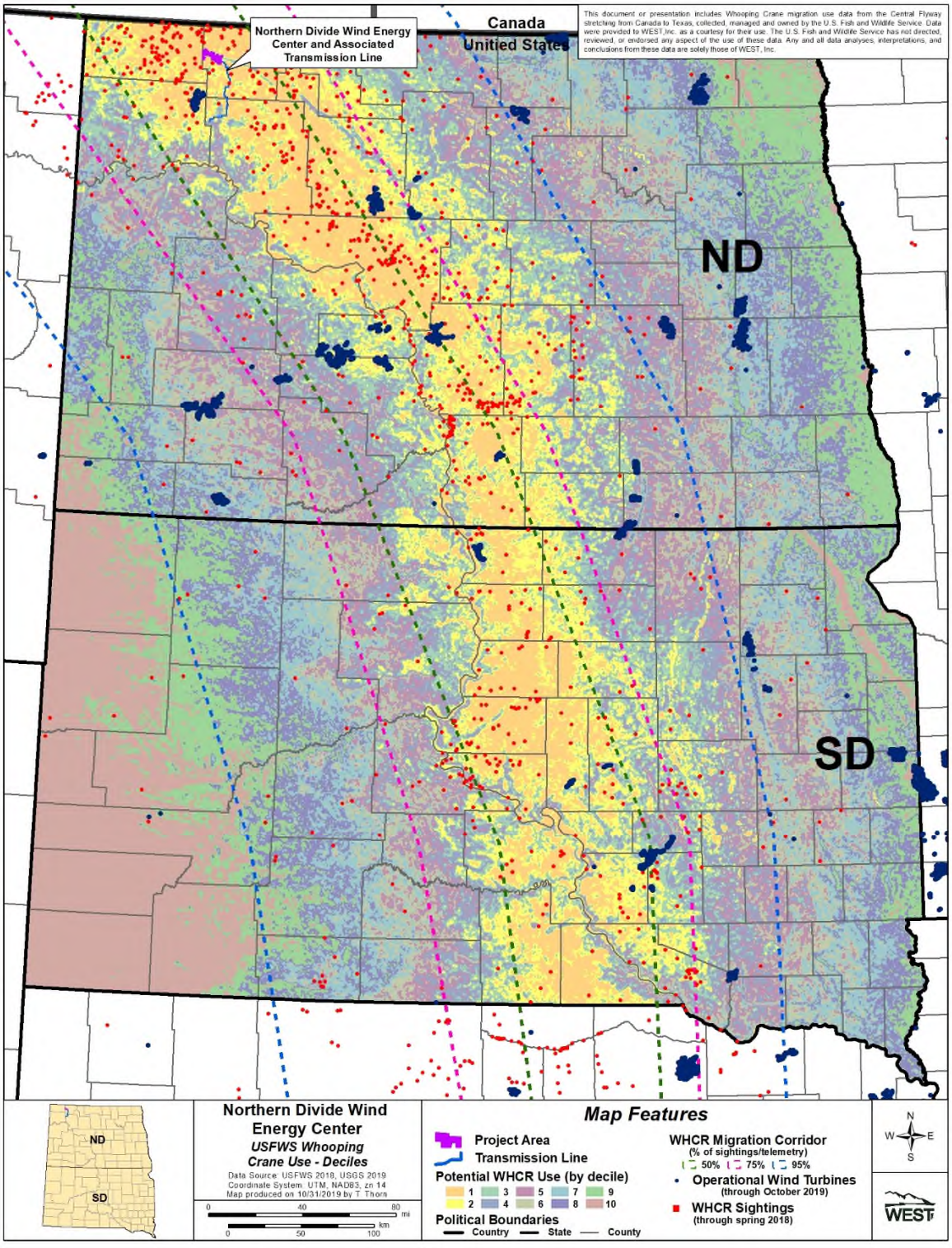


Figure 1. Location of the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, in relation to other wind energy projects within the whooping crane migration corridor, confirmed sightings through spring 2018, and potential whooping crane use deciles (Source: Niemuth et al. 2018).

METHODS

WEST completed the desktop review using ArcGIS, ArcMap 10.5.1 software (ArcMap 2017), 2016 National Land Cover Database (NLCD) information (Yang et al. 2018, Multi-Resolution Land Characteristics 2019), National Wetland Inventory (NWI) data (NWI 2018), model outputs from Niemuth et al. (2018), and the current Project Area provided by Northern Divide in October 2019. The desktop analysis included a summary of land cover/land use types to help describe conditions specific to the Project Area, as well as an assessment of the suitability of whooping crane habitat within the Project Area and four reference areas of the same dimensions located adjacent (based on the Project's boundary extent) to the Project in the four cardinal directions; this assessment was conducted using the habitat suitability model from Niemuth et al. (2018).

The Niemuth et al. (2018) model includes two different outputs related to potential whooping crane use. The first output evaluates potential use throughout North and South Dakota by breaking modeled potential use into deciles, with each decile containing the same total acres (Figure 1). This output is useful for evaluating potential use across broad geographic areas (e.g., an area in Burke County compared to an area in Barnes County compared to an area in Cass County, North Dakota). In essence, the decile map corresponds closely with the whooping crane migratory corridor (i.e., all areas of higher deciles are within the whooping crane migratory corridor, Figure 1) as one of the main factors in the model relates to historic whooping crane use. The second output evaluates relative probability of use within a range of low to high (probability 0–1). This output, which is useful for evaluating potential use within more defined locations or between locations in close proximity, can be used to assess whether the relative probability of use within the Project Area is higher, lower, or similar to adjacent areas.

RESULTS

According to the NLCD (Yang et al 2018, Multi-Resolution Land Characteristics 2019), the Project Area is composed of approximately 64% cultivated cropland, 21% grassland/herbaceous lands (including pasture/hay lands), and 10% wetland/open water (Table 1). The remaining 5% is mostly developed and woody lands (forests or scrub/shrub). Compared to the coarser NLCD data, results from finer scale desktop and field analyses (data provided by AECOM), indicate the Project Area is about 64% croplands/developed, 15% wetland/open water, 10% broken grasslands, 7% unbroken grasslands, and 4% forest/shrub land.

Table 1. Area (acres) and percent total cover (%) of 2016 National Land Cover Database (NLCD)[1] land use/land cover types in the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota.

Land Use/Land Cover Types	Acres	Percent Cover (%)
Cultivated crops	7,021	64.4
Herbaceous/Grassland	2,079	19.1
Wetland/Open water	1,092	10.0
Developed	349	3.2
Hay/Pasture	191	1.7
Forest	155	1.4
Barren land	10	0.1
Shrub/Scrub	<1	<0.1
Total[2]	**10,897**	**100**

1. NLCD data used for comparisons. Finer scale analyses (data provided by AECOM) show acres/percentages of unbroken grass being 7% within the Project Area, a lower value than the NLCD herbaceous/grassland classification.

2. Values might not add up to totals due to rounding.

Sources: Yang et al. 2018, Multi-Resolution Land Characteristics 2019.

The Project Area is within the central 50% of the whooping crane sightings corridor (Figure 1). This entire corridor area includes a swath of the central U.S.; in North Dakota, it extends from southcentral North Dakota along the Missouri River to northwest North Dakota through Burke County. The width of the 50% corridor is approximately 50–60 miles. Based on Niemuth et al. (2018), the majority of the Project Area is within the highest potential use decile compared to acreages across the entire state of North Dakota, including areas outside of the 95% migration corridor width (Table 2, Figure 1).

Table 2. Potential whooping crane use, broken out by deciles, for the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, based on all acres in North Dakota.

Decile	Acres	Percent (%)
1	8,635	79.2
2	2,216	20.3
3	45	0.4
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
Total	**10,897**	**100**

Source: Niemuth et al. 2018.

Based on a finer scale analysis, the relative probability of use within the Project Area ranges from 0–0.5, with over 78% of the Project Area within the lower end (from 0–0.20) relative probability of use (Table 3, Figure 2). This is within the relative probability of use values obtained for the four

reference areas (Table 3, Figure 2). The relative probability of use within the East and South reference areas is lower and ranges from 0–0.3, with most (77%) of the South reference area within the 0–0.1 relative probability of use (Table 3). Relative probability of use within the North and West reference areas ranges from 0–0.7 and 0–0.6, respectively (Table 3), with most of these reference areas within the 0–0.3 probability of use.

No whooping cranes sightings have been reported within the Project Area based the USFWS whooping crane database (USFWS 2018, Figure 2). During avian use surveys conducted in 2017, one group of three whooping cranes was observed flying over the Project Area, but no use was observed on the ground (Atwell 2019; Attachment 1).

Table 3. Relative probability of use for whooping cranes within the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, and the North, East, South, and West reference areas[1].

Relative Probability Ranges	Project		North		East		South		West	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
0-0.1	4,649	42.7	901	8.3	4,376	40.2	8,387	77.0	531	4.9
0.1-0.2	3,861	35.4	4,531	41.6	5,927	54.4	2,184	20.0	5,116	47.0
0.2-0.3	1,730	15.9	4,750	43.6	594	5.4	325	3.0	3,812	35.0
0.3-0.4	526	4.8	589	5.4	0	0	0	0	1,198	11.0
0.4-0.5	131	1.2	92	0.8	0	0	0	0	139	1.3
0.5-0.6	0	0	26	0.2	0	0	0	0	100	0.9
0.6-0.7	0	0	8	0.1	0	0	0	0	0	0
0.7-0.8	0	0	0	0	0	0	0	0	0	0
0.8-0.9	0	0	0	0	0	0	0	0	0	0
0.9-1	0	0	0	0	0	0	0	0	0	0
Total[2]	**10,897**	**100**	**10,897**	**100**	**10,897**	**100**	**10,897**	**100**	**10,897**	**100**

1. Acres and percent (%) total area within each relative probability range are shown.

2. Sums may not total values shown due to rounding.

Source: Niemuth et al.2018.

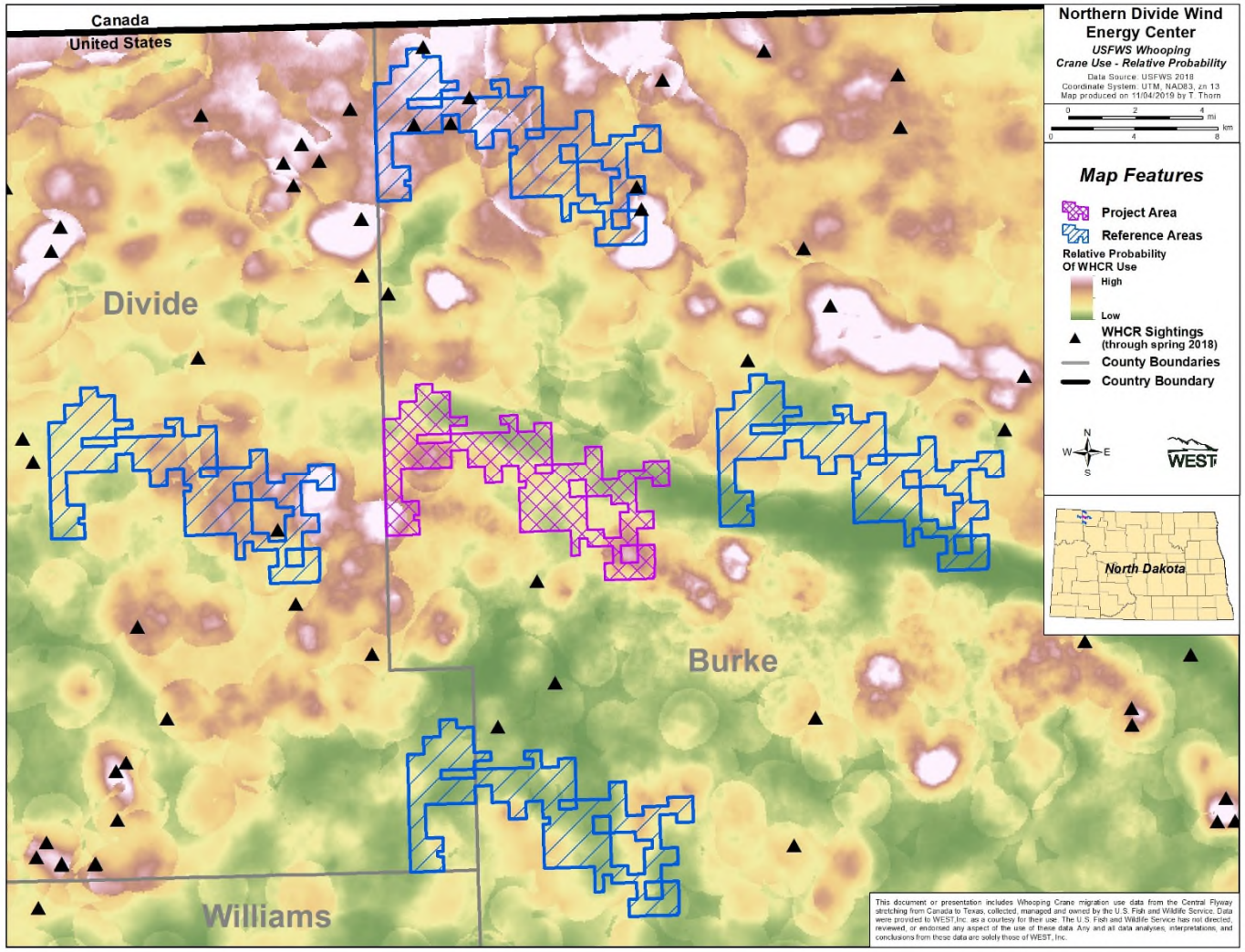


Figure 2. Whooping crane relative probability of use[1] for the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, and four reference areas (Source: Niemuth et al. 2018).

[1.] Relative probability of use ranges from 0–1 (low–high); probability of use within the Project Area ranges from 0–0.5 (Table 3).

DISCUSSION

The Endangered Species Act (32 Federal Register [FR] 48: 4001 1967) currently lists whooping cranes as endangered except where nonessential experimental populations exist (62 FR 139: 38932–38939 1997; 66 FR 123: 33903–33917 2001, and 58 FR 13: 5647–5658 1993). The 2018 – 2019 winter population of whooping cranes within the primary wintering grounds was estimated at 504 birds (412–660, 95.0% confidence interval); there were another estimated 12 whooping cranes thought to be outside of the primary wintering grounds when systematic surveys were conducted (USFWS 2019). Whooping cranes typically migrate from their breeding grounds in Wood Buffalo National Park, Canada to their wintering areas in Aransas National Wildlife Refuge, Texas; during the migration, most birds pass through central North Dakota (USFWS 2013).

Whooping cranes travel as singles, pairs, or in flocks, sometimes joining with sandhill cranes for a portion of the migration (Urbanek and Lewis 2015). From Texas to North Dakota, there are approximately 10,627 turbines in the whooping crane corridor with 1,389 turbines in the Dakotas (Figure 1; USGS et al. 2019). A review of whooping crane literature reveals no whooping or sandhill cranes (*Antigone canadensis*) have been reported as killed or injured by wind turbines in North or South Dakota, and no whooping crane at any project. One sandhill crane mortality was reported at the Altamont wind energy facility in California (Smallwood and Karas 2009); it is unclear if this was a result of turbine collision or collision with a power line. Two sandhill cranes did collide with turbines at two wind facilities in the Texas Panhandle during a study of wintering cranes in Texas (Navarrete and Griffis-Kyle 2011). No sandhill cranes or whooping cranes were found as fatalities at five wind facilities searched daily for crane mortalities during migration in North Dakota and South Dakota for up to three years (Derby et al. 2018). Data suggests that cranes are not overly susceptible to collision with turbines given that 400,000–600,000 sandhill cranes migrate twice annually through the Great Plains (Shoumatoff 2014) and none have been documented as wind turbine collision fatalities in this region during migration.

The Project Area is within the whooping crane migration corridor. In general, cropland and wetland areas within the migration corridor are depicted with a high decile rating following Niemuth et al. (2018), with local variations depending on the spatial configuration of suitable foraging and roosting habitats. The decile map separates all acres within North and South Dakota into predicted deciles of use, including areas outside of the whooping crane migration corridor. The decile ranking is useful when comparing sites across the State. For example, wildlife agencies might use deciles when making decisions on areas within a state to apply funds for whooping crane habitat conservation. While there has not been any documented use of the Project Area by whooping cranes feeding or roosting on the ground, one group of three individuals was observed flying over the Project Area in April of 2017. Given that the Project is within the migratory corridor, has higher deciles of predicted use, and contains areas of wetlands and croplands, use by the species is possible during spring or fall migration.

In analyzing the potential for significant impacts from wind development on whooping crane stopover habitat, Stehn (2007) suggests assessing whether there is “lots of suitable stopover

habitat in the general area … or is the proposed wind farm site the only suitable whooping crane stopover habitat for miles around?" This question can be informed through review of the relative probability of use. Results from the relative probability of use review indicate that there are areas within and outside the Project Area with elevated relative probability of use, but overall the Project Area has mostly areas of low (i.e., 0–0.2) relative probability of use, suggesting that suitable whooping crane habitats within the Project Area are not unique in the region.

The Project Area falls largely within the northwestern portion of an area previously proposed for a wind project in Burke County (Previous Project). A whooping crane habitat assessment for the Previous Project conducted by The Watershed Institute (2018), and subsequent addendum (Atwell 2018), found that potential suitable habitat for whooping cranes existed mostly within the central and eastern portions, while the northwestern portion, which largely corresponds to the Project Area, had limited potential habitat (Attachment 1).

In summary, the Project Area is within the whooping crane migratory corridor and whooping cranes have been observed flying over the Project Area, but none to date has been documented foraging or roosting on the ground. While migrating, whooping cranes generally fly at 1,000–6,000 ft above ground level, well above turbine height (Stehn 2007), and are unlikely to collide with turbines. As whooping cranes ascend and descend during takeoff and landing, or migrate during inclement weather, they may fly at lower altitudes, including those corresponding to the rotor swept area (generally below 657 ft). Given there is potential suitable roosting and foraging habitats (i.e., croplands and wetlands) within the Project Area and vicinity, and documented use in the region, whooping crane use on the ground during migration is possible. The relative probability of use indicates that the likelihood of use within the Project Area is low overall and within the range of values obtained for the four reference areas. Given low potential use of the Project Area in any given year, similarity in relative probability of use indicating unlikely differential use compared to adjacent areas, lack of whooping crane mortalities to date, and lack of documented sandhill crane mortality during migration, impacts to whooping cranes are unlikely.

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Attachment 1. Studies Conducted for the Previous Project

List of Studies

A. Burke County Wind Energy Center – Desktop Whooping Crane Habitat Assessment Report Addendum (Atwell 2018)

B. Desktop Whooping Crane Habitat Assessment, Burke Wind, LLC, Burke and Mountrail County, North Dakota (The Watershed Institute 2018)

C. Pre-Construction Eagle and Avian Use Study, April 2017 through March 2018, for the Burke County Wind Project, Burke County, North Dakota (Atwell 2019)

B7. Attachment 1A. Burke County Wind Energy Center – Desktop Whooping Crane Habitat Assessment Report Addendum

Report Addendum

TO: Burke Wind, LLC

FROM: Atwell, LLC

DATE: November 27, 2018

RE: Burke County Wind Energy Center – Desktop Whooping Crane Habitat Assessment Addendum

Burke Wind, LLC (Burke Wind), a wholly-owned, indirect subsidiary of NextEra Energy Resources, LLC, contracted The Watershed Institute, Inc. to conduct a desktop whooping crane habitat assessment for the proposed Burke County Wind Energy Center (Project). This addendum provides an update to the Desktop Whooping Crane Habitat Assessment[1] dated July, 2018 and submitted under Docket PU-18-344 on September 19, 2018. The Project was originally designed to produce up to 300 megawatts (MW) of renewable wind energy. Burke Wind has recently reduced the Project size from 300 MW to 200 MW. This has resulted in a smaller Project Area and the elimination of 38 wind turbine generators (WTGs) from the proposed Project. As revised, the Project will consist of the construction and operation of up to 68 General Electric (GE) 2.72 MW and eight (8) GE 1.715 MW WTGs (total of 76 WTGs). The GE 2.72-MW WTGs will have a 295-foot (90-meter) hub height and a 381-foot (116-meter) rotor diameter; and the GE 1.715-MW WTGs will have a 262-foot (80-meter) hub height and a 337-foot (103-meter) rotor diameter.

The reduced 200 MW Project Area remains located in Burke County, North Dakota, covers 23,933 acres, and is fully encompassed within the western half of the original 300 MW Project Area. As the reduced Project Area is encompassed within the area evaluated in the 300 MW Desktop Whooping Crane Habitat Assessment, the discussion and results of the report are reflective of the reduced Project Area. Therefore, information contained within the original report is still applicable.

The 300 MW Desktop Whooping Crane Habitat Assessment identified 277 potentially suitable wetland habitats areas for Whooping Crane stopover within the 300 MW Project Area. The reduced Project Area now contains only 40 potentially suitable wetland habitats, which has reduced the potentially suitable Whooping Crane wetland stopover habitat by 237 wetland areas.

[1] Watershed Institute, Inc., "Desktop Whooping Crane Habitat Assessment; Burke Wind, LLC, Burke and Mountrail County, North Dakota," July 2018.

B7. Attachment 1B. Desktop Whooping Crane Habitat Assessment, Burke Wind, LLC, Burke and Mountrail County, North Dakota

DESKTOP WHOOPING CRANE HABITAT ASSESSMENT
BURKE WIND, LLC
BURKE AND MOUNTRAIL COUNTY, NORTH DAKOTA



(*Grus americana*)

Prepared by:

WATERSHED INSTITUTE, INC.

1200 SW Executive Drive

Topeka, Kansas 66615

TABLE OF CONTENTS

Section **Page**

1.0 INTRODUCTION 1
2.0 SITE DESCRIPTION 1
3.0 HABITAT ASSESSMENT METHODOLOGY 2
3.1 Unsuitability Habitat Screening 2
3.2 Habitat Suitability Assessment..... 3
4.0 HABITAT ASSESSMENT FINDINGS.....6
5.0 References.....7

APPENDIX A

FIGURE

1 Site Location Map
2 Site Layout Map
3 Ecoregion Map
4 Landcover Map
6 Wetland Habitats Map
7 Assessed Wetland Habitats Map
8 Potential Suitable Wetland Habitats Map

APPENDIX B

Desktop Assessment Scores

July 2018

1.0 INTRODUCTION

Burke Wind, LLC (Burke Wind) tasked the Watershed Institute, Inc. (TWI) to complete a desktop habitat suitability assessment (desktop assessment) for the endangered whooping crane (*Grus americana*). The desktop assessment is for proposed windfarm and transmission line development (Project) in Burke and Mountrail Counties, North Dakota (Appendix A, Figure 1). Burke Wind conducted this study as part of a holistic natural resources review approach to assess potential adverse effects from development of this Project on species of concern and their habitats. Results from this study will be combined with results from other natural resource studies and will aid in responsibly siting wind turbines, access roads, underground electric collection lines, an electric substation, overhead high-voltage transmission line, and other proposed infrastructure.

For the desktop assessment, TWI examined 2016 aerial photographs and reviewed wetland habitats, elevation data, North Dakota infrastructure data (i.e. highways, roads, powerlines) and landuse data. Burke Wind provided TWI delineated wetland habitats, elevation data, and land use data in electronic format for use with ArcGIS Desktop software (ESRI 1999-2017). TWI also solicited known location records of whooping cranes and the whooping crane migratory corridor from U.S. Fish and Wildlife Service (USFWS). This report provides Project background information, outlines TWI's habitat assessment methodology (TWI 2013), and presents desktop assessment findings. Report figures are provided in Appendix A and the desktop assessment scoring summary in Appendix B.

2.0 SITE DESCRIPTION

The Project is in Burke and Mountrail Counties, North Dakota, and includes a proposed 72.7-square mile windfarm development area and a 195.0-square mile transmission line development area (Appendix A, Figure 1). The Project is found in the USFWS-defined 75-percent whooping crane migratory sighting corridor (Appendix A, Figure 2). The 75-percentile whooping crane migratory sighting corridor refers to the area encompassing 75-percent of confirmed sightings.

The Project encompasses portions of the Northern Dark Brown Prairie, Northern Missouri Coteau, Missouri Coteau Slope, and River Breaks ecoregions (Appendix A, Figure 3). The Northern Dark

Brown Prairie is part of the northern glaciated plains that is generally flat with some undulating topography (Bryce et al. 1996). This ecoregion contains high concentrations of temporary and seasonal wetlands. The Northern Missouri Coteau is part of the northwestern glaciated plains with a hummocky, rolling terrain (Bryce et al. 1996). There are numerous prairie pothole wetlands in this ecoregion. The Missouri Coteau Slope ecoregion is also in the northwestern glaciated plains and is a gently rolling plain sloping to the Missouri River (Bryce et al. 1996). The River Breaks is unglaciated and part of the northwestern great plains (Bryce et al. 1996). This ecoregion is highly dissected and borders major rivers and associated alluvial plains (Bryce et al. 1996). Overall, the Missouri Coteau Slope and River Breaks have fewer wetlands than the Northern Dark Brown Prairie and Northern Missouri Coteau.

Using landcover data from the 2011 GAP Analysis Program (GAP), cultivated land is the most common Project landuse covering 41.2-percent. Other significant Project landuses are shrublands at 22.6-percent, mixed-grass prairies at 20.6-percent, and wetlands/open water at 4.4-percent. A landuse map is shown in Appendix A, Figure 4.

3.0 HABITAT ASSESSMENT METHODOLOGY

Habitat assessment methods followed protocols recommended by the USFWS Aransas National Wildlife Refuge Complex (Tom Stehn *pers. comm.*), Manhattan, Kansas USFWS Ecological Services Office (Dan Mulhern *pers. comm.*), Region 6 Guidelines for Minimizing Effects from Power Line Projects within the Whooping Crane Mitigation Corridor (USFWS 2010), and habitat evaluation scientific literature. TWI's goal is to provide a reproducible methodology that provides clients with the appropriate information to make decisions that provide ecological value and protection. First, TWI developed an unsuitability screening process to eliminate wetlands that did not meet criteria based on wetland size, visual obstruction, and disturbance obstructions. After the unsuitability screening, TWI assessed remaining wetlands to determine habitat suitability based on water regime, distance to food, wetland size, wetland type (natural or created), and wetland density.

3.1 Unsuitability Habitat Screening

TWI assessed wetland habitats for potentially suitable habitat. TWI's approach was to screen the wetland habitats based on unsuitable habitat conditions (Tom Stehn *pers. comm.*).

First, TWI screened wetland habitats that were near human disturbances (i.e. highways, roads, railroads, and residential/commercial properties etc.). TWI generated buffers using distances in TWI's (2013) habitat assessment guideline around digital highway data (North Dakota Department of Transportation [NDDOT] 2017a), digital county road data (NDDOT 2017b), digital railroad data (Applied Data Consultants 2017), incorporated areas (NDDOT 2017c), digital transmission line data, and residential and commercial properties. TWI then clipped the buffered information to the Project extent and spatially analyzed the wetland habitats and human disturbance buffers. TWI selected wetland habitats located completely within the human disturbance buffers and removed the wetland habitats from the desktop assessment.

Next, TWI selected and eliminated wetland habitats equal to or less than 0.25 acres. These wetland features are deemed too small to designate as potentially suitable habitat (Tom Stehn *pers. comm.*).

For remaining wetland features, TWI visually inspected each wetland feature using the 2016 aerial photographs for tall, visual obstructions. If tall, visual obstructions were within 100 meters of a wetland habitat, TWI did not consider the wetland habitat as potentially suitable habitat.

Finally, TWI visually inspected all remaining wetland habitats using elevation data. TWI calculated a percent slope raster map and created a 1-meter topographic surface to inspect wetland habitat side-slopes. Visibility obstructions can be any feature, including topography, greater than 1.4 meters, the height at crane eye level (Armbruster 1990). TWI eliminated wetland habitats from the habitat quality assessment if side slopes, within 100-meters, were greater than 1.5-percent, a visibility obstruction for a whooping crane's open line of sight.

3.2 Habitat Suitability Assessment

TWI assessed remaining wetland habitats to rate habitat quality by assigning values to habitat criteria deemed important to migrating whooping cranes.

The first criterion was water regime. Since water is the primary attractant to whooping cranes, TWI scored wetlands with more permanent water higher as they would be a more consistent and likely stopover habitats from year to year (Table 1).

Table 1: Water Regime Habitat Score

Water Regime*	Score
Permanent (H)	5
Intermittently Exposed (G)	4
Semi-Permanent (F)	3
Seasonally Flooded (C)	2
Intermittent/Temporarily Flooded (J/A)	1

* Nontidal Water Regime from Cowardin et al. 1979

Distance to food was the second criterion. The literature states preferred roosting habitat is near food. The longest distance TWI found that a whooping crane would likely fly to food is 1.5 kilometers (Armbruster 1990). Table 2 shows the habitat scores based on distance from roosting sites and food.

Table 2: Distance to Food Habitat Score

Distance to Food	Score
Within or Adjacent to Cropfield	5
< 0.5 km	4
0.6-1.0 km	3
1.1-1.5 km	2
> 1.5 km	1

Wetland size was the third criterion. Whooping crane sighting records show them using a variety of wetland sizes from visual observations and radio collar data. The literature suggests that cranes will use small wetlands, but larger wetlands are preferable. Table 3 shows the habitat scores based on wetland size.

Table 3: Wetland Size Habitat Score

Wetland Size	Score
> 7 acres	5
5-6.9 acres	4
3-4.9 acres	3
1-2.9 acres	2

< 1 acre	1

TWI then scored the wetlands based on whether they are natural or created. Natural wetlands received a higher score as they are assumed to have shallower water. Whooping cranes prefer wetlands that are shallow. Studies have stated that cranes prefer water depths less than 30 centimeters (Armbruster 1990, Faanes et al. 1992). Table 4 shows the scoring.

Table 4: Natural Wetland Habitat Score

Wetland Type	Score
Natural	2
Created	0

The last criterion TWI evaluated was wetland density. Literature suggests whooping cranes prefer areas that have a wetland mosaic. TWI considered a wetland mosaic to be 5 or more wetlands within a one-quarter section and no visual obstructions between the wetlands habitats. Table 5 shows the scoring.

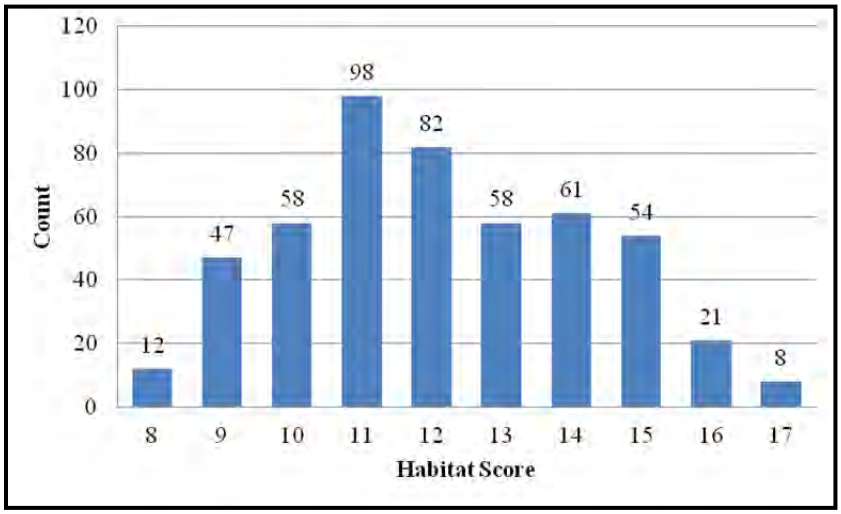
Table 5: Wetland Density Habitat Score

Wetland Mosaic	Score
Yes	3
No	0

After TWI scored the criteria, TWI added the scores to develop an overall habitat quality score. To determine a habitat quality score that constitutes potentially suitable habitat, TWI determined the habitat quality of national wetland inventory (NWI) wetlands at Quivira National Wildlife Refuge (NWR). Quivira NWR is a traditional migratory stopover location and is considered critical habitat for migrating whooping cranes. TWI analyzed the habitat quality as described in TWI's (2013) methodology for Quivira NWR wetlands. After completing the unsuitability habitat screening process, TWI evaluated 499 Quivira NWR NWI wetland habitats. Wetland habitat scores ranged from 8 to 17 with an average score of 12.1 (Figure 5). Using the Quivira NWR average habitat score as a benchmark, TWI considers a habitat score of 12 or higher as

potential suitable habitat when assessing whooping crane wetland habitats within the USFWS migratory sighting corridor.

Figure 5: *Distribution of Habitat Scores from Quivira NWR*



4.0 HABITAT ASSESSMENT FINDINGS

TWI identified a total of 10,673 wetland habitats in or intersecting the Project (Appendix A, Figure 6). The dominant wetland habitat type was palustrine emergent (PEM) wetlands. Other wetlands habitat types TWI found were lacustrine (L), palustrine aquatic bed (PAB), and riverine (R).

Using the unsuitability habitat screening process, TWI eliminated 9,768 wetland habitats. Of the 9,768 wetland habitats, 4,923 wetland habitats were completely within disturbance area buffers, 1,551 wetland habitats were less than 0.25 acres, and 3,294 wetland habitats were within 100-meters of visibility obstructions or adjacent to steep side-slopes. TWI evaluated the remaining 905 wetland habitats for habitat suitability (Appendix A, Figure 7). Appendix B lists the wetland habitat and their habitat suitability score. TWI scored 277 wetland habitats a 12 or higher, considered potentially suitable habitat (Appendix A, Figure 8). For the riverine channels, TWI did not consider as potential suitable habitat as they did not meet the 100-meter width defined by Faanes et al. (1992).

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APPENDIX A

FIGURES

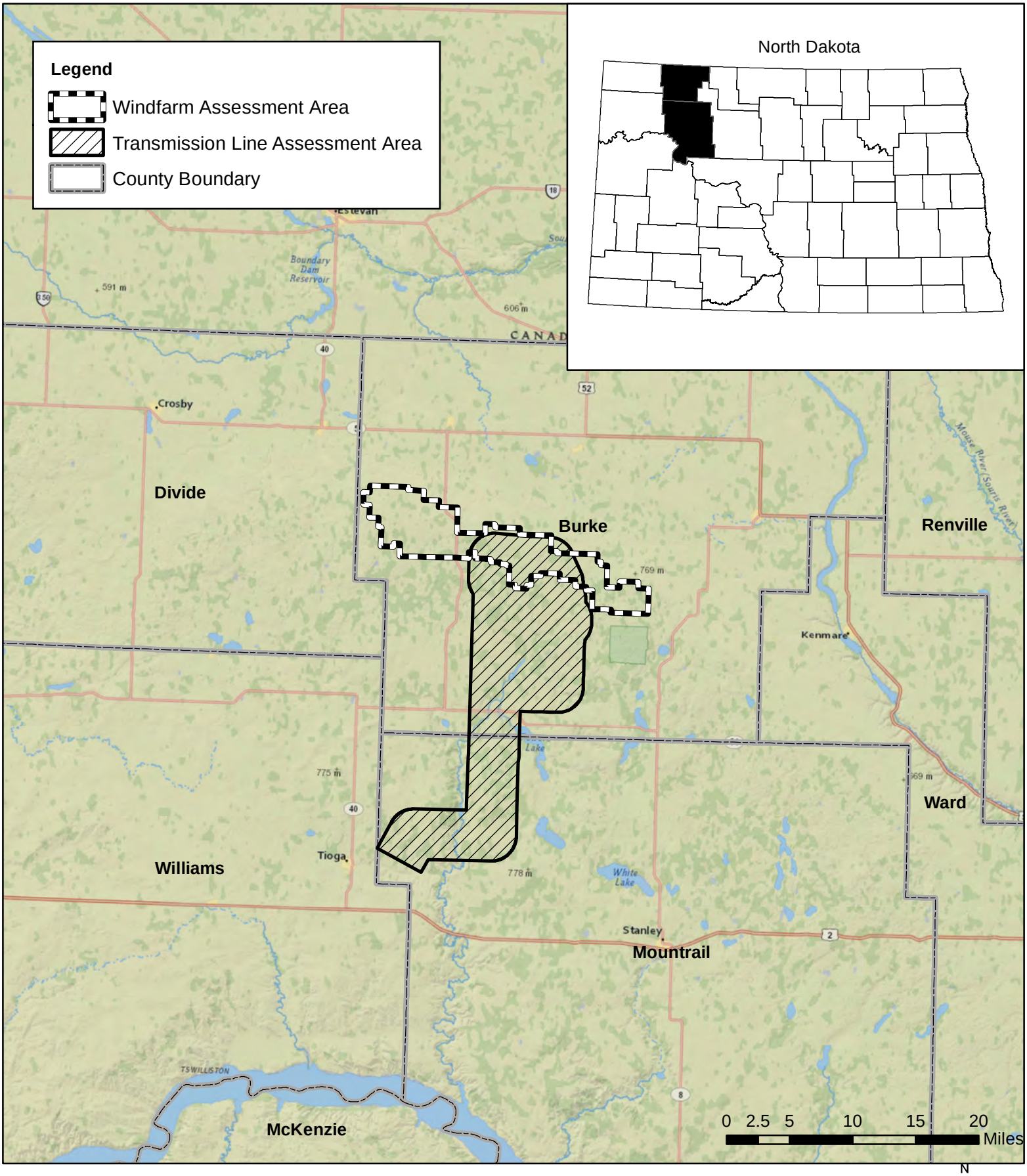


Figure 1
Location Map

Desktop Whooping Crane Habitat Assessment
Burke Wind, LLC Windfarm

Date: July 2018

Source: http://services.arcgisonline.com/arcgis/services, https://gishubdata.nd.gov/

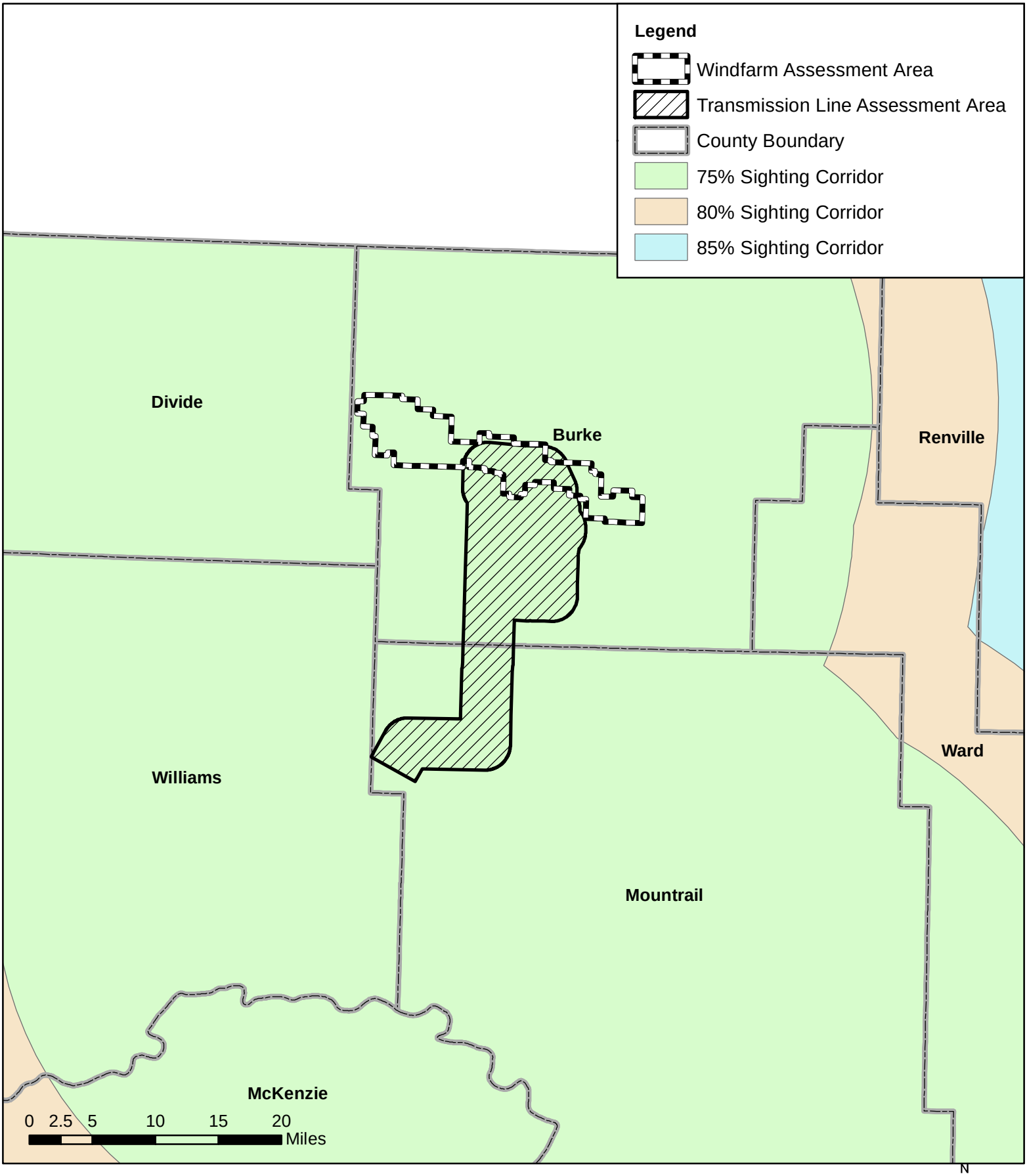
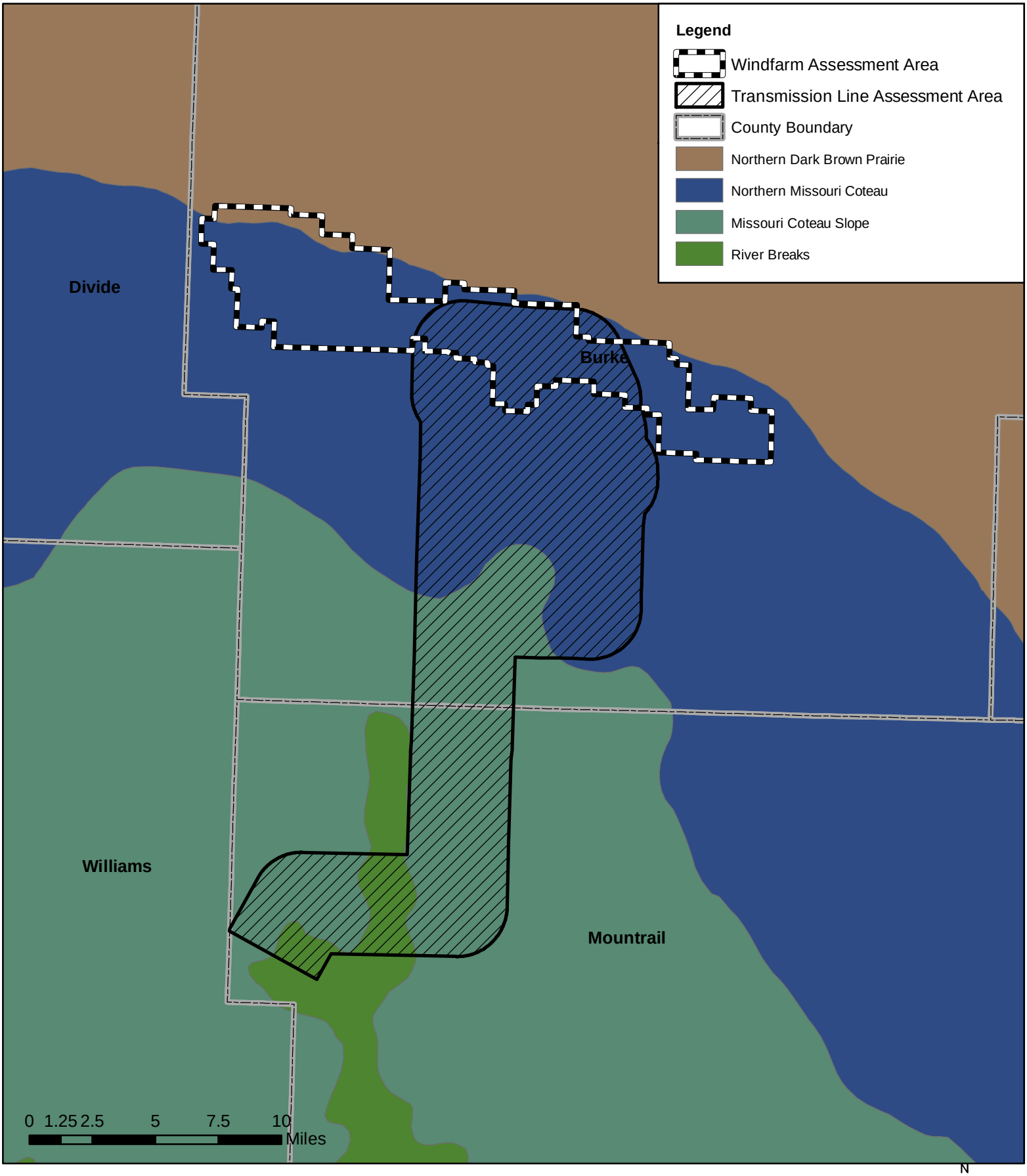


Figure 2
U.S. Migratory Sighting Corridor Map
Desktop Whooping Crane Habitat Assessment
North Dakota

Date: July 2018

Source: https://gishubdata.nd.gov/, U.S. Fish and Wildlife Service

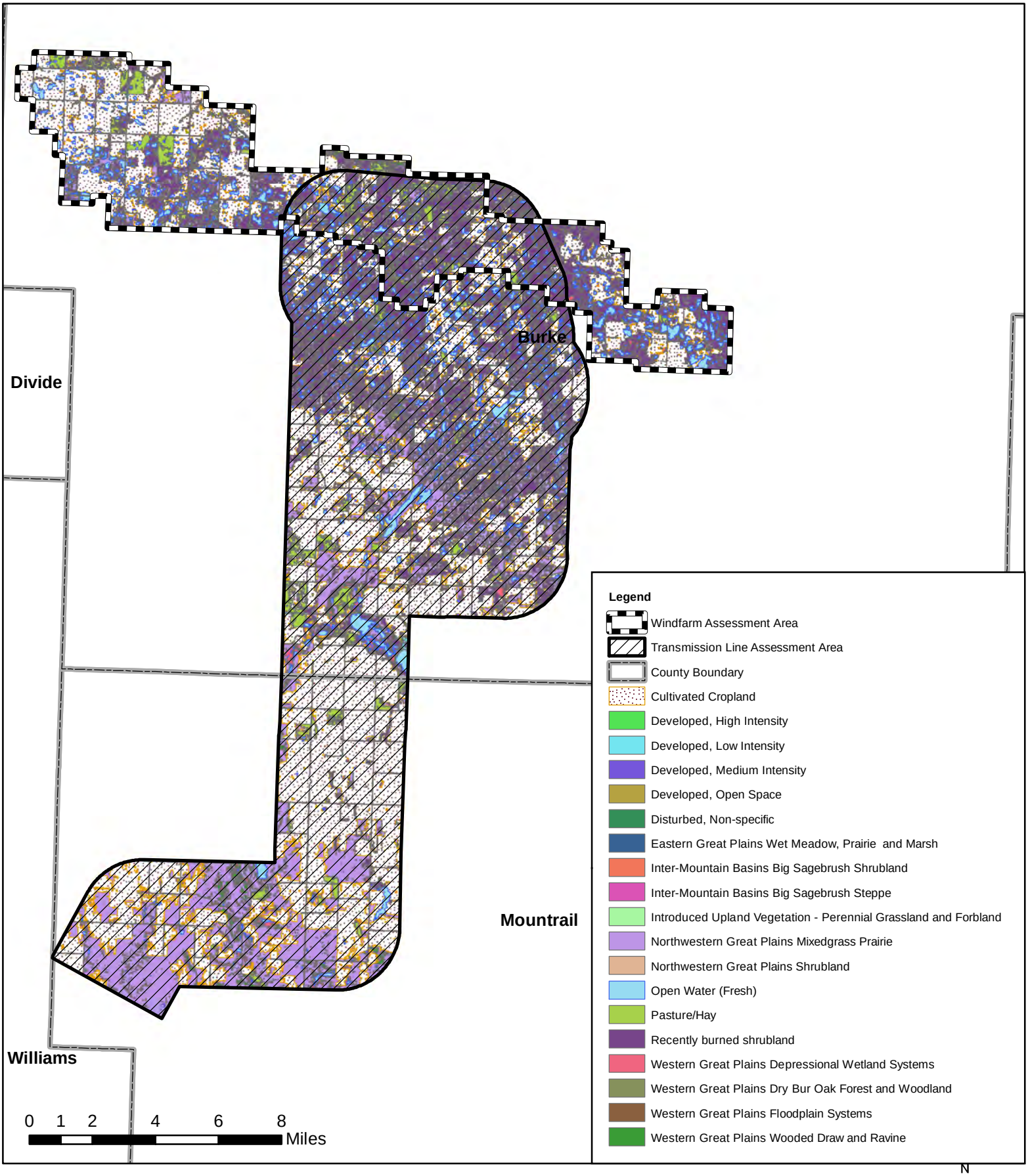


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Figure 3
Ecoregions Map
Desktop Whooping Crane Habitat Assessment
North Dakota

Date: July 2018

Source: https://gishubdata.nd.gov/, ftp://ftp.epa.gov/wed/ecoregions/nd/nd_eco_l4.zip



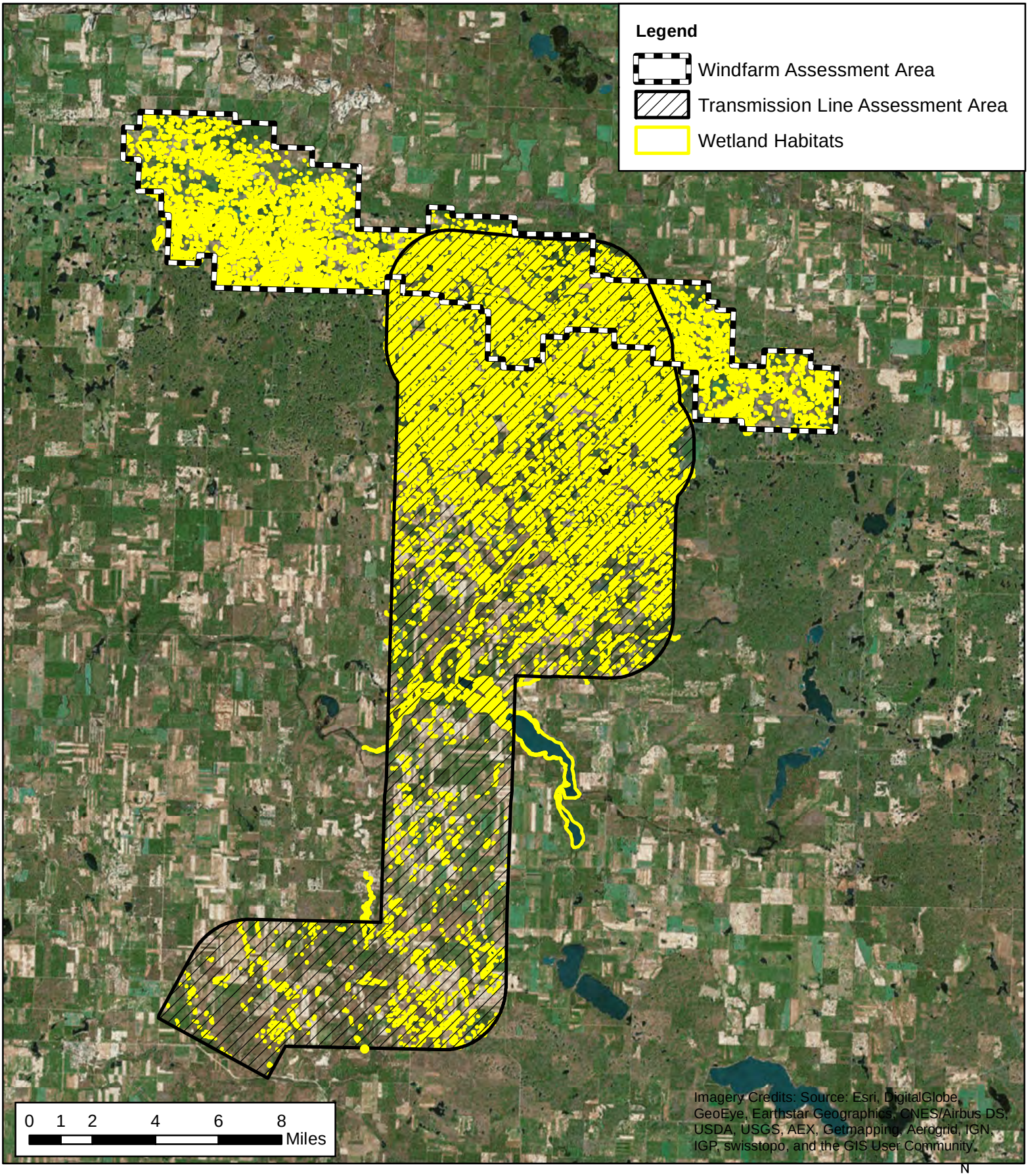
THE WATERSHED INSTITUTE

Figure 4
Landuse Map
Desktop Whooping Crane Habitat Assessment
North Dakota

N
W E
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Date: July 2018

Source: https://gishubdata.nd.gov/

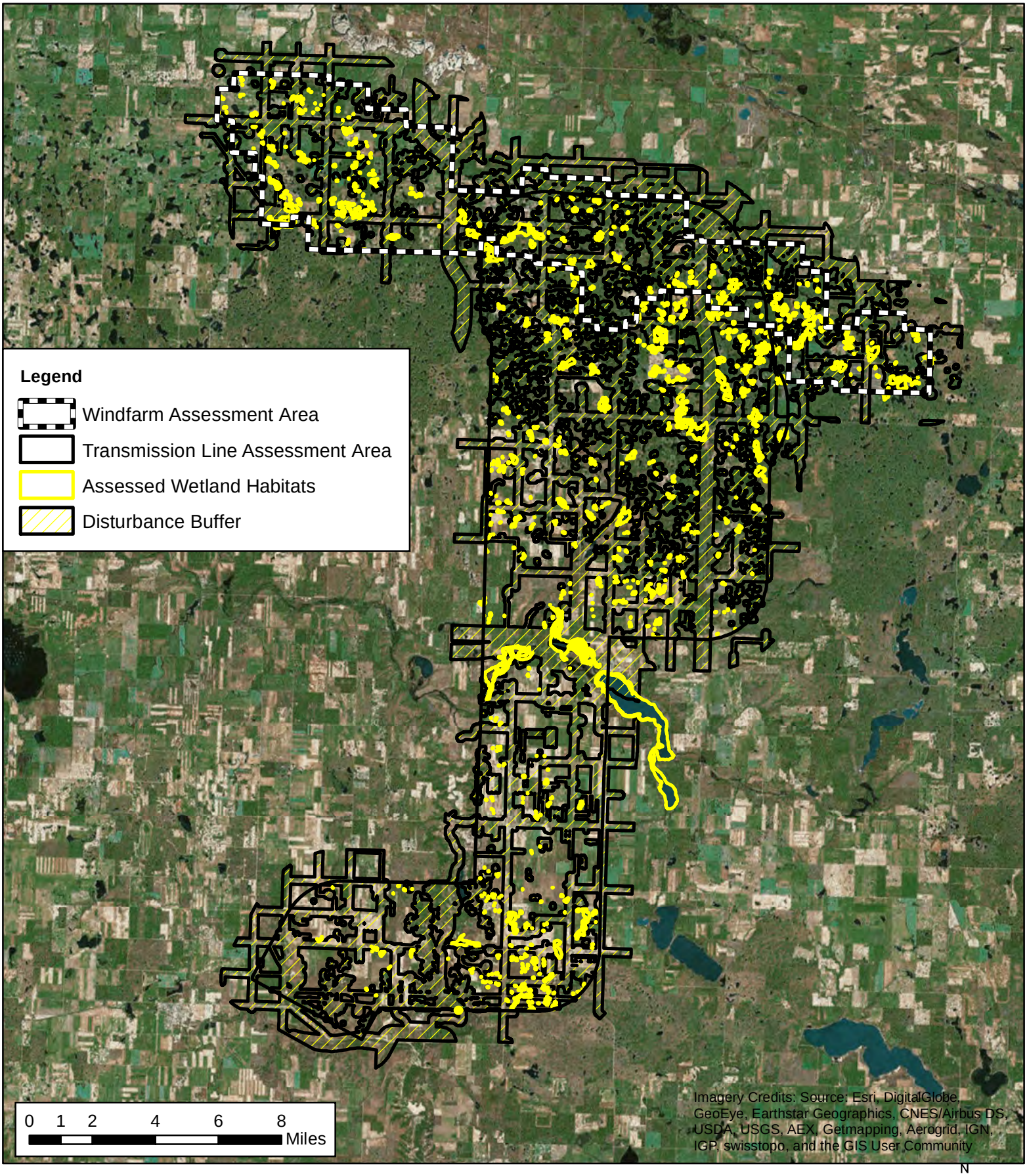


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Figure 6
Identified Wetland Habitats Map

Desktop Whooping Crane Habitat Assessment
North Dakota

Date: July 2018

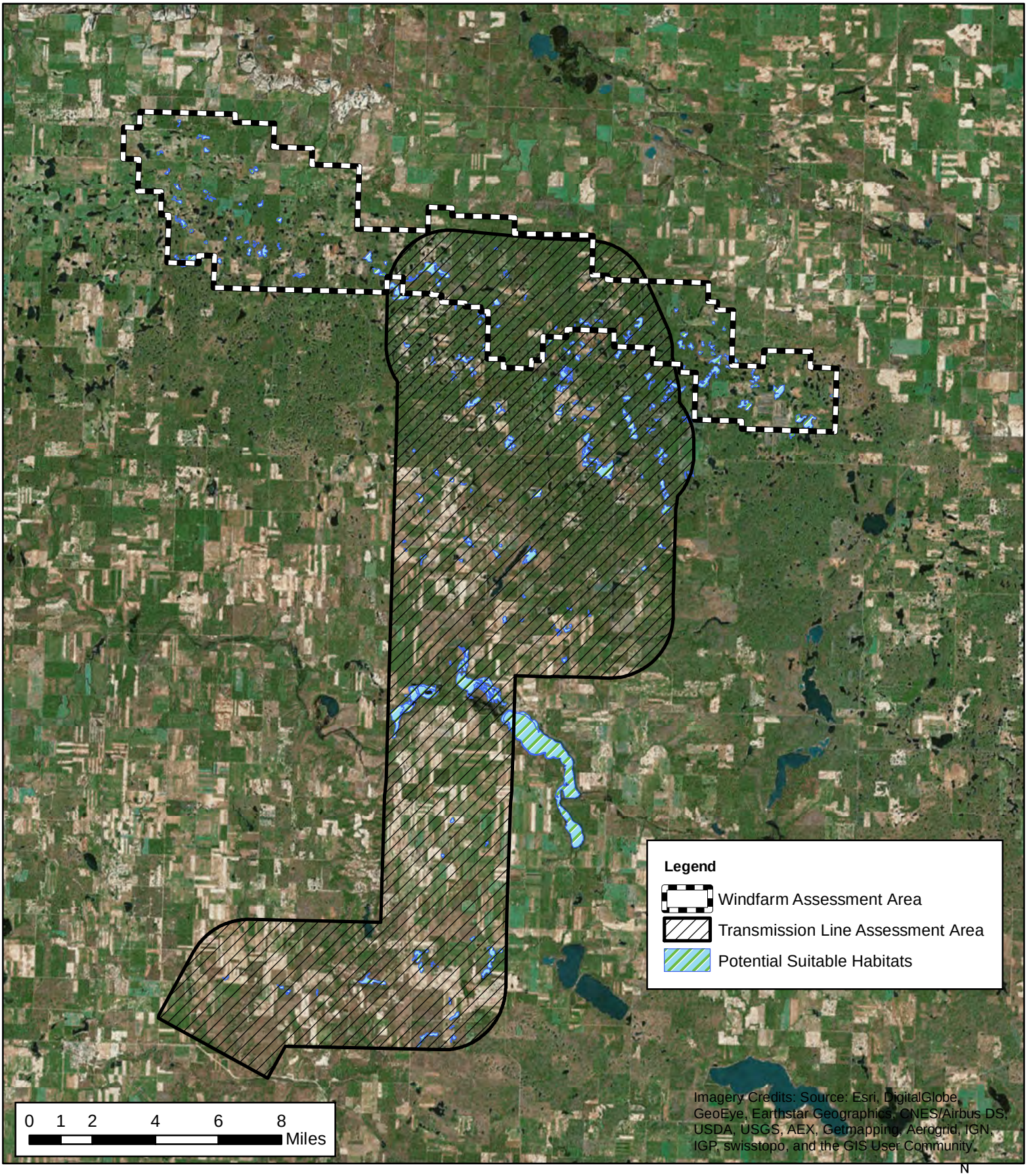


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Figure 7
Assessed Wetland Habitats Map

Desktop Whooping Crane Habitat Assessment
Burke Wind, LLC Transmission Line

Date: July 2018



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Figure 8
Potential Suitable Habitats Map

Desktop Whooping Crane Habitat Assessment
North Dakota

Date: July 2018

APPENDIX B

HABITAT SUITABILITY ASSESSMENT SCORES

Habitat Suitablility Assessment Scores

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
1	L1UBGh	1401.15	4	4	5	0	0	13
2	L2UBGh	106.36	4	5	5	0	0	14
3	PEM1A	6.84	1	4	4	2	0	11
4	PEM1A	0.67	1	5	1	2	0	9
5	PEM1A	4.37	1	5	3	2	0	11
6	PEM1A	1.62	1	4	2	2	0	9
7	PEM1C	1.28	2	4	2	2	0	10
8	PEM1C	0.77	2	5	1	2	0	10
9	PEM1C	1.87	2	5	2	2	0	11
10	PEM1C	1.02	2	4	2	2	0	10
11	PEM1C	0.31	2	5	1	2	0	10
12	PEM1C	0.66	2	5	1	2	0	10
13	PEM1C	0.52	2	5	1	2	0	10
14	PEM1C	0.97	2	4	1	2	0	9
15	PEM1Cd	0.29	2	5	1	0	0	8
16	PEM1Ch	0.30	2	4	1	0	0	7
17	PEM1C	2.20	2	5	2	2	0	11
23	PEM1Cd	17.42	2	5	5	0	0	12
26	PEMA	0.34	1	5	1	2	0	9
27	PEMC	0.66	2	5	1	2	0	10
28	PEMC	5.86	2	5	4	2	0	13
29	PEMC	3.25	2	4	3	2	0	11
30	PEMC	1.12	2	4	2	2	0	10
31	PEMC	3.76	2	5	3	2	0	12
32	PEMC	0.72	2	5	1	2	0	10
35	PEMC	0.28	2	4	1	2	0	9
36	PEMC	1.51	2	5	2	2	0	11
37	PEMC	2.19	2	5	2	2	3	14
38	L2ABG	81.28	4	5	5	2	0	16
39	PEMC	2.97	2	4	2	2	0	10
40	PEMA	0.56	1	5	1	2	0	9
41	PEMC	0.30	2	4	1	2	0	9
42	PEMC	10.71	2	4	5	2	0	13
43	PEMC	0.27	2	4	1	2	3	12
44	PEMC	1.04	2	5	2	2	0	11
45	PEMC	0.37	2	5	1	2	0	10
46	PEMC	0.86	2	5	1	2	0	10
47	PEMC	1.32	2	5	2	2	0	11
48	PEMC	5.54	2	4	4	2	0	12
49	PEMCd	1.12	2	5	2	0	0	9
50	PEMC	2.13	2	5	2	2	0	11
51	PEMA	0.42	1	5	1	2	0	9
52	PEMC	0.90	2	5	1	2	0	10

Habitat Suitablility Assessment Scores

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
53	L2ABG	106.30	4	5	5	2	0	16
54	PEMAd	1.35	1	5	2	0	0	8
55	PEMC	1.08	2	4	2	2	0	10
56	PEMC	3.68	2	5	3	2	0	12
57	PEMCd	2.11	2	5	2	0	0	9
59	PEMC	4.68	2	5	3	2	0	12
60	PEMC	0.33	2	4	1	2	0	9
61	PEMC	0.39	2	5	1	2	0	10
62	PEMC	0.45	2	5	1	2	0	10
63	PEMCd	3.44	2	5	3	0	0	10
64	PEMC	2.36	2	4	2	2	0	10
66	PEMC	0.36	2	4	1	2	0	9
67	PEMC	9.65	2	4	5	2	0	13
68	PEMC	0.34	2	4	1	2	0	9
69	PEMC	15.48	2	5	5	2	0	14
70	PEMC	4.68	2	4	3	2	3	14
71	PEMC	0.35	2	5	1	2	0	10
72	PEMC	8.64	2	5	5	2	0	14
73	PEMC	0.80	2	4	1	2	3	12
74	PEMC	0.89	2	5	1	2	3	13
75	PEMA	0.27	1	3	1	2	0	7
76	PEMF	4.87	3	4	3	2	0	12
77	PEMC	2.18	2	4	2	2	0	10
78	PEMC	9.90	2	5	5	2	0	14
79	PEMF	2.66	3	4	2	2	3	14
80	PEMC	2.65	2	4	2	2	0	10
81	PEMC	0.38	2	4	1	2	0	9
82	PEMC	0.77	2	4	1	2	0	9
83	PEMFd	2.01	3	5	2	0	0	10
84	PEMC	0.48	2	4	1	2	3	12
85	PEMCd	5.72	2	5	4	0	0	11
86	PEMCd	0.70	2	5	1	0	3	11
87	PEMC	1.97	2	4	2	2	0	10
88	PEMC	0.32	2	4	1	2	0	9
90	PEMF	3.35	3	5	3	2	0	13
91	PEMC	0.47	2	5	1	2	0	10
92	PEMC	7.61	2	5	5	2	0	14
93	PEMF	2.72	3	5	2	2	0	12
95	PEMC	0.94	2	5	1	2	0	10
96	PEMC	0.36	2	5	1	2	0	10
97	L2ABG	52.09	4	5	5	2	0	16
100	PEMC	0.53	2	4	1	2	3	12
101	PEMC	0.29	2	4	1	2	3	12

Habitat Suitablility Assessment Scores

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
102	PEMA	1.40	1	5	2	2	0	10
105	PEMC	20.85	2	4	5	2	0	13
107	PEMC	0.43	2	4	1	2	3	12
109	PABF	21.09	3	5	5	2	3	18
110	PABF	16.57	3	5	5	2	3	18
111	PEMC	6.65	2	4	4	2	3	15
112	PEMC	1.31	2	5	2	2	0	11
113	PEMCd	12.39	2	4	5	0	0	11
114	PABF	23.42	3	5	5	2	0	15
115	PEMC	3.74	2	4	3	2	0	11
117	PEMC	0.41	2	4	1	2	0	9
118	PEMC	1.75	2	4	2	2	3	13
119	PEMC	2.04	2	4	2	2	0	10
120	PEMC	5.21	2	4	4	2	3	15
121	PEMC	0.40	2	4	1	2	0	9
123	PABF	45.51	3	4	5	2	0	14
124	PEMC	0.83	2	4	1	2	0	9
126	PEMC	0.44	2	4	1	2	0	9
128	PEMC	0.72	2	4	1	2	0	9
129	PEMC	7.48	2	3	5	2	0	12
131	PEMC	0.63	2	5	1	2	0	10
132	PEMC	0.33	2	4	1	2	0	9
134	PEMC	1.60	2	4	2	2	3	13
136	PEMC	1.35	2	4	2	2	0	10
137	PEMC	2.97	2	5	2	2	0	11
138	L2ABG	48.08	4	4	5	2	0	15
140	PEMC	1.00	2	4	2	2	3	13
143	PEMC	6.80	2	5	4	2	0	13
144	PEMC	2.90	2	4	2	2	0	10
145	L2ABG	30.65	4	4	5	2	0	15
147	PEMC	1.29	2	5	2	2	0	11
148	PEMC	2.54	2	3	2	2	0	9
149	PEMC	3.04	2	3	3	2	0	10
152	PEMC	5.14	2	5	4	2	0	13
154	PEMA	6.51	1	4	4	2	0	11
156	PEMCd	29.90	2	5	5	0	0	12
157	PEMC	0.65	2	4	1	2	3	12
158	PABF	21.77	3	5	5	2	0	15
161	PEMC	0.66	2	5	1	2	0	10
162	PABF	12.88	3	5	5	2	3	18
165	PEMC	0.89	2	4	1	2	0	9
167	PEMC	1.49	2	4	2	2	3	13
169	PABF	11.07	3	5	5	2	0	15

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
171	PEMA	0.28	1	5	1	2	0	9
175	L2ABG	57.18	4	5	5	2	0	16
178	PEMC	0.40	2	4	1	2	3	12
183	PEMC	10.87	2	5	5	2	0	14
184	PEMC	0.37	2	5	1	2	0	10
185	PEMC	1.00	2	4	1	2	3	12
190	PEMC	0.75	2	4	1	2	0	9
192	PEMCd	0.98	2	5	1	0	0	8
197	PEMC	0.69	2	5	1	2	0	10
198	PEMC	0.91	2	4	1	2	0	9
200	PEMC	1.12	2	4	2	2	0	10
201	PEMC	1.48	2	5	2	2	0	11
202	PEMC	1.75	2	5	2	2	0	11
203	PEMC	4.75	2	5	3	2	0	12
204	PEMC	0.87	2	4	1	2	0	9
205	PEMC	0.83	2	4	1	2	0	9
206	PEMC	9.52	2	5	5	2	0	14
207	PEMCd	0.32	2	5	1	0	3	11
208	PEMC	1.30	2	4	2	2	0	10
209	PEMAd	46.05	1	5	5	0	0	11
210	PEMF	1.44	3	4	2	2	3	14
211	PEMC	2.32	2	4	2	2	0	10
212	PEMCd	0.85	2	5	1	0	0	8
213	PEMC	3.27	2	5	3	2	0	12
214	PEMC	3.35	2	4	3	2	0	11
215	PEMC	1.51	2	5	2	2	0	11
217	PEMC	7.72	2	5	5	2	0	14
218	PEMC	3.85	2	4	3	2	0	11
219	PEMAd	2.30	1	5	2	0	0	8
220	PEMC	23.21	2	4	5	2	0	13
221	PEMAd	0.65	1	5	1	0	0	7
222	PEMC	1.88	2	5	2	2	0	11
224	PEMC	0.63	2	4	1	2	0	9
225	PEMC	13.49	2	4	5	2	0	13
226	PEMC	0.58	2	5	1	2	3	13
227	PEMC	1.24	2	4	2	2	0	10
228	PEMA	0.46	1	5	1	2	0	9
229	PEMA	0.28	1	5	1	2	0	9
230	PEMCd	0.89	2	5	1	0	3	11
231	PEMA	8.77	1	5	5	2	0	13
232	PEMA	0.26	1	5	1	2	0	9
233	PEMF	4.40	3	4	3	2	0	12
234	PEMC	2.67	2	5	2	2	0	11

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
235	PEMCd	3.81	2	5	3	0	0	10
236	PEMC	7.72	2	5	5	2	3	17
237	PEMA	0.44	1	5	1	2	0	9
238	PEMC	10.08	2	5	5	2	0	14
239	PABF	7.35	3	5	5	2	0	15
240	PEMC	0.84	2	4	1	2	0	9
242	PEMC	2.06	2	5	2	2	0	11
243	PEMC	0.60	2	4	1	2	0	9
244	PEMC	7.18	2	4	5	2	3	16
245	PEMC	0.31	2	3	1	2	0	8
246	PEMC	2.42	2	5	2	2	0	11
247	PEMC	0.32	2	5	1	2	0	10
248	PEMC	0.40	2	5	1	2	0	10
249	PEMC	0.51	2	5	1	2	0	10
250	PEMC	0.85	2	4	1	2	0	9
251	PABF	10.90	3	5	5	2	0	15
252	PEMC	0.40	2	4	1	2	0	9
253	PEMC	0.39	2	4	1	2	3	12
254	PEMC	1.97	2	4	2	2	0	10
255	PEMA	0.69	1	5	1	2	0	9
256	PEMAd	0.68	1	5	1	0	0	7
258	PEMCd	0.50	2	4	1	0	0	7
259	PEMC	4.25	2	5	3	2	0	12
260	PEMFd	4.78	3	5	3	0	0	11
261	PEMF	1.26	3	4	2	2	0	11
262	PEMC	1.42	2	5	2	2	0	11
263	PEMC	4.23	2	4	3	2	0	11
264	PEMC	1.99	2	5	2	2	0	11
265	PEMC	80.36	2	5	5	2	3	17
266	PEMC	0.35	2	4	1	2	0	9
267	PEMC	0.34	2	4	1	2	0	9
268	PEMC	16.33	2	4	5	2	0	13
269	PABF	11.26	3	5	5	2	0	15
270	PEMCd	8.26	2	5	5	0	0	12
271	PEMC	0.32	2	4	1	2	0	9
272	PEMAd	0.72	1	5	1	0	0	7
273	PEMC	0.40	2	5	1	2	0	10
274	PEMCd	7.34	2	5	5	0	0	12
275	PEMC	0.65	2	5	1	2	0	10
276	PEMC	6.73	2	5	4	2	0	13
278	PEMC	0.29	2	4	1	2	0	9
280	PEMCd	0.55	2	5	1	0	0	8
281	PEMA	0.38	1	5	1	2	0	9

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
282	PEMC	9.83	2	5	5	2	0	14
283	PEMAd	0.65	1	5	1	0	0	7
284	PEMAd	0.82	1	5	1	0	0	7
286	PEMC	0.75	2	4	1	2	0	9
287	PEMC	1.76	2	5	2	2	0	11
288	PEMC	0.56	2	5	1	2	0	10
289	PEMC	1.10	2	4	2	2	0	10
290	PEMC	0.38	2	4	1	2	0	9
291	PEMC	4.44	2	5	3	2	0	12
292	PEMA	0.26	1	5	1	2	0	9
293	PEMC	0.58	2	4	1	2	0	9
294	PEMC	0.56	2	5	1	2	0	10
295	PEMC	1.16	2	4	2	2	3	13
296	PEMF	5.78	3	4	4	2	0	13
297	PEMF	10.60	3	4	5	2	0	14
298	PEMCd	0.77	2	5	1	0	0	8
299	PEMC	0.45	2	4	1	2	0	9
300	PABF	10.02	3	4	5	2	0	14
301	PEMA	2.99	1	4	2	2	0	9
302	PEMC	0.36	2	4	1	2	0	9
303	PEMC	0.27	2	4	1	2	0	9
304	PEMC	0.83	2	4	1	2	0	9
305	PEMF	0.79	3	4	1	2	0	10
306	PEMC	1.27	2	5	2	2	0	11
307	PEMC	5.22	2	4	4	2	0	12
308	PEMC	1.43	2	5	2	2	0	11
309	PEMC	0.34	2	5	1	2	0	10
310	L2ABG	28.43	4	4	5	2	0	15
312	PEMAd	0.28	1	5	1	0	0	7
313	PEMC	14.45	2	5	5	2	0	14
314	PEMC	0.57	2	4	1	2	3	12
316	PEMC	1.14	2	4	2	2	3	13
317	PEMC	2.38	2	4	2	2	0	10
318	PEMC	0.32	2	4	1	2	0	9
319	PEMC	6.16	2	5	4	2	0	13
321	PEMC	0.32	2	4	1	2	3	12
322	PEMC	0.31	2	4	1	2	0	9
323	PEMA	0.47	1	4	1	2	0	8
324	PEMC	0.72	2	5	1	2	0	10
325	PEMC	0.53	2	4	1	2	0	9
326	PEMC	0.89	2	4	1	2	0	9
327	PEMC	0.69	2	4	1	2	0	9
328	PEMC	0.53	2	5	1	2	0	10

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
329	PEMC	1.22	2	4	2	2	0	10
330	PEMAd	0.26	1	5	1	0	0	7
331	PEMC	0.50	2	5	1	2	0	10
332	PEMC	3.61	2	5	3	2	0	12
333	PEMC	11.36	2	5	5	2	0	14
334	PEMC	1.11	2	4	2	2	0	10
335	PEMC	0.43	2	5	1	2	0	10
336	PEMF	4.44	3	5	3	2	0	13
337	PEMC	6.00	2	5	4	2	3	16
338	PEMC	0.38	2	5	1	2	0	10
339	PEMC	0.50	2	5	1	2	0	10
340	PEMC	3.88	2	4	3	2	0	11
341	PEMC	1.08	2	4	2	2	0	10
342	PEMC	1.02	2	5	2	2	0	11
344	PABF	19.43	3	5	5	2	0	15
345	PABF	12.77	3	4	5	2	0	14
346	PEMC	0.27	2	5	1	2	0	10
347	PEMC	0.27	2	5	1	2	0	10
348	PABF	9.73	3	5	5	2	0	15
350	PEMC	1.02	2	5	2	2	0	11
351	PEMC	0.87	2	5	1	2	0	10
352	PEMC	1.17	2	5	2	2	0	11
353	PEMC	1.27	2	5	2	2	0	11
354	PEMC	0.69	2	5	1	2	0	10
355	PEMC	0.80	2	5	1	2	0	10
356	PEMA	0.27	1	5	1	2	0	9
357	PEMF	12.17	3	5	5	2	0	15
359	PEMC	1.10	2	5	2	2	0	11
360	PEMC	5.54	2	5	4	2	0	13
362	PEMC	0.42	2	4	1	2	0	9
363	PEMAd	0.35	1	5	1	0	0	7
364	PABF	18.81	3	5	5	2	0	15
365	PEMC	0.50	2	4	1	2	0	9
366	PEMC	3.77	2	5	3	2	0	12
367	PEMF	3.01	3	5	3	2	0	13
368	PEMC	3.25	2	4	3	2	0	11
369	PEMC	25.75	2	5	5	2	0	14
371	PEMC	0.31	2	5	1	2	3	13
372	PEMC	0.28	2	4	1	2	0	9
373	PEMC	1.75	2	4	2	2	3	13
374	PEMAd	0.89	1	5	1	0	0	7
375	PEMC	3.39	2	5	3	2	0	12
376	PEMC	0.47	2	5	1	2	0	10

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
377	PEMC	3.16	2	5	3	2	0	12
378	PEMCd	4.05	2	4	3	0	0	9
379	PEMA	0.38	1	5	1	2	0	9
380	PEMC	0.27	2	4	1	2	0	9
381	PEMA	1.03	1	4	2	2	0	9
382	PEMCd	0.35	2	5	1	0	0	8
383	PEMAd	0.54	1	5	1	0	0	7
384	PEMC	0.35	2	4	1	2	0	9
386	PEMC	0.67	2	5	1	2	0	10
387	PABFx	0.28	3	4	1	0	0	8
390	PEMC	5.44	2	5	4	2	0	13
391	PEMC	0.35	2	4	1	2	0	9
392	PEMC	3.79	2	5	3	2	0	12
396	PEMC	8.02	2	5	5	2	0	14
402	PEMC	3.31	2	3	3	2	0	10
404	PEMC	1.91	2	4	2	2	0	10
405	PEMC	0.33	2	4	1	2	0	9
406	PEMC	13.35	2	4	5	2	0	13
407	PEMC	1.53	2	3	2	2	0	9
408	PEMC	0.73	2	4	1	2	0	9
409	PEMC	3.13	2	4	3	2	0	11
410	PEMC	10.92	2	5	5	2	0	14
411	PEMF	5.07	3	5	4	2	0	14
412	PEMF	3.15	3	5	3	2	0	13
413	PEMC	1.24	2	4	2	2	0	10
414	PEMC	3.75	2	4	3	2	0	11
415	PEMC	1.42	2	5	2	2	0	11
416	PEMC	3.27	2	4	3	2	0	11
417	PEMC	0.78	2	4	1	2	0	9
418	PEMC	6.44	2	5	4	2	0	13
419	PEMC	1.86	2	5	2	2	0	11
420	PEMC	0.36	2	4	1	2	0	9
421	PEMC	0.55	2	5	1	2	0	10
422	PEMC	0.32	2	5	1	2	0	10
423	PEMC	10.66	2	5	5	2	0	14
424	PEMC	2.66	2	4	2	2	0	10
425	PEMC	0.75	2	5	1	2	0	10
426	PEMC	0.37	2	4	1	2	0	9
427	PEMC	9.61	2	4	5	2	0	13
428	PEMF	13.06	3	4	5	2	0	14
429	PEMC	5.77	2	5	4	2	0	13
430	PEMA	4.05	1	5	3	2	0	11
431	PEMC	0.43	2	5	1	2	0	10

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
432	PEMC	5.90	2	5	4	2	0	13
433	PEMC	0.42	2	5	1	2	0	10
434	PEMC	1.36	2	4	2	2	0	10
435	PEMC	2.15	2	5	2	2	0	11
436	PABF	15.93	3	5	5	2	0	15
437	PEMC	2.82	2	5	2	2	0	11
438	PEMC	4.78	2	4	3	2	0	11
439	PEMC	4.80	2	5	3	2	0	12
440	PEMC	1.17	2	5	2	2	0	11
441	PEMC	1.94	2	5	2	2	0	11
442	PEMC	2.65	2	5	2	2	0	11
443	PEMC	1.02	2	3	2	2	0	9
444	L2ABG	36.55	4	4	5	2	0	15
445	L2ABG	21.83	4	4	5	2	0	15
446	PEMC	0.70	2	4	1	2	0	9
447	PEMC	0.99	2	4	1	2	0	9
448	PEMC	1.07	2	4	2	2	0	10
449	PABF	15.93	3	4	5	2	0	14
450	PEMC	4.94	2	5	3	2	0	12
451	PEMC	1.62	2	4	2	2	0	10
452	PEMC	8.09	2	5	5	2	0	14
453	PEMC	4.55	2	4	3	2	0	11
454	PEMC	7.54	2	5	5	2	0	14
455	L2ABG	34.09	4	5	5	2	0	16
457	PEMC	0.27	2	5	1	2	0	10
458	PEMC	0.50	2	4	1	2	0	9
459	PEMC	0.29	2	4	1	2	0	9
460	PABF	2.87	3	5	2	2	0	12
462	PEMC	1.39	2	5	2	2	0	11
464	PEMC	2.47	2	5	2	2	0	11
466	PEMC	1.05	2	5	2	2	0	11
468	PEMC	0.70	2	4	1	2	0	9
469	PEMC	0.34	2	5	1	2	0	10
470	PEMAd	0.35	1	5	1	0	0	7
471	PEMAd	2.93	1	5	2	0	0	8
473	PEMC	0.38	2	5	1	2	0	10
474	L2ABG	36.96	4	4	5	2	0	15
475	L2ABG	80.10	4	5	5	2	0	16
476	L2ABG	168.16	4	4	5	2	3	18
477	L2ABG	65.05	4	4	5	2	0	15
478	L2ABG	23.58	4	4	5	2	0	15
479	L2ABG	20.08	4	5	5	2	0	16
480	L2ABG	23.83	4	5	5	2	3	19

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
481	L2ABG	48.96	4	5	5	2	0	16
482	L2ABG	24.98	4	5	5	2	0	16
483	L2ABG	42.29	4	5	5	2	0	16
484	L2ABG	29.18	4	5	5	2	3	19
485	PABF	3.76	3	4	3	2	3	15
486	PABF	0.27	3	4	1	2	0	10
487	PABF	1.98	3	4	2	2	3	14
488	PABF	19.21	3	4	5	2	3	17
489	PABF	0.60	3	4	1	2	0	10
490	PABF	11.84	3	5	5	2	3	18
491	PABF	3.65	3	4	3	2	0	12
492	PABF	10.59	3	5	5	2	0	15
493	PABF	6.77	3	4	4	2	0	13
494	PABF	5.71	3	5	4	2	0	14
495	PABF	22.72	3	5	5	2	0	15
496	PABF	2.11	3	4	2	2	0	11
497	PABFh	1.47	3	4	2	0	3	12
498	PABFx	0.65	3	3	1	0	0	7
499	PABFx	0.36	3	3	1	0	0	7
500	PABFx	0.49	3	5	1	0	0	9
501	PEM1C	1.06	2	5	2	2	0	11
502	PEM1C	1.03	2	4	2	2	0	10
503	PEM1C	2.82	2	4	2	2	0	10
504	PEM1/ABF	6.78	1	4	4	2	0	11
505	PEM1/ABF	2.73	1	3	2	2	0	8
506	PEM1/ABF	1.83	1	4	2	2	0	9
507	PEM1/ABFd	49.60	1	5	5	0	0	11
508	PEM1A	0.35	1	4	1	2	0	8
509	PEM1A	0.32	1	4	1	2	0	8
510	PEM1A	0.48	1	5	1	2	0	9
511	PEM1A	0.30	1	5	1	2	0	9
512	PEM1A	0.28	1	5	1	2	0	9
513	PEM1A	1.07	1	4	2	2	0	9
514	PEM1A	0.37	1	5	1	2	0	9
515	PEM1A	0.41	1	5	1	2	0	9
516	PEM1A	2.16	1	5	2	2	0	10
517	PEM1A	0.78	1	4	1	2	0	8
518	PEM1A	1.00	1	5	1	2	0	9
519	PEM1A	0.30	1	4	1	2	0	8
520	PEM1A	0.83	1	5	1	2	0	9
521	PEM1A	0.42	1	5	1	2	0	9
522	PEM1A	1.06	1	5	2	2	0	10
523	PEM1A	0.41	1	5	1	2	0	9

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
524	PEM1A	0.27	1	4	1	2	0	8
525	PEM1C	4.56	2	4	3	2	3	14
526	PEM1A	0.47	1	5	1	2	0	9
527	PEM1A	0.48	1	5	1	2	0	9
528	PEM1A	1.06	1	5	2	2	0	10
529	PEM1A	7.32	1	5	5	2	3	16
530	PEM1A	56.25	1	5	5	2	3	16
531	PEM1A	0.27	1	5	1	2	0	9
532	PEM1A	121.32	1	5	5	2	3	16
533	PEM1C	6.58	2	5	4	2	0	13
534	PEM1A	0.56	1	5	1	2	0	9
535	PEM1A	0.98	1	4	1	2	0	8
536	PEM1A	0.41	1	5	1	2	0	9
537	PEM1A	0.26	1	5	1	2	0	9
538	PEM1A	0.38	1	5	1	2	0	9
539	PEM1A	1.37	1	4	2	2	3	12
540	PEM1A	0.30	1	4	1	2	0	8
541	PEM1A	0.28	1	5	1	2	0	9
542	PEM1A	0.48	1	4	1	2	0	8
543	PEM1A	0.34	1	4	1	2	0	8
544	PEM1A	0.39	1	4	1	2	0	8
545	PEM1A	1.14	1	4	2	2	0	9
546	PEM1A	0.37	1	4	1	2	0	8
547	PEM1A	1.72	1	5	2	2	0	10
548	PEM1A	0.29	1	4	1	2	0	8
549	PEM1A	0.27	1	4	1	2	0	8
550	PEM1A	1.14	1	4	2	2	0	9
551	PEM1A	0.46	1	5	1	2	0	9
552	PEM1C	0.61	2	4	1	2	0	9
553	PEM1A	0.39	1	5	1	2	0	9
554	PEM1A	15.33	1	5	5	2	0	13
555	PEM1A	11.61	1	5	5	2	0	13
556	PEM1A	0.30	1	5	1	2	0	9
557	PEM1A	1.35	1	5	2	2	0	10
558	PEM1A	0.33	1	5	1	2	0	9
559	PEM1A	0.85	1	5	1	2	0	9
560	PEM1Ad	22.07	1	5	5	0	3	14
561	PEM1C	3.44	2	4	3	2	0	11
562	PEM1C	1.10	2	5	2	2	0	11
563	PEM1C	1.61	2	4	2	2	0	10
564	PEM1C	2.85	2	4	2	2	0	10
565	PEM1C	10.37	2	5	5	2	0	14
566	PEM1C	0.78	2	4	1	2	0	9

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
567	PEM1C	0.80	2	4	1	2	0	9
568	PEM1C	1.09	2	4	2	2	0	10
569	PEM1C	0.28	2	4	1	2	0	9
570	PEM1C	1.94	2	5	2	2	0	11
571	PEM1C	0.92	2	3	1	2	0	8
572	PEM1C	0.30	2	3	1	2	0	8
573	PEM1C	2.59	2	4	2	2	0	10
574	PEM1C	0.39	2	4	1	2	0	9
575	PEM1C	0.35	2	3	1	2	0	8
576	PEM1C	0.29	2	5	1	2	0	10
577	PEM1C	0.57	2	4	1	2	0	9
578	PEM1C	0.49	2	3	1	2	0	8
579	PEM1C	3.58	2	5	3	2	0	12
580	PEM1C	0.31	2	3	1	2	0	8
581	PEM1C	0.49	2	5	1	2	0	10
582	PEM1C	1.34	2	4	2	2	0	10
583	PEM1C	0.29	2	3	1	2	0	8
584	PEM1C	0.92	2	4	1	2	0	9
585	PEM1C	1.34	2	3	2	2	0	9
586	PEM1C	6.06	2	3	4	2	0	11
587	PEM1C	1.73	2	3	2	2	0	9
588	PEM1C	1.29	2	4	2	2	0	10
589	PEM1C	0.60	2	4	1	2	0	9
590	PEM1C	2.28	2	4	2	2	0	10
591	PEM1C	1.81	2	4	2	2	0	10
592	PEM1C	0.45	2	3	1	2	0	8
593	PEM1C	0.36	2	4	1	2	0	9
594	PEM1C	0.60	2	5	1	2	0	10
595	PEM1C	0.28	2	4	1	2	0	9
596	PEM1C	0.64	2	4	1	2	0	9
597	PEM1C	0.60	2	4	1	2	0	9
598	PEM1C	0.42	2	3	1	2	0	8
599	PEM1C	0.84	2	3	1	2	0	8
600	PEM1C	0.89	2	5	1	2	0	10
601	PEM1C	2.04	2	4	2	2	0	10
602	PEM1C	0.28	2	4	1	2	0	9
603	PEM1C	1.27	2	3	2	2	0	9
604	PEM1C	2.47	2	5	2	2	0	11
605	PEM1C	1.12	2	4	2	2	0	10
606	PEM1C	0.65	2	4	1	2	0	9
607	PEM1C	0.43	2	3	1	2	0	8
608	PEM1C	0.32	2	4	1	2	0	9
609	PEM1C	0.43	2	4	1	2	0	9

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
610	PEM1C	0.71	2	5	1	2	0	10
611	PEM1C	1.14	2	4	2	2	0	10
612	PEM1C	5.70	2	5	4	2	0	13
613	PEM1C	4.99	2	4	3	2	0	11
614	PEM1C	1.43	2	4	2	2	0	10
615	PEM1C	0.28	2	4	1	2	0	9
616	PEM1C	0.51	2	4	1	2	0	9
617	PEM1C	0.50	2	4	1	2	0	9
618	PEM1C	2.91	2	4	2	2	0	10
619	PEM1C	2.70	2	4	2	2	0	10
620	PEM1C	0.69	2	5	1	2	0	10
621	PEM1C	0.62	2	5	1	2	0	10
622	PEM1C	0.42	2	5	1	2	0	10
623	PEM1C	3.82	2	5	3	2	0	12
624	PEM1C	1.72	2	5	2	2	0	11
625	PEM1C	0.68	2	5	1	2	0	10
626	PEM1C	0.30	2	5	1	2	0	10
627	PEM1C	1.29	2	5	2	2	0	11
628	PEM1C	0.59	2	4	1	2	0	9
629	PEM1C	6.16	2	5	4	2	0	13
630	PEM1C	1.51	2	5	2	2	3	14
631	PEM1C	0.40	2	4	1	2	3	12
632	PEM1C	0.52	2	5	1	2	0	10
633	PEM1C	0.32	2	4	1	2	0	9
634	PEM1C	0.42	2	5	1	2	3	13
635	PEM1C	0.44	2	5	1	2	0	10
636	PEM1C	0.41	2	5	1	2	0	10
637	PEM1C	0.38	2	5	1	2	0	10
638	PEM1C	0.44	2	5	1	2	0	10
639	PEM1C	6.82	2	5	4	2	0	13
640	PEM1C	39.20	2	5	5	2	0	14
641	PEM1C	3.29	2	4	3	2	0	11
642	PEM1C	3.71	2	5	3	2	0	12
643	PEM1C	1.28	2	5	2	2	0	11
644	PEM1C	1.79	2	5	2	2	0	11
645	PEM1C	7.26	2	4	5	2	0	13
646	PEM1C	0.36	2	5	1	2	0	10
647	PEM1C	2.38	2	4	2	2	0	10
648	PEM1C	1.87	2	5	2	2	0	11
649	PEM1C	2.50	2	4	2	2	0	10
650	PEM1C	1.50	2	4	2	2	0	10
651	PEM1C	0.71	2	4	1	2	0	9
652	PEM1C	0.50	2	5	1	2	0	10

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
653	PEM1C	0.26	2	4	1	2	0	9
654	PEM1C	0.45	2	4	1	2	0	9
655	PEM1C	1.73	2	5	2	2	0	11
656	PEM1C	0.41	2	5	1	2	0	10
657	PEM1C	2.36	2	4	2	2	0	10
658	PEM1C	0.57	2	5	1	2	0	10
659	PEM1C	0.32	2	4	1	2	0	9
660	PEM1C	0.49	2	4	1	2	0	9
661	PEM1C	0.54	2	5	1	2	0	10
662	PEM1C	1.64	2	5	2	2	0	11
663	PEM1C	0.62	2	5	1	2	0	10
664	PEM1C	4.57	2	5	3	2	0	12
665	PEM1C	0.72	2	4	1	2	0	9
666	PEM1C	0.57	2	5	1	2	0	10
667	PEM1C	0.37	2	5	1	2	0	10
668	PEM1C	0.34	2	5	1	2	0	10
669	PEM1C	0.43	2	5	1	2	0	10
670	PEM1C	0.86	2	5	1	2	0	10
671	PEM1C	3.88	2	5	3	2	0	12
672	PEM1C	0.91	2	5	1	2	0	10
673	PEM1C	0.33	2	5	1	2	0	10
674	PEM1C	1.12	2	4	2	2	0	10
675	PEM1C	0.26	2	5	1	2	0	10
676	PEM1C	0.88	2	5	1	2	0	10
677	PEM1C	0.65	2	5	1	2	0	10
678	PEM1C	1.42	2	5	2	2	0	11
679	PEM1C	6.97	2	5	4	2	0	13
680	PEM1C	2.50	2	5	2	2	0	11
681	PEM1C	1.08	2	5	2	2	0	11
682	PEM1C	0.68	2	5	1	2	0	10
683	PEM1C	0.27	2	5	1	2	0	10
684	PEM1C	0.66	2	5	1	2	0	10
685	PEM1C	0.49	2	5	1	2	0	10
686	PEM1C	1.92	2	5	2	2	0	11
687	PEM1C	0.35	2	5	1	2	0	10
688	PEM1C	0.38	2	5	1	2	0	10
689	PEM1C	1.38	2	5	2	2	0	11
690	PEM1C	25.14	2	5	5	2	0	14
691	PEM1C	2.69	2	4	2	2	3	13
692	PEM1C	4.16	2	4	3	2	3	14
693	PEM1C	0.28	2	5	1	2	0	10
694	PEM1C	0.43	2	5	1	2	0	10
695	PEM1C	1.31	2	5	2	2	0	11

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
696	PEM1C	1.38	2	5	2	2	0	11
697	PEM1C	0.73	2	5	1	2	0	10
698	PEM1C	0.30	2	5	1	2	0	10
699	PEM1C	1.03	2	5	2	2	0	11
700	PEM1C	6.29	2	5	4	2	3	16
701	PEM1C	7.25	2	5	5	2	0	14
702	PEM1C	4.18	2	5	3	2	0	12
703	PEM1C	0.59	2	5	1	2	0	10
704	PEM1C	0.34	2	5	1	2	0	10
705	PEM1C	0.65	2	5	1	2	0	10
706	PEM1C	0.35	2	5	1	2	0	10
707	PEM1C	1.32	2	5	2	2	0	11
708	PEM1C	1.18	2	4	2	2	3	13
709	PEM1C	0.61	2	5	1	2	0	10
710	PEM1C	2.32	2	5	2	2	0	11
711	PEM1C	2.70	2	5	2	2	3	14
712	PEM1C	2.16	2	5	2	2	0	11
713	PEM1A	1.60	1	5	2	2	0	10
714	PEM1C	1.99	2	5	2	2	0	11
715	PEM1C	0.44	2	4	1	2	0	9
716	PEM1C	1.98	2	4	2	2	0	10
717	PEM1C	1.04	2	4	2	2	0	10
718	PEM1C	0.76	2	4	1	2	0	9
719	PEM1C	0.33	2	5	1	2	0	10
720	PEM1C	0.26	2	4	1	2	0	9
721	PEM1C	0.53	2	4	1	2	0	9
722	PEM1C	4.32	2	4	3	2	0	11
723	PEM1C	6.47	2	5	4	2	3	16
724	PEM1C	1.70	2	5	2	2	3	14
725	PEM1C	0.66	2	4	1	2	0	9
726	PEM1C	0.75	2	4	1	2	0	9
727	PEM1C	0.49	2	4	1	2	3	12
728	PEM1C	13.38	2	5	5	2	0	14
729	PEM1C	0.81	2	4	1	2	0	9
730	PEM1C	3.08	2	5	3	2	0	12
731	PEM1C	0.37	2	4	1	2	0	9
732	PEM1C	1.29	2	4	2	2	3	13
733	PEM1C	0.95	2	5	1	2	0	10
734	PEM1C	0.97	2	4	1	2	0	9
735	PEM1C	0.36	2	5	1	2	0	10
736	PEM1C	0.28	2	4	1	2	0	9
737	PEM1C	0.29	2	4	1	2	0	9
738	PEM1C	2.05	2	5	2	2	0	11

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
739	PEM1C	4.63	2	5	3	2	0	12
740	PEM1C	4.11	2	5	3	2	0	12
741	PEM1C	0.31	2	5	1	2	0	10
742	PEM1C	0.81	2	5	1	2	0	10
743	PEM1C	0.52	2	5	1	2	0	10
744	PEM1C	0.77	2	4	1	2	0	9
745	PEM1C	1.69	2	4	2	2	0	10
746	PEM1C	0.89	2	4	1	2	0	9
747	PEM1C	0.61	2	4	1	2	0	9
748	PEM1C	2.08	2	5	2	2	0	11
749	PEM1C	0.82	2	4	1	2	0	9
750	PEM1C	1.64	2	4	2	2	0	10
751	PEM1C	3.72	2	5	3	2	0	12
752	PEM1A	1.55	1	5	2	2	0	10
753	PEM1C	0.37	2	5	1	2	0	10
754	PEM1C	0.71	2	5	1	2	0	10
755	PEM1C	1.54	2	5	2	2	0	11
756	PEM1C	2.61	2	5	2	2	0	11
757	PEM1C	0.43	2	4	1	2	0	9
758	PEM1C	0.61	2	5	1	2	0	10
759	PEM1C	0.36	2	5	1	2	0	10
760	PEM1C	0.33	2	5	1	2	0	10
761	PEM1C	1.56	2	4	2	2	0	10
762	PEM1C	0.29	2	4	1	2	0	9
763	PEM1C	0.33	2	5	1	2	0	10
764	PEM1C	1.71	2	4	2	2	0	10
765	PEM1C	0.96	2	4	1	2	0	9
766	PEM1C	1.56	2	5	2	2	0	11
767	PEM1C	2.23	2	5	2	2	0	11
768	PEM1C	0.36	2	4	1	2	0	9
769	PEM1C	0.57	2	4	1	2	0	9
770	PEM1C	0.71	2	4	1	2	0	9
771	PEM1C	2.71	2	5	2	2	0	11
772	PEM1C	0.53	2	5	1	2	0	10
773	PEM1C	0.36	2	4	1	2	0	9
774	PEM1C	0.55	2	5	1	2	0	10
775	PEM1C	2.09	2	5	2	2	0	11
776	PEM1C	0.48	2	4	1	2	0	9
777	PEM1C	3.49	2	5	3	2	0	12
778	PEM1C	0.61	2	5	1	2	0	10
779	PEM1C	0.71	2	5	1	2	0	10
780	PEM1C	0.38	2	5	1	2	0	10
781	PEM1C	0.58	2	5	1	2	0	10

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
782	PEM1C	0.97	2	5	1	2	0	10
783	PEM1C	0.31	2	5	1	2	0	10
784	PEM1C	0.78	2	5	1	2	0	10
785	PEM1C	1.05	2	5	2	2	0	11
786	PEM1C	3.47	2	5	3	2	0	12
787	PEM1C	2.72	2	5	2	2	0	11
788	PEM1C	0.91	2	4	1	2	0	9
789	PEM1C	2.28	2	4	2	2	0	10
790	PEM1C	0.46	2	4	1	2	0	9
791	PEM1C	3.22	2	5	3	2	0	12
792	PEM1C	3.08	2	4	3	2	0	11
793	PEM1C	1.97	2	4	2	2	0	10
794	PEM1C	0.60	2	5	1	2	0	10
795	PEM1C	0.64	2	5	1	2	0	10
796	PEM1C	2.39	2	4	2	2	0	10
797	PEM1C	3.02	2	4	3	2	0	11
798	PEM1C	1.74	2	5	2	2	0	11
799	PEM1C	2.57	2	4	2	2	0	10
800	PEM1C	0.37	2	5	1	2	0	10
801	PEM1C	0.45	2	5	1	2	0	10
802	PEM1C	0.37	2	5	1	2	0	10
803	PEM1C	1.58	2	4	2	2	0	10
804	PEM1C	1.15	2	4	2	2	0	10
805	PEM1C	0.33	2	4	1	2	0	9
806	PEM1C	0.38	2	4	1	2	0	9
807	PEM1C	1.60	2	4	2	2	0	10
808	PEM1C	4.62	2	3	3	2	0	10
809	PEM1C	0.27	2	4	1	2	0	9
810	PEM1C	2.69	2	5	2	2	0	11
811	PEM1C	0.77	2	3	1	2	0	8
812	PEM1C	3.74	2	5	3	2	0	12
813	PEM1C	1.11	2	5	2	2	0	11
814	PEM1C	1.12	2	4	2	2	0	10
815	PEM1C	0.91	2	4	1	2	0	9
816	PEM1C	0.77	2	5	1	2	0	10
817	PEM1C	0.49	2	5	1	2	0	10
818	PEM1C	0.26	2	5	1	2	0	10
819	PEM1C	0.87	2	5	1	2	0	10
820	PEM1C	0.97	2	5	1	2	0	10
821	PEM1C	0.53	2	5	1	2	0	10
822	PEM1C	0.81	2	5	1	2	0	10
823	PEM1C	0.37	2	5	1	2	0	10
824	PEM1C	0.39	2	5	1	2	0	10

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
825	PEM1C	0.41	2	5	1	2	0	10
826	PEM1C	2.03	2	5	2	2	0	11
827	PEM1C	0.99	2	5	1	2	0	10
828	PEM1C	2.20	2	5	2	2	0	11
829	PEM1C	1.72	2	4	2	2	0	10
830	PEM1C	3.15	2	5	3	2	0	12
831	PEM1C	2.01	2	5	2	2	0	11
832	PEM1C	1.03	2	4	2	2	0	10
833	PEM1C	0.76	2	4	1	2	0	9
834	PEM1C	3.74	2	4	3	2	0	11
835	PEM1C	4.10	2	4	3	2	0	11
836	PEM1C	0.41	2	4	1	2	0	9
837	PEM1C	0.38	2	4	1	2	0	9
838	PEM1C	5.93	2	5	4	2	3	16
839	PEM1C	3.34	2	5	3	2	0	12
840	PEM1C	1.18	2	4	2	2	0	10
841	PEM1C	1.62	2	5	2	2	0	11
842	PEM1C	0.35	2	4	1	2	0	9
843	PEM1C	0.43	2	5	1	2	0	10
844	PEM1C	4.19	2	5	3	2	0	12
845	PEM1C	0.32	2	5	1	2	0	10
846	PEM1C	0.62	2	4	1	2	0	9
847	PEM1C	1.67	2	5	2	2	0	11
848	PEM1C	10.73	2	4	5	2	0	13
849	PEM1C	2.92	2	5	2	2	0	11
850	PEM1C	1.18	2	4	2	2	0	10
851	PEM1C	6.90	2	5	4	2	0	13
852	PEM1C	0.77	2	5	1	2	0	10
853	PEM1C	0.39	2	5	1	2	3	13
854	PEM1C	11.36	2	5	5	2	3	17
855	PEM1C	3.26	2	5	3	2	3	15
856	PEM1C	7.46	2	5	5	2	3	17
857	PEM1C	5.00	2	5	4	2	3	16
858	PEM1C	1.65	2	5	2	2	0	11
859	PEM1C	2.08	2	5	2	2	3	14
860	PEM1C	5.35	2	5	4	2	3	16
861	PEM1Cd	0.61	2	4	1	0	0	7
862	PEM1Cd	0.82	2	4	1	0	0	7
863	PEM1Cd	16.47	2	5	5	0	0	12
864	PEM1Cd	18.54	2	5	5	0	0	12
865	PEM1Cd	0.50	2	4	1	0	0	7
866	PEM1Cd	0.55	2	4	1	0	0	7
867	PEM1Cd	1.36	2	5	2	0	0	9

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
868	PEM1Cd	11.33	2	4	5	0	0	11
869	PEM1Cd	3.99	2	4	3	0	0	9
870	PEM1F	7.75	3	4	5	2	0	14
871	PEM1F	0.37	3	4	1	2	3	13
872	PEM1F	1.60	3	4	2	2	3	14
873	PEM1F	37.80	3	5	5	2	3	18
874	PEM1F	182.04	3	5	5	2	3	18
875	PEM1F	44.47	3	4	5	2	3	17
876	PEM1F	37.12	3	4	5	2	3	17
877	PEM1F	41.86	3	5	5	2	3	18
878	PEM1F	15.27	3	5	5	2	3	18
879	PEM1F	0.51	3	5	1	2	0	11
880	PEM1F	0.45	3	5	1	2	0	11
881	PEM1F	13.42	3	5	5	2	0	15
882	PEM1F	14.81	3	5	5	2	0	15
883	PEM1F	2.48	3	5	2	2	0	12
884	PEM1F	2.53	3	4	2	2	0	11
885	PEM1F	1.88	3	5	2	2	0	12
886	PEM1F	1.76	3	5	2	2	0	12
887	PEM1F	2.40	3	5	2	2	0	12
888	PEM1F	1.38	3	4	2	2	0	11
889	PEM1F	4.51	3	5	3	2	0	13
890	PEM1F	7.23	3	5	5	2	0	15
891	PEM1F	6.45	3	5	4	2	3	17
892	PEM1F	28.17	3	5	5	2	3	18
893	PEM1F	0.99	3	4	1	2	0	10
894	PEM1F	1.70	3	5	2	2	3	15
895	PEM1F	2.45	3	5	2	2	3	15
896	PEM1F	2.34	3	5	2	2	3	15
897	PEM1F	2.68	3	4	2	2	0	11
898	PEM1F	26.95	3	5	5	2	3	18
899	PEM1F	5.36	3	4	4	2	0	13
900	PEM1F	25.35	3	5	5	2	3	18
901	PEM1F	0.74	3	4	1	2	0	10
902	L2ABG	33.00	4	4	5	2	0	15
903	L2ABG	16.43	4	4	5	2	0	15
904	PABF	9.45	3	5	5	2	0	15
905	PABF	10.78	3	4	5	2	0	14
906	PABF	36.69	3	5	5	2	0	15
907	PABF	13.06	3	5	5	2	0	15
908	PABF	56.95	3	5	5	2	0	15
909	PABF	32.98	3	4	5	2	0	14
910	PABFd	19.79	3	4	5	0	0	12

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
911	PEM1A	0.76	1	5	1	2	0	9
912	PEM1A	0.29	1	4	1	2	0	8
913	PEM1A	0.47	1	5	1	2	0	9
914	PEM1A	0.74	1	5	1	2	0	9
915	PEM1Ad	0.49	1	5	1	0	0	7
916	PEM1C	0.65	2	5	1	2	0	10
917	PEM1C	0.28	2	5	1	2	0	10
918	PEM1C	0.82	2	5	1	2	0	10
919	PEM1C	0.74	2	5	1	2	0	10
920	PEM1C	0.63	2	5	1	2	0	10
921	PEM1C	1.60	2	5	2	2	0	11
922	PEM1C	0.69	2	5	1	2	0	10
923	PEM1C	4.81	2	4	3	2	0	11
924	PEM1C	0.65	2	4	1	2	0	9
925	PEM1C	2.03	2	5	2	2	0	11
926	PEM1C	1.80	2	4	2	2	0	10
927	PEM1C	0.65	2	5	1	2	0	10
928	PEM1C	0.55	2	3	1	2	0	8
929	PEM1C	2.34	2	3	2	2	0	9
930	PEM1C	1.01	2	3	2	2	0	9
931	PEM1C	0.37	2	5	1	2	0	10
932	PEM1C	1.04	2	5	2	2	0	11
933	PEM1C	1.36	2	5	2	2	0	11
934	PEM1C	0.85	2	5	1	2	0	10
935	PEM1C	0.55	2	4	1	2	0	9
936	PEM1C	9.92	2	5	5	2	0	14
937	PEM1C	1.34	2	4	2	2	0	10
938	PEM1C	2.10	2	5	2	2	0	11
939	PEM1C	0.97	2	5	1	2	0	10
940	PEM1C	5.63	2	5	4	2	0	13
941	PEM1C	3.43	2	4	3	2	0	11
942	PEM1C	0.58	2	4	1	2	0	9
943	PEM1C	0.39	2	4	1	2	0	9
944	PEM1C	9.94	2	4	5	2	0	13
945	PEM1C	2.05	2	4	2	2	0	10
946	PEM1C	2.29	2	5	2	2	3	14
947	PEM1C	18.36	2	4	5	2	0	13
948	PEM1C	8.74	2	5	5	2	0	14
949	PEM1C	4.20	2	4	3	2	0	11
950	PEM1Cd	4.64	2	5	3	0	0	10
951	PEM1F	3.82	3	5	3	2	0	13
952	L2ABG	120.44	4	5	5	2	3	19
953	PEM1C	16.08	2	4	5	2	0	13

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
954	PEM1C	2.11	2	5	2	2	3	14
955	PEM1C	0.37	2	4	1	2	0	9
956	PEM1C	0.33	2	3	1	2	3	11
957	PEM1C	0.37	2	5	1	2	0	10
958	PEM1C	1.81	2	4	2	2	0	10
959	PEM1C	0.74	2	5	1	2	0	10
960	PEM1C	3.54	2	5	3	2	3	15
961	PEM1C	3.57	2	4	3	2	0	11
962	PEM1C	1.03	2	4	2	2	3	13
963	PEM1C	0.53	2	5	1	2	0	10
964	PABF	11.12	3	5	5	2	0	15
965	PEM1C	1.24	2	5	2	2	0	11
966	PEM1C	0.72	2	5	1	2	0	10
967	PABF	7.86	3	5	5	2	0	15
968	PEM1C	6.91	2	5	4	2	0	13
969	PEM1C	3.04	2	5	3	2	0	12
970	PEM1C	5.57	2	5	4	2	0	13
971	PEM1F	3.55	3	4	3	2	0	12
972	PABF	32.71	3	5	5	2	0	15
973	PEM1Cd	1.37	2	4	2	0	0	8
974	PEM1F	3.38	3	5	3	2	0	13
975	PEM1F	4.38	3	4	3	2	0	12
976	PEM1F	4.35	3	5	3	2	0	13
977	PEM1A	0.29	1	5	1	2	0	9
978	PEM1C	0.32	2	4	1	2	0	9
979	PEM1C	0.33	2	4	1	2	0	9
980	PEM1C	3.20	2	5	3	2	0	12
981	PEM1C	1.81	2	4	2	2	0	10
982	PEM1C	4.46	2	5	3	2	0	12
983	PABF	8.83	3	5	5	2	0	15
984	PEM1C	1.58	2	4	2	2	0	10
985	PEM1C	7.92	2	4	5	2	0	13
986	PEM1C	5.98	2	5	4	2	3	16
987	PEM1C	5.15	2	5	4	2	0	13
988	PABF	8.52	3	5	5	2	0	15
989	PEM1C	1.66	2	5	2	2	0	11
990	PEM1C	0.49	2	4	1	2	0	9
991	PEM1C	2.25	2	4	2	2	0	10
992	PEM1C	0.30	2	4	1	2	0	9
993	PEM1C	0.45	2	4	1	2	0	9
994	PEM1C	5.98	2	4	4	2	0	12
995	PEM1C	1.11	2	4	2	2	0	10
996	PEM1C	2.20	2	5	2	2	0	11

Habitat Suitablility Assessment Scores

OBJECTID	ATTRIBUTE	ACRES	REGIME	FOOD	SIZE	TYPE	DENSITY	TOTAL
997	PEM1A	3.33	1	5	3	2	0	11
998	PABF	58.26	3	5	5	2	0	15

B7. Attachment 1C. Pre-Construction Eagle and Avian Use Study, April 2017 through March 2018, for the Burke County Wind Project, Burke County, North Dakota

Pre-Construction Eagle and Avian Use Study
April 2017 through March 2018

for the

BURKE COUNTY WIND PROJECT
Burke County, North Dakota

Prepared for

Burke Wind, LLC
700 Universe Boulevard
Juno Beach, FL 33408

Submitted by Atwell LLC—Atwell Project No. 16000947

January 31, 2019

TABLE OF CONTENTS

Section		Page
EXECUTIVE SUMMARY		**I**
1.0	**INTRODUCTION**	**1**
2.0	**METHODS**	**2**
2.1	**Project Setting**	**2**
2.2	**Eagle Use Surveys**	**2**
2.3	**Avian Use Surveys**	**7**
2.4	**Incidental Observations**	**9**
2.5	**Data Management**	**9**
2.6	**Data Analysis**	**9**
2.6.1	Eagle Use Surveys	9
2.6.2	Avian Use Surveys	10
2.6.3	North Dakota Species of Conservation Priority	10
3.0	**RESULTS AND DISCUSSION**	**11**
3.1	**Bald Eagle Use**	**11**
3.1.1	Overall Detections	11
3.1.2	Seasonality	11
3.1.3	Other Raptor Use	12
3.1.4	Spatial Distribution of Detections	13
3.1.5	Directional Movements	16
3.1.6	Flight Heights	16
3.2	**Golden Eagles**	**20**
3.3	**Avian Use**	**21**
3.3.1	Federally Listed Threatened and Endangered Species	21
3.3.2	General Avian Use	21
3.3.3	Mean Flight Heights during Spring and Fall Migration	25
4.0	**REFERENCES**	**28**

TABLES

Table 1. Total Standardized Survey Effort by Point Count Station, April 2017 through March 2018—Burke County Wind Project (Burke County, North Dakota) 5
Table 2. Raptor Survey Seasonal Use Summary Statistics within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota) 14
Table 3. Raptor Survey Seasonal Use Summary Statistics within the Burke County Wind Project (Burke County, North Dakota) 15
Table 4. Raptor Mean Flight Heights within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota) 18
Table 5. Raptor Mean Flight Heights within the Burke County Wind Project (Burke County, North Dakota) 19
Table 6. Mean Flight Heights during Spring and Fall Migration within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota) 26
Table 7. Mean Flight Heights during Spring and Fall Migration within the Burke County Wind Project (Burke County, North Dakota) 27

APPENDICES

Appendix I. Report Figures

Figure 1. Avian and Raptor Use Point Count Schematic
Figure 2. Eagle Observation Map, April 2017 through March 2018
Figure 3. Seasonal Bald Eagle Detection Totals within the Burke County Wind Project and the Avian Use Study Area
Figure 4. Raptor Species Monthly Occurrence Frequency
Figure 5a. Seasonal Bald Eagle Mean Use, April 2017 through March 2018
Figure 5b. Seasonal Raptor Mean Use, All Raptor Species, April 2017 through March 2018
Figure 6a. Bald Eagle Flight Direction Rose Plot for Spring Migration Observations
Figure 6b. Bald Eagle Flight Direction Rose Plot for Fall Migration Observations

Appendix II. Spring and Fall Avian Use Survey – Summary Statistics Tables

Table A. Seasonal Use Summary Statistics for Waterfowl within the Burke County Wind Project
Table B. Seasonal Use Summary Statistics for Waterfowl within the Burke County Wind Project Avian Use Study Area
Table C. Seasonal Use Summary Statistics for Shorebirds, Waders, and Waterbirds (Shorebirds, Cranes, Herons, Pelicans, Grebes, Coots, Gulls, Terns) within the Burke County Wind Project
Table D. Seasonal Use Summary Statistics for Shorebirds, Waders, and Waterbirds (Shorebirds, Cranes, Herons, Pelicans, Grebes, Coots, Gulls, Terns) within the Burke County Wind Project Avian Use Study Area

Table E. Seasonal Use Summary Statistics for Large-Bodied Corvids, Large-Bodied Non-Passerines, and Upland Gamebirds within the Burke County Wind Project
Table F. Seasonal Use Summary Statistics for Large-Bodied Corvids, Large-Bodied Non-Passerines, and Upland Gamebirds within the Burke County Wind Project Avian Use Study Area
Table G. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project
Table H. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project Avian Use Study Area

Appendix III. Species Observed during Standardized Avian Use Surveys

ABBREVIATIONS AND ACRONYMS

Atwell	Atwell, LLC
ECPG	*Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2*
MW	megawatt
NDGFD	North Dakota Game and Fish Department
RSZ	rotor-swept zone
SCP	Species of Conservation Priority
SD	standard deviation

EXECUTIVE SUMMARY

This report summarizes one year of pre-construction eagle and avian use surveys conducted by Atwell, LLC on behalf of Burke Wind, LLC, a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, at the proposed Burke County Wind Project (the Project) in Burke County, North Dakota. Eagle and raptor use surveys were conducted biweekly from April 2017 through March 2018. Avian use surveys were conducted biweekly during the spring migration period (April through May 2017) and the fall migration period (mid-August through November 2017). All surveys were conducted within the Avian Use Study Area, defined as the original 300-megawatt (MW) Project plus a 1-mile (1.6 km) boundary area. In late 2018, the Project was reduced in size to 200 MW, and all subsequent references to the Project refer to this 200 MW configuration. Results of the eagle use and avian use studies are presented in this report for both the Avian Use Study Area (300 MW configuration plus boundary area) and the Project (200 MW configuration).

The 2012 *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines* recommend various studies to document avian use. This information can also be used to assess potential risk to avian species from wind energy development. One year of eagle and raptor use studies and spring and fall avian use surveys were completed to document vertical and horizontal use of the Project and Avian Use Study Area. Specific focus was directed on documenting avian activity within the 115 to 492 ft (35 to 150 m) rotor-swept zone (RSZ). Eagle and raptor use surveys were also conducted in accordance with recommendations provided by the 2013 U.S. Fish and Wildlife Service *Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2.*

Key Results

- Twenty-four Bald Eagle detections were recorded as part of standardized eagle use surveys in the Avian Use Study Area. An additional 26 Bald Eagle detections were recorded incidental to the surveys. Of the 24 standardized Bald Eagle detections, six occurred at points within the Project. Of the 26 incidental detections, seven occurred within the Project.
- Bald Eagle mean use rates were higher in the fall than the spring. Bald Eagles were not observed during standardized surveys in the summer or winter.
- No Bald Eagle concentration areas were found within the Avian Use Study Area, including the Project. There was also no evidence from the pattern of observations of eagles that physiographic features such as ridgelines were concentrating eagle use within specific areas of the Project. This lack of a spatial pattern in the spring and fall suggests that Bald Eagles migrate through the Avian Use Study Area in a broad front.
- Two Golden Eagle detections occurred during standardized eagle use surveys. An additional six Golden Eagles were detected incidental to the surveys. Of the two standardized detections, one occurred within the Project. Of the six incidental detections, three occurred within the Project.

- No federal threatened/endangered avian species were observed using habitat in the Avian Use Study Area during standardized avian use point count surveys. Three Whooping Cranes were incidentally observed flying over the Project, well above the RSZ, during northbound spring migration (early April 2017).
- With some exceptions, avian use rates tended to be higher in the fall than in the spring, an expected pattern in North America. Seasonal use rates for Sandhill Cranes were lower within the Project than across the larger Avian Use Study Area, and observations of the highest Sandhill Crane concentrations occurred east of the current 200 MW turbine configuration. Mean use rates for grassland species such as the Bobolink and Western Meadowlark were also lower within the Project than across the Avian Use Study Area.

1.0 INTRODUCTION

Atwell was contracted in 2017 by Burke Wind, LLC, a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, to conduct pre-construction eagle use and avian use studies for the proposed Burke County Wind Project (the Project) in Burke County, North Dakota. All surveys were conducted within the Avian Use Study Area, defined as the original 300-megawatt (MW) Project plus an additional 1-mile (1.6 km) boundary area. In late 2018, the Project was reduced in size to 200 MW, and all subsequent references to the Project refer to this 200 MW configuration. In Figure 1 (**Appendix I**), the Avian Use Study Area is shown with a dashed line around the 200 MW Project, which is delineated with a solid black line.

The objective of the studies summarized in this report was to document eagle and avian use within the proposed Project. Survey protocols described herein were designed to adhere to Tier 3 of the *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines* (USFWS 2012) and Stage 2 assessments described in the *Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2* (ECPG) (USFWS 2013). These two documents provide wind energy developers and operators guidance for adhering to the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act, respectively. Additionally, Atwell utilized industry standard approaches for avian use studies as promoted by the National Wind Wildlife Collaborative (e.g., Strickland et al. 2011).

2.0 METHODS

The avian resource survey methods summarized in this section were originally described in an avian resources study plan (Atwell 2017b) submitted to the North Dakota Game and Fish Department (NDGFD) and the U.S. Fish and Wildlife Service for review and comment on October 11, 2017. Feedback on the plan was received from NDGFD on November 16, 2017; the comments referenced breeding bird assessment protocols described in Atwell (2018) and did not address eagle/raptor use or the avian use study design and protocols described in this report.

This report adheres to taxonomy outlined in the American Ornithological Society's online *Checklist of North and Middle American Birds*, 59th supplement (Chesser et al. 2018).

2.1 Project Setting

The Project is situated on approximately 22,933 acres (9,281 hectares) in Burke County, northwest North Dakota (Figure 1, **Appendix I**). The Project land area is predominantly agricultural cropland and grassland within a regional prairie pothole wetland system. The general topography of the Project slopes along a ridgeline that is oriented southeast-northwest. Elevations within the Project range from approximately 2,159 to 2,502 ft (658 to 762 m) above mean sea level.

According to the 2011 National Land Cover Database – Land Use Land Cover data set, approximately 54.1% of the Project land area is grassland-type habitat (approximately 12,400 acres [5,018 hectares] of herbaceous and hay/pasture land cover types), and 32.0% is classified as cultivated crops (7,346 acres [2,973 hectares]) (Homer et al. 2015). Additional cover classifications found within the Project include open water (4.7%), emergent herbaceous wetlands (4.1%), aggregated development classifications (3.4%), deciduous forest (1.5%), and woody wetlands (0.2%).

2.2 Eagle Use Surveys

Eagle use surveys followed a fixed-point protocol to document activity and behavior of individual eagle detections (e.g., minutes of flight within a cylindrical air-space plot). The surveys were conducted in accordance with the ECPG (USFWS 2013), a protocol based on a 2,625 ft (800 m) fixed-radius circular plot approach (Strickland et al. 2011). Eagle surveys were conducted year-round during the spring (March through May), summer (June through July), fall (August through November), and winter (December through February). The survey period began in April 2017 and continued through March 2018. Raptor species detections were also recorded during eagle use surveys.

The study plan established 34 roadside point count stations across the Avian Use Study Area, with the goal of having survey coverage for 30% of the originally planned 300 MW configuration (Figure 1*,* **Appendix I**). At the time when the original point count station locations were established, the project layout was in the early stages of development, and it was anticipated to evolve over time. Therefore, the objective for establishing point count station locations was to achieve as much

coverage of the 300 MW area as possible, given land access restrictions. Locations were selected so the 2,625 ft (800 m)–radius survey cylinder for each station had the greatest possible extent of overlap with the Avian Use Study Area. Point count stations were located along roads with low traffic levels and where reasonable survey vantages of the surrounding landscape were obtainable. Because land acquisition was in the early stages at the time of study plan development, point count stations were restricted to roadside locations.

The only way to obtain survey coverage of some portions of the Avian Use Study Area and/or have adequate visibility was to locate point count stations outside of, but adjacent to, the originally planned 300 MW area. As much as possible of each point count station's survey area coincided with the 300 MW configuration. Ground-truthing for these factors in April 2017 shifted eight of the 34 point count stations to locations that did not fully overlap with the 300 MW area but did provide sufficient visibility.

The collective survey area coverage for the original 34 point count station locations comprised 16.55% (11,373 acres [4,602 hectares]) of the Avian Use Study Area. In June 2017, six additional point count stations (stations #50–55 in Figure 1, **Appendix I**) were added to increase sampling effort and spatial coverage during the summer survey period. These six stations were placed following the guidelines described above, on unimproved roadways in portions of the Project that lacked year-round accessibility (Atwell 2017b). The addition of these six points increased the sampling size to 40 and increased survey coverage of the Avian Use Study Area to 20.79% (14,285 acres [5,781 hectares]).

In late 2018, the Project was reconfigured to 200 MW (Figure 1, **Appendix I**). Fifteen of the original 34 point count stations' 2,625 ft (800 m)–radius survey cylinders intersect the 200 MW Project, covering 19.87% (4,557 acres [1,844 hectares]). Twelve of these 15 points are within the current Project (Table 1); the remaining three are located outside the Project but have survey areas that overlap the Project.

The ECPG recommends obtaining 30% coverage of an area that encompasses all wind turbines plus a 3,281 ft (1 km) buffer around each wind turbine. However, it is not uncommon for the 30% goal to not be achieved for final project layouts because of land access restrictions, inadequate visibility, and changes to project layout during the development period, which can result in significant changes. In this case, the coverage achieved for eagle use surveys, calculated for the current 200 MW Project, was 20.97% (5,511 acres [2,230 hectares]), including the wind turbine 3,281 ft (1 km) buffer area.

The 34 point count stations initially surveyed in accordance with the study plan were divided into two subgroups of 17 each; the two subgroups were surveyed on alternating weeks. Each point count station was surveyed for 60 minutes twice monthly over a one-year period. The six additional point count stations (stations #50–55; Figure 1, **Appendix I**) added in June 2017, increased the

sampling effort and spatial coverage during the summer. Surveys were conducted between dawn and dusk. The eagle use survey effort at each point count station is summarized by season in Table 1.

Table 1. Total Standardized Survey Effort by Point Count Station, April 2017 through March 2018—Burke County Wind Project (Burke County, North Dakota)

	Eagle Use Survey Standardized Effort (hours)					Avian Use Survey Effort (hours)		
Point Count Station	Winter	Spring	Summer	Fall	Total Hours	Spring	Fall	Total Hours
10	6	6	4	8	24	2	2.67	4.67
11*	6	6	4	8	24	2	2.67	4.67
12**	6	6	4	8	24	2	2.67	4.67
13*	6	6	4	8	24	2	2.67	4.67
14*	6	6	4	8	24	2	2.67	4.67
15*	6	7^	4	8	25	2.33^	2.67	5
16*	6	6	4	8	24	2	2.67	4.67
17*	6	5^	4	8	23	1.67^	2.67	4.33
18**	6	6	4	8	24	2	2.67	4.67
19*	6	6	4	8	24	2	2.67	4.67
20	6	6	4	8	24	2	2.67	4.67
21	6	6	4	8	24	2	2.67	4.67
22*	6	6	4	8	24	2	2.67	4.67
23*	6	6	4	8	24	2	2.67	4.67
24	6	6	4	8	24	2	2.67	4.67
25*	6	6	4	8	24	2	2.67	4.67
26*	6	6	4	8	24	2	2.67	4.67
27**	6	6	4	8	24	2	2.67	4.67
28	6	6	4	8	24	2	2.67	4.67
29	6	6	4	8	24	2	2.67	4.67
31*	6	6	4	8	24	2	2.67	4.67
32	6	6	4	8	24	2	2.67	4.67
33	6	6	4	8	24	2	2.67	4.67
34	6	6	4	8	24	2	2.67	4.67
35	6	6	4	8	24	2	2.67	4.67

Table 1. Total Standardized Survey Effort by Point Count Station, April 2017 through March 2018—Burke County Wind Project (Burke County, North Dakota)

	Eagle Use Survey Standardized Effort (hours)					Avian Use Survey Effort (hours)		
Point Count Station	Winter	Spring	Summer	Fall	Total Hours	Spring	Fall	Total Hours
36	6	6	4	8	24	2	2.67	4.67
39	6	6	4	8	24	2	2.67	4.67
40	6	6	4	8	24	2	2.67	4.67
41	6	6	4	8	24	2	2.67	4.67
42	6	6	4	8	24	2	2.67	4.67
43	6	6	4	8	24	2	2.67	4.67
44	6	6	4	8	24	2	2.67	4.67
45	6	6	4	8	24	2	2.67	4.67
46	6	6	4	8	24	2	2.67	4.67
50	0	0	4	0	4	0	0	0
51	0	0	4	0	4	0	0	0
52	0	0	4	0	4	0	0	0
53	0	0	4	0	4	0	0	0
54	0	0	4	0	4	0	0	0
55	0	0	4	0	4	0	0	0
Grand Total	**204**	**204**	**160**	**272**	**840**	**68**	**90.67**	**158.67**

All point count stations in this table coincided with the original 300 MW project configuration.
* Point count survey area coincides with the 200 MW Project (using layout dated December 2018).
** Point count survey area coincides with the 200 MW Project (using layout dated December 2018), but survey station outside of 200 MW Project.
^ Point #17 was inaccessible on March 7, 2018 due to inclement weather. Following winter storm protocols described in Atwell (2017b), point #15 was surveyed in point #17's place.
Points #50–55 were added to the sample in June 2017 and were only surveyed during the summer period because of seasonal accessibility (see Section 2.2).
Point numbering began at #10 to avoid single-digit identifiers.

A total of 840 standardized eagle use survey hours were completed as part the one-year eagle use survey (Table 1) for the Avian Use Study Area. A total of 360 standardized eagle use survey hours were completed at 15 points within 2,625 ft (800 m) of the 200 MW Project, and 288 standardized eagle use survey hours were completed at 12 points within the Project boundary.

For each raptor observation, including eagles, the following information was recorded:

- Raptor species
- Age
- Times at first and final observation
- Duration of the raptor observation (rounded to the nearest minute)
- Behavior
- Height of flight at first detection, and minimum and maximum flight height during observation within the standardized survey cylinder.

Additional data were recorded for each eagle observed during the standardized surveys, including the distance to initial eagle detection, closest distance to the detection, time of detection, duration of flight within the rotor-swept zone (RSZ) to the nearest 0.1 minute, and duration of flight within the 2,625 ft (800 m)–radius, 656 ft (200 m)–high survey cylinder to the nearest full minute, rounded upward for fractions of a minute (e.g., eagle-minutes; USFWS 2013). Eagle flight paths were also mapped to document eagles' directional movements within the survey area. While not part of the standardized survey protocol, these data were also recorded for incidental eagle observations where feasible.

At the conclusion of each eagle survey event, biologists confirmed that the data sheet was complete and legible and then proceeded to the next survey station.

2.3 Avian Use Surveys

Point count methodologies adhered to typical industry standard recommendations (National Wind Coordinating Committee 1999, Strickland et al. 2011) and those targeted specifically at providing collision risk due diligence. The same point count stations that were established for eagle use surveys were also used for the avian use surveys. However, the avian use surveys were conducted during the spring (March to May) and fall (August to November) migration periods. Avian point count surveys during the spring migration period were conducted between April 1 and May 31, 2017, and between March 1 and March 31, 2018. The fall migration avian point count surveys were conducted between August 1 and November 30, 2017. As with the timing of eagle use surveys (Section 2.2), points were divided into two subgroups; each subgroup was surveyed on alternating weeks, and each point was visited twice per month.

These survey periods coincide with the periods of highest expected avian use during the year. Point count methodology followed the ECPG but with minor adaptations to accommodate the capture of baseline avian use data for a wider array of avian taxa.

The point count protocol was designed to document diurnal horizontal and vertical bird movements through the Avian Use Study Area. For each point count station monitoring event, biologists conducted a 20-minute point count, recording all avian species detected during that period. Large-bodied birds detected within a 2,625 ft (800 m)–radius survey cylinder (0.77 square miles [2 km^2]) and small-bodied birds detected within a 984 ft (300 m)–radius survey cylinder (0.11 square miles [0.28 km^2]) were recorded. Small-bodied species include the passerine group (perching birds except large-bodied crows and ravens) and most non-passerine species (woodpeckers, doves, hummingbirds, swifts). Large-bodied species include all waterfowl, waterbirds (gulls, terns, cormorants, pelicans), wading birds (herons, cranes, ibises), shorebirds, upland gamebirds (pheasants, grouse, partridges), and some non-passerines and passerines (nightjars, Rock Pigeons *[Columba livia],* Pileated Woodpeckers *[Dryocopus pileatus],* and large-bodied corvids such as crows and ravens).

In total, avian use surveys were conducted over 68 cumulative hours during the spring survey periods in 2017 and 2018 and over 90.7 cumulative hours during the fall survey period in 2017. The surveys occurred over 30 cumulative hours during the spring survey periods in 2017 and 2018 at 15 points within 2,625 ft (800 m) of the Project, and over 24 cumulative hours at 12 points within the Project boundary. Avian use surveys occurred over 40 cumulative hours during the 2017 fall survey period at 15 points within 2,625 ft (800 m) of the Project, and over 32 cumulative hours during the fall 2017 survey period at 12 points within the Project boundary. Avian use survey effort for each point is summarized in Table 1.

The start and end times of the 20-minute observation period were recorded for each survey event. Surveys were conducted between dawn and dusk. For each bird observation (visual and auditory), biologists recorded the following information:

- Species
- Time at which the bird was first observed
- Number of associated individuals (where birds are observed as part of a pair or flock)
- Behavior
- Height of flight
- Distance from observer
- Habitat in which the bird was first observed.

At the conclusion of each 20-minute observation period/survey event, biologists confirmed that the data sheet was complete and legible and then proceeded to the next survey station.

2.4 Incidental Observations

Outside of standardized surveys, incidental avian data were recorded for raptors, eagles, and bird species of concern that were observed within the Avian Use Study Area. Attention was given to habitats that may act as local concentration points for a variety of avian taxa and potential habitat for bird species of concern. All observation locations were marked with a global positioning system (i.e., GPS), and species, number of individuals, and behaviors were recorded. Incidental detections included observations recorded while en route to surveys, birds observed outside the 2,625 ft (800 m)–radius, 656 ft (200 m)–high standardized survey cylinder during point count surveys, birds observed immediately outside the beginning and end of the point count survey's duration, and birds observed during nonstandardized breeding bird surveys.

2.5 Data Management

The survey protocols described above were performed by five avian biologists over the course of the study. All completed data forms were proofread and photocopied, with data subsequently entered into an electronic database and proofread as part of a quality assurance/quality control program.

2.6 Data Analysis

2.6.1 Eagle Use Surveys

Eagle and avian use survey data were organized and analyzed with Microsoft Excel and Program R (R Core Team 2018). The following metrics were recorded in the field or calculated later using data collected from the eagle use surveys:

- *Seasonal mean use rate* for eagles and other raptors is the total number of individuals detected during standardized surveys per 2,625 ft (800 m)–radius plot per 20-minute survey segment. All three consecutive 20-minute segments of each point visit's 60-minute count were used to calculate mean use rates. Reported as detections/800 m plot/20-minute point count segment, seasonal mean use rates are summarized for each individual point count station and averaged across all point count stations. Data were summarized in 20-minute segments rather than for the entire 60-minute visit for ease of data management and to allow comparison with avian use data that were also collected over 20-minute segments, if desired.
- *Raptor occurrence frequency* is the number of 20-minute survey segments during which a species was detected, divided by the total number of 20-minute survey segments conducted. Occurrence frequency is summarized by month and season. All three 20-minute

segments of each point visit's 60-minute count were used to calculate occurrence frequencies. Incidental detections are not included in occurrence frequency calculations.

- *Flight time* was recorded to the nearest 0.1 minute for duration of bird flight within the RSZ and less than 2,625 ft (800 m) from the survey point for all raptors. Following ECPG (USFWS 2013), eagle-minutes were also recorded for all Bald Eagle *(Haliaeetus leucocephalus)* and Golden Eagle *(Aquila chrysaetos)* detections. Eagle-minutes represent the duration of flight (to the nearest minute, rounded up for fractions) within the 2,625 ft (800 m)–radius, 656 ft (200 m)–high survey cylinder.
- *Direction of movement* was recorded during the surveys to analyze seasonal patterns in movement. All Bald Eagle and Golden Eagle detections within the survey cylinder were also plotted on 328 x 328 ft (100 x 100 m) gridded maps to document flight paths through the survey cylinder.
- *Raptor species percent composition* is the total number of observed individuals of the taxon divided by the total number of raptors observed during the survey period. Incidental detections are not included in percent composition calculations.

2.6.2 Avian Use Surveys

For data collected during the avian use surveys, the seasonal mean use rate represents the total number of individuals detected during standardized surveys per 2,625 ft (800 m)–radius plot per 20-minute survey for large-bodied species, and the total number of individuals detected per 984 ft (300 m)–radius plot per 20-minute survey for small-bodied species. Reported as detections/800 m plot/20-minute count segment for large-bodied species and detections/300 m plot/20-minute count segment for small-bodied species, seasonal mean use rates are summarized for each individual point count station and averaged across all point count stations. Flight heights are likewise reported for flights recorded within the 2,625 ft (800 m)–radius plot for large-bodied species and within the 984 ft (300 m)–radius plot for small-bodied species.

2.6.3 North Dakota Species of Conservation Priority

The North Dakota State Wildlife Action Plan (Dyke et al. 2015) lists Species of Conservation Priority (SCP), including avian SCP species. Under this plan, species are classified according to their conservation priority. Level I species have a high conservation priority because of declining status in North Dakota or across their range, or because North Dakota represents a core segment of their breeding range. Level II species have moderate conservation priority or may hold a high conservation priority, but a substantial level of non–State Wildlife Grant funding may be available for their conservation. Level III species have moderate conservation priority but are peripheral or nonbreeding in North Dakota.

3.0 RESULTS AND DISCUSSION

Eagle use survey results, along with discussion regarding annual and seasonal patterns, spatial distribution (where sample size allowed), directional movements, and flight heights are presented in Sections 3.1 and 3.2. Monthly occurrences, frequencies, and flight heights for all spring and fall avian use are discussed in Section 3.3. All survey results are presented for the 200 MW Project as well as for the entire Avian Use Study Area.

3.1 Bald Eagle Use

3.1.1 Overall Detections

Across the Avian Use Study Area, 24 Bald Eagles were detected over 840 hours of standardized eagle use survey effort (Table 2). This total includes several detections that were the same individual counted twice in concurrent 20-minute count segments. Accounting for this potential duplication, 21 discrete Bald Eagle observations that occurred within the standardized survey cylinder during point count surveys are mapped on Figure 2 (**Appendix I**). While these totals only include eagles observed within the 2,625 ft (800 m)–radius, 656 ft (200 m)–high survey cylinder, an additional 26 incidental detections were documented across the Avian Use Study Area during the one-year survey period, including detections outside the survey cylinder during point count surveys and detections recorded while en route to point count stations.

Six of the 24 standardized Bald Eagle detections occurred over 360 hours of standardized eagle use survey effort at the 15 point count stations with survey cylinders that intersected the Project (Table 3). Seven incidental Bald Eagle detections occurred within the Project. Bald Eagle totals are depicted by season, separated by detection type (standardized survey or incidental) within the Project and the Avian Use Study Area, in Figure 3 (**Appendix I**).

3.1.2 Seasonality

Bald Eagles were only recorded as standardized detections during the spring and fall surveys. Surveyors did not observe Bald Eagles during summer surveys, and Bald Eagles were only recorded as incidental detections during winter surveys. Within the Avian Use Study Area, standardized mean use was 0.013 Bald Eagle detections/800 m plot/20-minute survey segment (standard deviation [SD] = 0.114) during the spring survey period and 0.020 Bald Eagle detections/800 m plot/20-minute survey segment (SD = 0.170) during the fall period (Table 2). Within the Project, spring standardized mean use was 0.016 Bald Eagle detections/800 m plot/20-minute survey segment (SD = 0.105) and fall standardized mean use was 0.010 Bald Eagle detections/800 m plot/20-minute count segment (Table 3). Monthly species-specific occurrence frequencies, depicted in Figure 4 (**Appendix I**), provide additional seasonal context for raptor use of the Avian Use Study Area by charting frequency of occurrence for the most common raptor species across the year.

Accounting for the total eagle use survey effort across the Avian Use Study Area during the spring survey period, the equivalent of one Bald Eagle was detected for every 25.6 hours of standardized eagle use survey effort. During the fall survey period, the equivalent of one Bald Eagle was detected for every 16.7 hours of standardized eagle use survey effort.

Accounting for total eagle use survey effort across the Project (15 points with survey cylinders intersecting the Project, 90 spring survey hours, and 120 fall hours) one Bald Eagle was detected within the Project for every 30 hours of standardized eagle use survey effort during the spring. One Bald Eagle was detected within the Project for every 40 hours of standardized eagle use surveys during the fall.

3.1.3 Other Raptor Use

Observed Bald Eagle seasonal use patterns indicated slightly higher eagle use in the fall than the spring and low levels of eagle use in the summer and winter. These use patterns generally paralleled the seasonal use patterns for the raptor guild (hawks, eagles, falcons, and owls) (Tables 2 and 3). Mean raptor use was:

- *highest* during the fall period (Project: 0.861 raptors/800 m plot/20-minute survey segment; Avian Use Study Area: mean use = 0.787 raptors/800 m plot/20-minute survey segment; SD = 1.451),
- *similar* during the spring (Project: 0.700 raptors/800 m plot/20-minute survey segment; Avian Use Study Area: mean use = 0.760 raptors/800 m plot/20-minute survey segment; SD = 1.266),
- *low* in the summer (Project: 0.411 raptors/800 m plot/20-minute survey segment; Avian Use Study Area: mean use = 0.452 raptors/800 m plot/20-minute survey segment; SD = 0.803), and
- *very low* during the winter period (Project: 0.56 raptors/800 m plot/20-minute survey segment; Avian Use Study Area: mean use = 0.039 raptors/800 m plot/20-minute survey segment; SD = 0.203).

A total of 24 raptors were observed over 204 hours of standardized eagle use surveys across the Avian Use Study Area during the winter.

Among the raptor guild as a whole, Red-tailed Hawks *(Buteo jamaicencis)* and Northern Harriers *(Circus cyaneus)* comprised much of the raptor use during the spring and fall (Tables 2 and 3). Swainson's Hawks (*Buteo swainsoni)*, which arrived in migration later in the spring, comprised much of the summer raptor use. Rough-legged Hawks *(Buteo lagopus),* which arrived in fall migration, comprised much of the winter use. Winter raptor use of the Project was minimal once wintering Rough-legged Hawks moved south of the Project, during the coldest part of the season.

3.1.4 Spatial Distribution of Detections

Bald Eagle mean use rates were uniformly low across the Avian Use Study Area and the 200 MW Project. There was not a clear spatial pattern to eagle detections within the spring or fall, the seasons in which they were detected during standardized surveys. There was no evidence from the pattern of observations of eagles that physiographic features such as ridgelines were concentrating eagle use within specific areas of the Project; this lack of a spatial pattern in the spring and fall suggests that Bald Eagles migrate through the Avian Use Study Area in a broad front. Bald Eagle mean use in the spring and fall is graphically depicted in the Bald Eagle Mean Use Map (Figure 5a, **Appendix I**).

For additional context, a review of the raptor guild's larger sample size shows that raptors as a whole did not exhibit strong inter-seasonal patterns of spatial use within the Avian Use Study Area that might suggest local concentrations of use. However, point count stations with the highest spring and summer raptor use rates tended to be in the portion of the Avian Use Study Area to the east of the Project (Figure 5b, **Appendix I**). In contrast, the four point count stations (stations #25, 16, 11, and 27) with the highest observed mean use rates during the fall were within the western portion of the Avian Use Study Area, within or adjacent to the Project.

Table 2. Raptor Survey Seasonal Use Summary Statistics within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/ Species Name	Spring					Summer					Fall					Winter				
	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20 min)	SD.	Occur. Freq.	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20 min)	SD	Occur. Freq.	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20 min)	SD	Occur. Freq.	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot/ 20 min)	SD	Occur. Freq.
American Kestrel [b]	10	0.022	0.016	0.127	0.016	2	0.009	0.004	0.064	0.004	14	0.022	0.017	0.148	0.015	-	-	-	-	-
Bald Eagle [b]	8	0.017	0.013	0.114	0.013	-	-	-	-	-	16	0.025	0.020	0.170	0.015	-	-	-	-	-
Broad-winged Hawk	1	0.002	0.002	0.040	0.002	-	-	-	-	-	25	0.039	0.031	0.584	0.007	-	-	-	-	-
Cooper's Hawk	5	0.011	0.008	0.090	0.008	4	0.018	0.008	0.091	0.008	12	0.019	0.015	0.130	0.013	-	-	-	-	-
Ferruginous Hawk [a]	-	-	-	-	-	-	-	-	-	-	4	0.006	0.005	0.070	0.005	-	-	-	-	-
Golden Eagle [b]	-	-	-	-	-	-	-	-	-	-	1	0.002	0.001	0.035	0.001	1	0.042	0.002	0.040	0.002
Great Horned Owl	5	0.011	0.008	0.090	0.008	1	0.005	0.002	0.046	0.002	3	0.005	0.004	0.078	0.002	-	-	-	-	-
Merlin	4	0.009	0.007	0.081	0.007	-	-	-	-	-	6	0.009	0.007	0.085	0.007	-	-	-	-	-
Northern Goshawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.042	0.002	0.040	0.002
Northern Harrier [b]	171	0.368	0.279	0.686	0.186	26	0.120	0.054	0.236	0.052	154	0.240	0.189	0.484	0.158	-	-	-	-	-
Osprey	1	0.002	0.002	0.040	0.002	-	-	-	-	-	1	0.002	0.001	0.035	0.001	-	-	-	-	-
Peregrine Falcon [c]	3	0.006	0.005	0.070	0.005	1	0.005	0.002	0.046	0.002	-	-	-	-	-	-	-	-	-	-
Prairie Falcon [b]	-	-	-	-	-	-	-	-	-	-	1	0.002	0.001	0.035	0.001	-	-	-	-	-
Red-tailed Hawk	201	0.432	0.328	0.808	0.203	136	0.627	0.283	0.655	0.219	296	0.461	0.363	0.802	0.234	-	-	-	-	-
Rough-legged Hawk	2	0.004	0.003	0.057	0.003	-	-	-	-	-	54	0.084	0.066	0.344	0.047	11	0.458	0.018	0.145	0.016
Sharp-shinned Hawk	6	0.013	0.010	0.099	0.010	-	-	-	-	-	15	0.023	0.018	0.152	0.016	-	-	-	-	-
Short-eared Owl [b]	1	0.002	0.002	0.040	0.002	-	-	-	-	-	-	-	-	-	-	3	0.125	0.005	0.070	0.005
Snowy Owl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0.167	0.007	0.081	0.007
Swainson's Hawk [a]	34	0.073	0.056	0.263	0.049	44	0.203	0.092	0.329	0.079	28	0.044	0.034	0.235	0.025	-	-	-	-	-
Turkey Vulture	10	0.022	0.016	0.161	0.011	3	0.014	0.006	0.079	0.006	10	0.016	0.012	0.140	0.009	-	-	-	-	-
Unknown Accipiter	-	-	-	-	-	-	-	-	-	-	1	0.002	0.001	0.035	0.001	-	-	-	-	-
Unknown Eagle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.125	0.005	0.070	0.005
Unknown Falcon	-	-	-	-	-	-	-	-	-	-	1	0.002	0.001	0.035	0.001	1	0.042	0.002	0.040	0.002
Unknown Owl Species	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown Raptor	3	0.006	0.005	0.070	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All Raptors	**465**	**1.000**	**0.760**	**1.266**	**0.389**	**217**	**1.000**	**0.452**	**0.803**	**0.327**	**642**	**1.000**	**0.787**	**1.451**	**0.420**	**24**	**1.000**	**0.039**	**0.203**	**0.038**

Seasonal mean use statistics by species

- *Total Standard Detections* = total number of detections occurring within the 800 m–radius survey cylinder during standardized use surveys
- Detection totals are cumulative and occasionally may double-count individuals observed across concurrent 20-minute segments at the point.
- *Composition* = fraction of species composition using total standardized detections
- *Mean Use* = total standardized detections divided by number of point count segments conducted within the season, with standard deviation (SD)
- *Occurrence Frequency* = the number of segments at which the taxon was detected divided by the total number of segments conducted during that season
- North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table 3. Raptor Survey Seasonal Use Summary Statistics within the Burke County Wind Project (Burke County, North Dakota)

	Spring					Summer					Fall					Winter				
Species Group/Species Name	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20 min)	SD	Occur. Freq.	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20-min)	SD	Occur. Freq.	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20 min)	SD	Occur. Freq.	Total Std. Detections	%Comp.	Mean Use (birds/ 800 m plot /20 min)	SD	Occur. Freq.
American Kestrel b	2	0.011	0.007	0.086	0.007	-	-	-	-	-	7	0.023	0.019	0.157	0.017	-	-	-	-	-
Bald Eagle b	3	0.016	0.011	0.105	0.011	-	-	-	-	-	3	0.010	0.008	0.118	0.006	-	-	-	-	-
Broad-winged Hawk	-	-	-	-	-	-	-	-	-	-	18	0.058	0.050	0.846	0.008	-	-	-	-	-
Cooper's Hawk	3	0.016	0.011	0.105	0.011	2	0.027	0.011	0.105	0.011	7	0.023	0.019	0.157	0.017	-	-	-	-	-
Ferruginous Hawk a	-	-	-	-	-	-	-	-	-	-	2	0.006	0.006	0.074	0.006	-	-	-	-	-
Golden Eagle b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.067	0.004	0.061	0.004
Great Horned Owl	2	0.011	0.007	0.086	0.007	-	-	-	-	-	3	0.010	0.008	0.118	0.006	-	-	-	-	-
Merlin	1	0.005	0.004	0.061	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Goshawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.067	0.004	0.061	0.004
Northern Harrier b	69	0.365	0.256	0.683	0.174	8	0.108	0.044	0.232	0.039	76	0.245	0.211	0.528	0.175	-	-	-	-	-
Osprey	-	-	-	-	-	-	-	-	-	-	1	0.003	0.003	0.053	0.003	-	-	-	-	-
Peregrine Falcon c	1	0.005	0.004	0.061	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rough-legged Hawk	2	0.011	0.007	0.086	0.007	-	-	-	-	-	26	0.084	0.072	0.395	0.047	6	0.400	0.022	0.148	0.022
Red-tailed Hawk	82	0.434	0.304	0.779	0.189	53	0.716	0.294	0.536	0.256	135	0.435	0.375	0.773	0.247	-	-	-	-	-
Sharp-shinned Hawk	4	0.021	0.015	0.121	0.015	-	-	-	-	-	8	0.026	0.022	0.181	0.017	-	-	-	-	-
Short-eared Owl b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.133	0.007	0.086	0.007
Snowy Owl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0.267	0.015	0.121	0.015
Swainson's Hawk a	16	0.085	0.059	0.266	0.052	11	0.149	0.061	0.262	0.056	19	0.061	0.053	0.308	0.033	-	-	-	-	-
Turkey Vulture	4	0.021	0.015	0.149	0.011	-	-	-	-	-	5	0.016	0.014	0.158	0.008	-	-	-	-	-
Falcon sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.067	0.004	0.061	0.004
All Raptors	**189**	**-**	**0.700**	**1.205**	**0.378**	**74**	**--**	**0.411**	**0.641**	**0.333**	**310**	**-**	**0.861**	**1.730**	**0.444**	**15**	**-**	**0.056**	**0.229**	**0.056**

Seasonal mean use statistics by species

- *Total Standard Detections* = total number of detections occurring within the 800 m–radius survey cylinder during standardized use surveys
- Detection totals are cumulative and occasionally may double-count individuals observed across concurrent 20-minute segments at the point.
- *Composition* = fraction of species composition using total standardized detections
- *Mean Use* = total standardized detections divided by number of point count segments conducted within the season, with standard deviation (SD)
- *Occurrence Frequency* = the number of segments at which the taxon was detected divided by the total number of segments conducted during that season
- North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

3.1.5 Directional Movements

Rose plots provide a broad-scale view of directional movement patterns throughout the Avian Use Study Area (Figures 6a and 6b [**Appendix I**]). These figures plot frequencies of directional movement among eagles observed during standardized surveys by season. Green-shaded 'petals' provide an illustrated assessment of each cardinal direction's relative dominance among movements captured in the sample. The strongest trends were for Bald Eagle movements—north-northwestward in the spring and southward in the fall. These patterns are expected for individuals encountered during their migrations, suggesting that the Bald Eagles observed during the standardized surveys were migratory, not wintering or breeding within or near the Avian Use Study Area. Directional movement plots are only provided for the Avian Use Study Area because of low sample sizes recorded within the 200 MW Project.

3.1.6 Flight Heights

Tables 4 and 5 summarize the mean distributions of minimum and maximum flight heights for raptor species with the largest sample sizes detected during standardized eagle use surveys. These two tables detail seasonal flight heights within the Avian Use Study Area and at 15 points with survey cylinders that intersect the Project, respectively. The following is a summary of flight height results.

- Spring – Mean flight heights within the Project and the larger Avian Use Study Area were highest during the spring survey period for Bald Eagles and most other raptor species (Tables 4 and 5). Bald Eagle mean minimum and maximum flight heights were within the RSZ during the spring period, within both the Project and the larger Avian Use Study Area. Within the Project, minimum and maximum mean flight heights were within the RSZ for Cooper's Hawk *(Accipiter cooperii),* the Red-tailed Hawk, and the Rough-legged Hawk. Mean maximum flight height was within the RSZ for the Swainson's Hawk. Mean minimum and maximum flight heights were below the RSZ for the American Kestrel *(Falco sparverius)* and Northern Harrier.
- Summer – Bald Eagles were not recorded during standardized surveys in the summer. Within the Project, both minimum and maximum mean flight heights were within the RSZ for Swainson's Hawk (Table 5). Swainson's Hawk flight heights were lower across the greater Avian Use Study Area (Table 4), and mean minimum flight height was below the RSZ. Mean maximum flight height was within the RSZ for the Red-tailed Hawk in both the Project and the Avian Use Study Area. Mean flight heights were below the RSZ for Cooper's Hawk and the Northern Harrier.
- Fall – Within the Project, Bald Eagle minimum and maximum mean flight heights were below the RSZ. Mean minimum and maximum flight heights were within the RSZ for the Broad-winged Hawk *(Buteo platypterus),* and mean maximum flight height was within the

RSZ for the Red-tailed Hawk and Cooper's Hawk. Mean minimum and maximum flight heights were below the RSZ for the American Kestrel, Ferruginous Hawk *(Buteo regalis),* Northern Harrier, and Rough-legged Hawk. A lone Golden Eagle that was observed during standardized surveys outside the Project but within the Avian Use Study Area was recorded within the RSZ.

- Winter – There were no standardized detections of Bald Eagles during the winter period. Mean maximum flight heights were within the RSZ for the Golden Eagle and Rough-legged Hawk within both the Project and the greater Avian Use Study Area.
- Within the Project, Bald Eagle mean maximum flight height was 191.37 ft (58.33 m). Bald Eagle mean minimum flight height was 76.02 ft (23.17 m). Within the Avian Use Study Area, Bald Eagle mean maximum flight height was 201.15 ft (61.31 m). Bald Eagle mean minimum flight height was 91.57 ft (27.91 m).

Table 4. Raptor Mean Flight Heights within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species	Flight Height	Spring					Summer					Fall					Winter					Year				
		Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95 %CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95 %CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95 %CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95 %CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95 %CI Bound	Lower 95% CI Bound
American Kestrel[b]	Min	3	10.00	8.66	-11.51	31.51	1	2.00	-	2.00	2.00	8	17.13	29.72	-7.71	41.97	-	-	-	-	-	12	14.08	24.50	-1.49	29.65
	Max	10	13.20	3.16	10.94	15.46	2	6.00	-	6.00	6.00	14	16.93	22.98	3.66	30.20	-	-	-	-	-	26	14.65	16.97	7.79	21.51
Bald Eagle[b]	Min	8	51.25	29.97	26.19	77.44	-	-	-	-	-	14	14.57	15.40	5.68	23.46	-	-	-	-	-	22	27.91	27.79	15.59	40.23
	Max	8	110.63	64.72	45.91	164.74	-	-	-	-	-	15	35.00	22.07	22.78	47.22	-	-	-	-	-	23	61.31	54.76	37.63	84.99
Broad-winged Hawk	Min	-	-	-	-	-	-	-	-	-	-	9	53.89	48.78	16.39	91.39	-	-	-	-	-	9	53.89	48.78	16.39	91.39
	Max	1	12.00	-	12.00	12.00	-	-	-	-	-	9	73.89	63.82	24.83	122.95	-	-	-	-	-	10	67.70	63.28	22.43	112.97
Cooper's Hawk	Min	5	54.40	69.47	-15.07	140.66	4	15.00	14.63	-8.28	38.28	12	45.75	82.51	-6.68	98.18	-	-	-	-	-	21	41.95	70.25	9.97	73.93
	Max	5	69.20	61.48	7.72	145.53	4	23.00	19.70	-8.34	54.34	12	57.33	81.04	5.84	108.82	-	-	-	-	-	21	53.62	68.43	22.47	84.77
Ferruginous Hawk[a]	Min	-	-	-	-	-	-	-	-	-	-	4	15.75	16.30	-10.18	41.68	-	-	-	-	-	4	15.75	16.30	-10.18	41.68
	Max	-	-	-	-	-	-	-	-	-	-	4	31.25	16.52	4.97	57.53	-	-	-	-	-	4	31.25	16.52	4.97	57.53
Golden Eagle[b]	Min	-	-	-	-	-	-	-	-	-	-	1	45.00	0.00	45.00	45.00	1	15.00	-	15.00	15.00	2	30.00	21.21	-160.59	220.59
	Max	-	-	-	-	-	-	-	-	-	-	1	80.00	0.00	80.00	80.00	1	60.00	-	60.00	60.00	2	70.00	14.14	-57.06	197.06
Northern Harrier[b]	Min	149	11.34	25.08	7.28	15.40	24	4.54	7.84	1.23	7.85	145	4.55	17.81	1.63	7.47	-	-	-	-	-	318	7.73	21.30	5.38	10.08
	Max	170	23.04	35.81	17.62	28.46	26	10.92	11.56	6.25	15.59	153	10.35	23.76	6.55	14.15	-	-	-	-	-	349	16.58	30.31	13.39	19.77
Red-tailed Hawk	Min	162	40.85	47.71	33.45	48.25	91	25.65	22.92	20.88	30.42	230	33.04	40.40	27.79	38.29	-	-	-	-	-	483	34.27	40.78	30.62	37.92
	Max	186	55.95	54.69	48.04	63.86	113	36.40	24.43	31.85	40.95	279	41.42	41.24	36.56	46.28	-	-	-	-	-	578	45.11	44.20	41.50	48.72
Rough-legged Hawk	Min	2	67.50	60.10	-472.51	607.51	-	-	-	-	-	39	14.23	10.93	10.69	17.77	4	26.25	18.87	-3.78	56.28	45	17.67	18.43	12.14	23.20
	Max	2	90.00	70.71	-545.30	725.30	-	-	-	-	-	51	28.41	13.75	24.54	32.28	7	45.00	22.91	23.81	66.19	60	32.40	21.06	26.96	37.84
Swainson's Hawk[a]	Min	32	27.00	24.56	35.86	18.14	36	27.17	30.73	37.57	16.77	22	28.64	30.28	22.07	42.07	-	-	-	-	-	90	27.47	28.25	33.39	21.55
	Max	34	45.50	28.62	55.49	35.51	41	39.54	35.66	50.79	28.29	25	57.40	65.36	84.20	30.60	-	-	-	-	-	100	46.03	43.27	54.62	37.44

Seasonal mean flight height statistics by raptor species. Flight heights recorded within the 800 m–radius survey cylinder during standardized use surveys. Zero-value heights (i.e., perched) not included in calculation of means; a bird perched throughout the count period would have both minimum and maximum flight heights of 0 m. Sample size totals are cumulative and occasionally may double-count individuals observed across concurrent 20-minute segments at the point. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.
CI = confidence interval; SD = standard deviation

Table 5. Raptor Mean Flight Heights within the Burke County Wind Project (Burke County, North Dakota)

		Spring					Summer					Fall					Winter					Year				
Species	Flight Height	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sam-ple Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound
American Kestrel[b]	Min	2	12.50	10.61	107.80	-82.80	-	-	-	-	-	5	26.00	35.78	70.42	-18.42	-	-	-	-	-	7	22.14	30.26	50.13	-5.84
	Max	2	17.50	3.54	49.27	-14.27	-	-	-	-	-	7	26.29	30.52	54.51	-1.94	-	-	-	-	-	9	24.33	26.74	44.89	3.78
Bald Eagle[b]	Min	3	41.67	2.89	48.84	34.50	-	-	-	-	-	3	4.67	4.73	16.41	-7.07	-	-	-	-	-	6	23.17	20.57	44.75	1.58
	Max	3	93.33	83.86	301.67	-115.00	-	-	-	-	-	3	23.33	2.89	30.50	16.16	-	-	-	-	-	6	58.33	65.47	127.04	-10.38
Broad-winged Hawk	Min	-	-	-	-	-	-	-	-	-	-	4	86.25	49.56	165.11	7.39	-	-	-	-	-	4	86.25	49.56	165.11	7.39
	Max	-	-	-	-	-	-	-	-	-	-	4	117.50	71.36	231.04	3.96	-	-	-	-	-	4	117.50	71.36	231.04	3.96
Cooper's Hawk	Min	3	47.33	80.25	246.69	-152.02	2	13.00	16.97	165.47	-139.47	7	28.14	21.57	48.10	8.19	-	-	-	-	-	12	30.42	39.84	55.73	5.10
	Max	3	52.00	76.32	241.58	-137.58	2	22.00	25.46	250.71	-206.71	7	38.43	29.11	65.35	11.50	-	-	-	-	-	12	39.08	40.98	65.12	13.05
Ferruginous Hawk[a]	Min	-	-	-	-	-	-	-	-	-	-	2	25.00	21.21	215.59	-165.59	-	-	-	-	-	2	25.00	21.21	215.59	-165.59
	Max	-	-	-	-	-	-	-	-	-	-	2	32.50	24.75	254.86	-189.86	-	-	-	-	-	2	32.50	24.75	254.86	-189.86
Golden Eagle[b]	Min	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	15.00	-	15.00	15.00	1	15.00	-	15.00	15.00
	Max	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	60.00	-	60.00	60.00	1	60.00	-	60.00	60.00
Northern Harrier[b]	Min	59	9.00	11.60	12.02	5.98	8	1.13	0.35	1.42	0.83	71	6.37	25.00	12.28	0.45	-	-	-	-	-	138	7.19	19.50	10.47	3.91
	Max	69	26.52	34.67	34.85	18.19	8	6.63	3.02	9.15	4.10	76	11.88	31.95	19.18	4.58	-	-	-	-	-	153	18.21	33.17	23.51	12.91
Red-tailed Hawk	Min	73	37.42	35.12	45.62	29.23	35	29.91	26.21	38.92	20.91	103	34.61	36.40	41.73	27.50	-	-	-	-	-	211	34.81	34.41	39.48	30.14
	Max	80	58.36	46.67	68.75	47.98	44	41.27	27.65	49.68	32.87	126	43.63	39.88	50.67	36.60	-	-	-	-	-	250	47.93	40.91	53.03	42.84
Rough-legged Hawk	Min	2	67.50	60.10	607.51	-472.51	-	-	-	-	-	16	15.44	14.06	22.93	7.94	3	33.33	15.28	71.28	-4.61	21	22.95	24.74	34.21	11.69
	Max	2	90.00	70.71	725.31	-545.31	-	-	-	-	-	24	28.75	14.55	34.89	22.61	5	50.00	25.50	81.66	18.34	31	36.13	26.17	45.73	26.53
Swainson's Hawk[a]	Min	16	28.75	23.27	41.15	16.35	11	45.91	37.20	70.90	20.92	14	33.93	34.98	54.13	13.73	-	-	-	-	-	41	35.12	31.55	45.08	25.16
	Max	16	49.50	28.57	64.72	34.28	11	61.36	44.11	91.00	31.73	17	66.47	77.69	106.41	26.53	-	-	-	-	-	44	59.02	55.13	75.79	42.26

Seasonal mean flight height statistics by raptor species. Flight heights recorded within 800 m–radius survey cylinder during standardized use surveys. Zero-value heights (i.e., perched) not included in calculation of means; a bird perched throughout the count period would have both minimum and maximum flight heights of 0 m. Sample size totals are cumulative and occasionally may double-count individuals across concurrent 20-minute segments at the point. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.
CI = confidence interval; SD = standard deviation

3.2 Golden Eagles

Overall, two Golden Eagles were detected during 840 hours of eagle use surveys within the Avian Use Study Area, and one was observed during 360 hours of eagle use surveys at 15 points within or immediately adjacent to the Project (Figure 2, **Appendix I**). Within the Avian Use Study Area, standardized mean use was 0.001 Golden Eagles/800 m plot/20-minute count segment (SD = 0.035) during the fall and 0.002 Golden Eagles/800 m plot/20-minute count segment (SD = 0.040) during the winter. Within the Project, mean use was 0.004 Golden Eagles/800 m plot/20-minute count segment during the winter, the only season they were encountered within the Project on standardized surveys. The single Golden Eagle observed during the fall spent 2.4 minutes within the RSZ, and the Golden Eagle observed during the winter spent 2.1 minutes within the RSZ. An additional six Golden Eagles were incidentally detected within the Avian Use Study Area. Four of these incidental detections were recorded within the Project or immediately adjacent to the Project boundary (Figure 2, **Appendix I**).

The following is a summary of seasonal Golden Eagle observations, as depicted in Figure 2:

- Spring – Three Golden Eagles were observed during the spring survey period; however, each Golden Eagle was observed incidental to standardized use surveys, either outside the 2,625 ft (800 m)–radius survey cylinders or recorded while en route to survey locations within the Avian Use Study Area. One of these incidental spring detections was recorded near the Project boundary—an adult flying northward in May.
- Summer – No Golden Eagles were observed during the summer.
- Fall – Four Golden Eagles were detected during the fall migration survey period. One immature individual was observed during standardized eagle use surveys outside the Project, heading northward. The other three individuals were observed incidentally within the Project; the observations were made either outside the 2,625 ft (800 m)–radius survey cylinders or recorded while en route between point count stations.
- One adult Golden Eagle was observed during the winter period, during standardized eagle use surveys within the Project.

In total, two adults, two immatures, and four unaged Golden Eagles were observed within the Avian Use Study Area. Two adults, one immature, and two unaged individuals were observed within the Project. In contrast to Bald Eagles, Golden Eagles observed during the study period did not generally follow expected directional movements (e.g., northbound in the spring and southbound in the fall [Atwell data]). While sample sizes are small, this pattern suggests that the Golden Eagles seen during the study period were not migrating at the time of observation.

3.3 Avian Use

The following sections summarize the results of the avian use studies.

3.3.1 Federally Listed Threatened and Endangered Species

Standardized spring and fall avian use surveys did not detect the presence of any federal threatened/endangered species using Project habitats during migration. An incidental observation of three Whooping Cranes (*Grus americana*) migrating northbound over the Project occurred on April 10, 2017, in Leaf Mountain Township, Burke County (Atwell 2017a). These cranes were not observed flying through the RSZ, nor were they observed as a standing flock within Project stopover habitat.

3.3.2 General Avian Use

Standardized mean use and avian point count data for all 142 species observed during 20-minute avian use point count surveys in the spring and fall are presented in **Appendix II.** A list of all species observed during the avian use studies is included in **Appendix III**. Data are grouped into four broad groups: waterfowl; waterbirds (pelicans, grebes, waders, coots and rails, cranes, shorebirds, gulls); raptors (hawks, eagles, vultures, owls, falcons); and land birds (upland gamebirds, non-passerines such as kingfishers and woodpeckers, and passerines).

The following is a summary of observed avian use:

- Avian use tended to be higher during the fall season than during the spring, an expected pattern in North America (Dokter et al. 2018). Exceptions included the Laughing Gull *(Leucophaeus pipixcan)* and Black Tern *(Chlidonias niger)*.
- During the spring migration avian use surveys, 7,798 total individuals were detected across the Avian Use Study Area, at a rate of approximately 38.2 birds/800 m plot/20-minute count segment. Across the Project, 3,831 total individuals were detected, at a rate of approximately 42.6 birds/800 m plot/20-minute point count segment. This does not include the raptor guild, discussed in Section 3.1.3.
- During the fall migration avian use surveys, 15,149 total individuals were detected, at a rate of approximately 55.7 birds/800 m plot/20-minute count segment. Across the Project, 8,711 total individuals were detected at a rate of 72.59 birds/800 m plot/20-minute point count segment. This does not include the raptor guild, discussed in Section 3.1.3.

Comparing avian mean use rates drawn from the Project area with the larger Avian Use Study Area, mean use rates for pothole and wetland-associated species (groups including waterfowl, wading birds such as herons and cranes, shorebirds, and other waterbirds such as gulls, coots, and cormorants) were generally similar across the Project and the Avian Use Study Area in the spring and fall, suggesting that pothole and wetland habitat availability was similar within the Project in comparison to the larger Avian Use Study Area. Sandhill Crane *(Grus canadensis)* mean use rates

were notably lower outside the Project. The 10 largest observed congregations of cranes (21–170 individuals) were migrating flocks observed in flight from point count station #31 on the edge of the Project and eastward.

Sharp-tailed Grouse *(Tympanuchus phasianellus;* SCP) were rarely seen during avian use surveys and were observed at similar rates within the Project and the Avian Use Study Area. Among other SCP associated with grassland habitats, mean use rates tended to be lower in the Project than in the Avian Use Study Area, suggesting that the Project is avoiding higher-quality grassland habitats found within the larger Avian Use Study Area. Sprague's Pipits *(Anthus spragueii)* were only observed within the Avian Use Study Area and not within the Project during avian use surveys, and Western Meadowlarks *(Sturnella neglecta)* and Bobolinks *(Dolichonyx oryzivorus)* were observed at lower rates in the Project than in the Avian Use Study Area (Appendix II).

Passerine mean use rates were higher in the Project than the larger Avian Use Study Area, particularly in the fall. Large concentrations of common passerine species (e.g., Common Grackle *[Quiscalus quiscula]* and Red-winged Blackbirds *[Agelaius phoeniceus]*) observed near or in agricultural habitats within the Project accounted for much of this difference.

The waterfowl and passerine guilds comprised the largest proportions of non-raptor detections in the spring and fall. Within the Project, passerines accounted for 50.6% of all non-raptor detections in the spring and 60.3% in the fall. Within the Avian Use Study Area, passerines accounted for 44.5% of all non-raptor detections in the spring and 45.5% during the fall. Within the Project, waterfowl accounted for 30.1% of all non-raptor detections during the fall and 26.4% during the spring. Within the Avian Use Study Area, waterfowl accounted for 33.1% of all non-raptor detections during the spring and 36.3% during the fall.

The following guild summaries describe mean use statistics, also presented in Tables A through H (**Appendix II**).

Large-Bodied Corvids

Large-bodied corvid (i.e., crows and ravens) mean use rates within the Avian Use Study Area were similar between the spring (0.377 detections/800 m plot/20-minute count segment) and the fall (0.294 detections/800 m plot/20-minute count segment). Large-bodied corvid mean use rates were lower within the Project (0.289 detections/800 m plot/20-minute count segment during the spring and 0.108 detections/800 m plot/20-minute count segment in the fall). This guild represented 1.0% of all non-raptor spring detections and 0.6% of all non-raptor fall detections in the Avian Use Study Area and 0.7% of all non-raptor spring detections and 0.1% of all non-raptor fall detections within the Project. Most corvid detections (Project: 80.8% of spring corvid detections and 61.5% of fall corvid detections; Avian Use Study Area: 86.8% of spring corvid detections and 70.9% of fall corvid detections) were American Crows (*Corvus brachyrhynchos*).

Non-Passerines

Non-passerines include woodpeckers, doves, pigeons, and swifts. Rock Pigeons (*Columba livia*) were classified as large-bodied passerines and detections were recorded to 800 m from the point count station. Other non-passerine species were classified as small-bodied, with detections recorded up to 300 m from the point count station. Rock Pigeon mean use detection rates were higher in the fall (Project: 0.850 detections/800 m plot/20-minute count segment; Avian Use Study Area: 0.787 detections/800 m plot/20-minute count segment) than in the spring (Project: 0.589 detections/800 m plot/20-minute count segment; Avian Use Study Area: 0.417 detections/800 m plot/20-minute count segment). Non-passerines represented 1.6% of spring non-raptor detections and 2.2% of fall non-raptor detections. Most non-passerine detections (66.4% of spring non-passerine detections and 62.9% of fall non-passerine detections) were Rock Pigeons.

Passerines Including Small-Bodied Corvids

Small-bodied passerine species (perching birds) accounted for a large portion of non-raptor detections both in the spring (Project: 50.6%; Avian Use Study Area: 44.5%) and in the fall (Project: 60.3%; Avian Use Study Area: 45.5%). Observers recorded mean use rates of 21.544 small-bodied passerines/800 m plot/20- minute count segment during the spring and 43.742 small-bodied passerines/800 m plot/20-minute count segment in the fall within the Project. Within the Avian Use Study Area, observers recorded mean use rates of 17.020 small-bodied passerines/800 m plot/20-minute count segment in the spring and 25.324 small-bodied passerines/800 m plot/20-minute count segment in the fall.

Sixty small-bodied passerine species were recorded during standardized avian use surveys. Common Grackles (Project: 8.5% of spring passerine detections and 51.5% of fall passerine detections; Avian Use Study Area: 7.8% of spring passerine detections and 43.4% of fall passerine detections) and Red-winged Blackbirds (Project: 19.5% of spring passerine detections and 19.6% of fall passerine detections; Avian Use Study Area: 22.1% of spring passerine detections and 20.8% of fall passerine detections) accounted for large proportions of passerine detections in the spring and fall.

Large congregations of Common Grackles, Red-winged Blackbirds, and longspurs played an important role in an observed pattern of higher passerine mean use rates within the Project relative to the Avian Use Study Area, particularly during the fall season. In September 2017, 2,500 Common Grackles were recorded during one visit at point #31, and 325 Red-winged Blackbirds were recorded during one visit at point #27. In October, a flock of 600 longspurs (observed at distance and only assessed to the generic level rather than species) were recorded during one visit at point #11. These three survey events combined to represent 65% of the cumulative total all fall passerine detections within the Project.

Shorebirds

Shorebirds were observed at similar mean use rates in the spring (Project: 1.600 spring detections/800 m plot/20-minute count segment; Avian Use Study Area: 1.475 spring detections/800 m plot/20-minute count segment) and in the fall (Project: 2.392 fall detections/800 m plot/20-minute count segment; Avian Use Study Area: 1.574 spring detections/20-minute count segment). Shorebirds accounted for 7.4% of non-raptor detections within the Project in the spring and 5.5% in the fall, and 3.9% of non-raptor detections within the Avian Use Study Area in the spring and 2.8% in the fall.

Upland Gamebirds

Upland gamebirds were uncommon during avian use surveys, with observed mean use rates of 0.178 detections/800 m plot/20-minute count segment in the spring and 0.075 detections/800 m plot/20-minute count segment in the fall within the Project, and 0.113 detections/800 m plot/20-minute count segment in the spring and 0.107 detections/800 m plot/20-minute count segment in the fall within the Avian Use Study Area. Ring-necked Pheasants *(Phasianus colchicus)* accounted for the majority (Project: 87.5%; Avian Use Study Area: 82.6%) of upland gamebird detections in the spring, and Sharp-tailed Grouse accounted for the majority (Project: 77.8%; Avian Use Study Area: 55.2%) of upland gamebird detections in the fall. The Sharp-tailed Grouse is a Level II SCP in North Dakota (Dyke et al. 2015).

Waders

Waders include herons and cranes. Waders were detected much more frequently in the fall (mean use rate in the Project: 2.717 detections/800 m plot/20-minute count segment; Avian Use Study Area: 3.493 detections/800 m plot/20-minute count segment) than in the spring (mean use rate in the Project: 0.500 detections/800 m plot/20-minute count segment; Avian Use Study Area: 0.917 detections/800 m plot/20-minute count segment). Waders accounted for 2.3% of all non-raptor detections in the spring and 6.2% in the fall within the Project, and within the Avian Use Study Area, 2.4% of all non-raptor detections in the spring and 6.3% in the fall. The large majority of fall wader detections were the Sandhill Crane and White-faced Ibis (*Plegadis chihi*).

Waterbirds

The waterbird group includes loons, grebes, cormorants, and gulls. Waterbirds represented 11.4% of spring non-raptor detections and 4.2% of all fall non-raptor detections within the Project, and 13.2% of all spring non-raptor detections and 6.1% of all fall non-raptor detections within the Avian Use Study Area. Spring mean use for the waterbird guild was 4.856 detections/800 m plot/20-minute count segment within the Project and 5.064 detections/800 m plot/20-minute count segment within the Avian Use Study Area. This use rate was mainly influenced by Franklin's Gulls, which accounted for 76.2% of spring waterbird detections within the Project and 74.3% within the Avian Use Study Area. Waterbird mean use rates were lower during fall migration (Project: 3.058 detections/800 m plot/20-minute count segment; Avian Use Study Area: 3.412

detections/800 m plot/20-minute count segment) and was again influenced by Franklin's Gull detections (28.1% of all fall waterbird detections within the Project, 35.7% of fall waterbird detections within the Avian Use Study Area). Franklin's Gull is a Level I North Dakota SCP (Dyke et al. 2015).

Waterfowl

Waterfowl mean use rates were higher in the fall (Project: 19.200 detections/800 m plot/20-minute count segment; Avian Use Study Area: 20.221 detections/800 m plot/20-minute count segment) than in the spring (Project: 12.811/800 m plot/20-minute count segment; Avian Use Study Area: 12.637 detections/800 m plot/20-minute count segment). In the spring, the Lesser Scaup *(Aythya affinis),* Mallard (*Anas platyrhynchos*), and Canada Goose *(Branta canadensis)* accounted for 26.6%, 19.9%, and 8.8% of spring waterfowl detections, respectively within the Project, and accounted for 24.5%, 20.4%, 17.0% of spring waterfowl detections, respectively within the Avian Use Study Area. In the fall, the Mallard (18.5% Project, 28.2% Avian Use Study Area), Canada Goose (20.3% Project, 12.5% Avian Use Study Area), and Gadwall *(Anas strepera)* (11.4% Project, 10.7% Avian Use Study Area) accounted for the most relative detections among the waterfowl guild. The Lesser Scaup is a Level II North Dakota SCP (Dyke et al. 2015).

3.3.3 Mean Flight Heights during Spring and Fall Migration

Tables 6 and 7 detail the mean flight height statistics for the non-raptor guilds detected during avian use surveys within the Avian Use Study Area (Table 6) and at the 15 points either within the Project or with survey cylinders intersecting the Project (Table 7). Mean minimum and maximum flight heights are summarized for the spring survey period, the fall survey period, and for spring and fall observations combined. Mean flight heights were within the RSZ for the waders group and below the RSZ for all other guilds consistently across the Project and across the large Avian Use Study Area.

Table 6. Mean Flight Heights during Spring and Fall Migration within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

		Spring						Fall						Spring and Fall Migration Combined					
Species Guild	Flight Height	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound
	Min	28	17.86	29.67	11.50	6.36	29.36	22	14.55	29.72	24.84	-10.29	39.39	50	16.40	24.20	6.88	9.52	23.28
Corvids	Max	39	21.64	25.64	8.31	13.33	29.95	30	19.23	16.70	6.23	13.00	25.46	69	20.59	22.09	5.31	15.28	25.90
	Min	12	8.25	5.51	3.50	4.75	11.75	24	14.71	12.77	5.39	9.31	20.10	36	12.56	11.24	3.80	8.75	16.36
Non-Passerines (Large)	Max	22	15.27	8.89	3.94	11.33	19.22	35	18.51	10.86	3.73	14.78	22.25	57	17.26	10.19	2.70	14.56	19.97
	Min	14	3.21	2.67	1.54	1.68	4.75	18	3.67	2.33	1.16	2.51	4.82	32	3.47	2.45	0.88	2.59	4.35
Non-Passerines (Small)	Max	29	5.41	3.05	1.16	4.25	6.58	41	6.56	3.70	1.17	5.39	7.73	70	6.09	3.47	0.83	5.26	6.91
	Min	301	8.88	11.72	1.33	7.55	10.21	342	11.43	12.16	1.29	10.13	12.72	643	10.23	12.01	0.93	9.30	11.16
Passerines	Max	980	7.42	9.24	0.58	6.84	7.99	696	10.63	10.47	0.78	9.85	11.41	1676	8.75	9.89	0.47	8.27	9.22
	Min	37	14.49	14.48	4.83	9.66	19.32	55	14.95	14.61	3.95	11.00	18.90	21	41.95	70.25	31.98	9.97	73.93
Shorebirds	Max	128	13.71	14.62	2.56	11.15	16.27	87	15.55	13.39	2.85	12.70	18.40	92	14.77	14.48	3.00	11.77	17.77
	Min	1	2.00	0.00	0.00	2.00	2.00	-	-	-	-	-	-	1	2.00	0.00	0.00	2.00	2.00
Upland Gamebird	Max	3	16.67	10.41	25.86	-9.19	42.53	7	5.00	3.56	3.29	1.71	8.29	10	8.50	8.02	5.74	2.76	14.24
	Min	13	110.15	73.46	44.39	65.76	154.54	39	83.10	142.64	46.24	36.86	129.34	52	89.87	128.73	35.84	54.03	125.71
Waders	Max	13	132.69	76.09	45.98	86.71	178.67	45	89.20	136.22	40.93	48.27	130.13	58	98.95	126.01	33.13	65.82	132.08
	Min	148	21.11	22.37	3.63	17.48	24.74	121	24.69	43.73	7.81	16.88	32.50	269	22.72	33.47	4.02	18.70	26.74
Waterbirds	Max	172	27.88	23.32	3.51	24.37	31.39	156	27.36	38.84	6.14	21.22	33.50	328	27.63	31.62	3.43	24.20	31.06
	Min	168	14.46	14.34	2.18	12.28	16.64	206	30.94	35.71	4.91	26.03	35.85	374	23.54	29.33	2.98	20.56	26.52
Waterfowl	Max	399	18.65	15.94	1.57	17.08	20.22	263	35.71	32.96	4.00	31.71	39.71	662	25.43	25.56	1.95	23.48	27.38

Seasonal migration and total migration mean flight height statistics by species guild. Flight heights recorded within the 300 m–radius survey cylinder for small-bodied detections and within the 800 m–radius survey cylinder for large-bodied detections during standardized use surveys. Zero-value heights (i.e., perched) not included in calculation of means; a bird perched throughout the count period would have both minimum and maximum flight heights of 0 m. Some guilds have mean maximum heights that are slightly lower than mean minimum heights. This occurs due to large numbers of low-flying, occasionally perching birds (e.g., sparrows or blackbirds) with minimum heights (0 m) not included in calculation of the mean. Raptor guild flight heights are presented in Table 4.
CI = confidence interval; SD = standard deviation

Table 7. Mean Flight Heights during Spring and Fall Migration within the Burke County Wind Project (Burke County, North Dakota)

		Spring						Fall						Spring and Fall Migration Combined					
Species Guild	Flight Height	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound
	Min	14	14.50	11.14	6.43	20.93	8.07	5	10.00	8.34	10.35	20.35	-0.35	19	13.32	10.45	5.04	18.35	8.28
Corvids	Max	19	21.37	13.83	6.67	28.03	14.70	7	15.00	7.35	6.80	21.80	8.20	26	19.65	12.61	5.09	24.75	14.56
	Min	10	8.30	6.09	4.36	12.66	3.94	13	15.77	14.48	8.75	24.52	7.02	23	12.52	11.99	5.19	17.71	7.34
Non-Passerines (Large)	Max	14	15.29	8.44	4.88	20.16	10.41	18	19.17	12.59	6.26	25.43	12.90	32	17.47	10.99	3.96	21.43	13.51
	Min	7	4.86	2.91	2.69	2.16	7.55	12	2.75	1.29	0.82	1.93	3.57	19	3.53	2.22	1.07	2.46	4.60
Non-Passerines (Small)	Max	14	5.79	3.58	2.07	3.72	7.85	22	6.00	3.21	1.42	4.58	7.42	36	5.92	3.31	1.12	4.80	7.04
	Min	125	8.26	9.48	1.68	6.59	9.94	150	13.15	15.47	2.50	10.65	15.64	275	10.93	13.29	1.58	9.35	12.51
Passerines	Max	449	6.89	8.86	0.82	6.07	7.71	315	11.60	12.52	1.39	10.22	12.99	764	8.83	10.77	0.76	8.07	9.60
	Min	17	11.47	13.47	6.92	18.40	4.55	29	14.90	12.12	4.61	19.51	10.29	46	13.63	12.60	3.74	17.37	9.89
Shorebirds	Max	54	14.09	13.46	3.67	17.77	10.42	48	15.25	12.41	3.60	18.85	11.65	102	14.64	12.92	2.54	17.18	12.10
	Min	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upland Gamebird	Max	1	5.00	-	-	5.00	5.00	3	3.33	1.53	3.79	7.13	-0.46	4	3.75	1.50	2.39	6.14	1.36
	Min	6	102.00	86.58	90.86	192.86	11.14	17	48.41	33.70	17.32	65.74	31.09	23	62.39	55.75	24.11	86.50	38.28
Waders	Max	6	120.83	92.06	96.61	217.44	24.23	20	52.35	35.47	16.60	68.95	35.75	26	68.15	59.30	23.95	92.11	44.20
	Min	65	25.06	26.12	6.47	31.53	18.59	50	22.66	32.01	9.10	31.76	13.56	115	24.02	28.72	5.31	29.32	18.71
Waterbirds	Max	74	31.42	26.82	6.21	37.63	25.21	63	27.27	30.97	7.80	35.07	19.47	137	29.51	28.77	4.86	34.37	24.65
	Min	92	15.74	15.66	3.24	18.98	12.50	103	28.97	21.97	4.29	33.26	24.68	195	22.73	20.32	2.87	25.60	19.86
Waterfowl	Max	209	18.75	16.24	2.21	20.97	16.54	130	34.38	21.97	3.81	38.20	30.57	339	24.75	20.11	2.15	26.89	22.60

Seasonal migration and total migration mean flight height statistics by species guild. Flight heights recorded within the 300 m–radius survey cylinder for small-bodied detections and within the 800 m–radius survey cylinder for large-bodied detections during standardized use surveys. Zero-value heights (i.e., perched) not included in calculation of means; a bird perched throughout the count period would have both minimum and maximum flight heights of 0 m. Some guilds have mean maximum heights that are slightly lower than mean minimum heights. This occurs due to large numbers of low-flying, occasionally perching birds (e.g., sparrows or blackbirds) with minimum heights (0 m) not included in calculation of the mean. Raptor guild flight heights are presented in Table 5.
CI = confidence interval; SD = standard deviation

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APPENDIX I

Report Figures

N

Divide County
Burke County
CoalfieldTownship
KellerTownship
FayTownship
ValeTownship
DaleTownship
FoothillsTownship
ClaytonTownship
WardTownship
CarterTownship
BorderTownship
HarmoniousTownship
ThorsonTownship
StoneviewTownship
LeafMountainTownship
ClearyTownship
LucyTownship
DimondTownship
RoselandTownship

0 2 4 Miles

Burke County Wind Project

Figure 1. Avian and Raptor Use Point Count Schematic

Burke County, North Dakota

Date: 1/30/2019

Client:

Burke Wind, LLC

Atwell, LLC Project:16000947

- Turbine Layout (10/08/2018)
- Avian Study Points
- 800 m Study Point Buffer (±19,797 Ac.)
- Project 10/23/2018 (±22,933 Ac.)
- Avian Use Study Area (01/25/2017)
- Townships
- Counties

SOURCE: USDA NAIP 2017 IMAGERY

ATWELL

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Burke County Wind Project

Figure 2. Eagle Observation Map April 2017 through March 2018

Burke County, North Dakota

Date: 1/8/2019

Client:

Burke Wind, LLC

Atwell, LLC Project:16000947

Species

- Bald Eagle - Standardized
- Bald Eagle - Incidental
- Golden Eagle - Standardized
- Golden Eagle - Incidental
- Unknown Eagle Species - Standardized
- Unknown Eagle Species - Incidental

Season

- Fall
- Spring
- Winter

- Turbine Layout (10/08/2018)
- Project 10/23/2018 (±22,933 Ac.)
- Avian Use Study Area (01/25/2017)
- Townships
- Counties

SOURCE: USDA NAIP 2017 IMAGERY

0 2 4 Miles

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Figure 3. Seasonal Bald Eagle Detection Totals within the Burke County Wind Project and the Avian Use Study Area – Burke County Wind Project (Burke County, North Dakota)

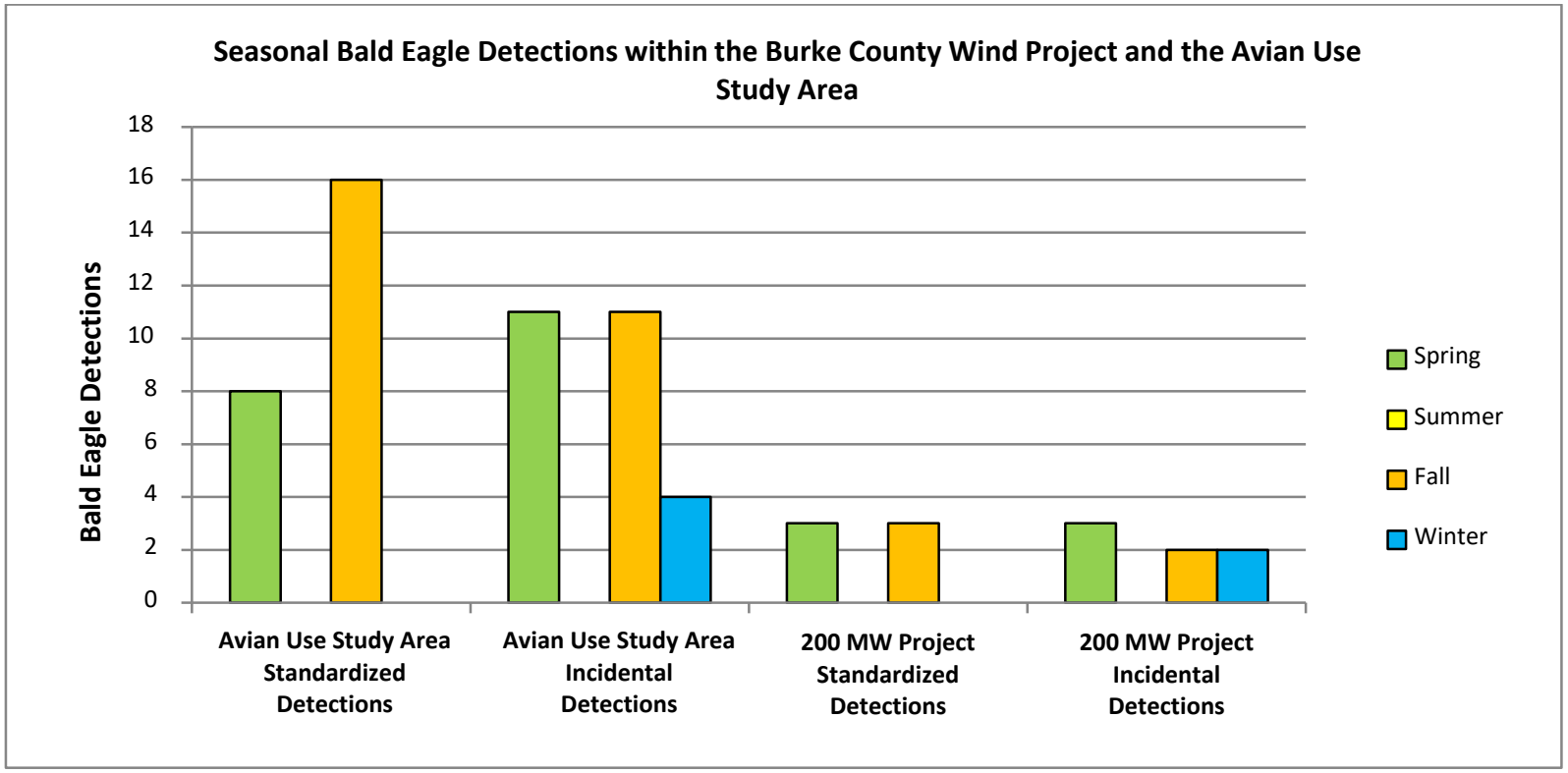
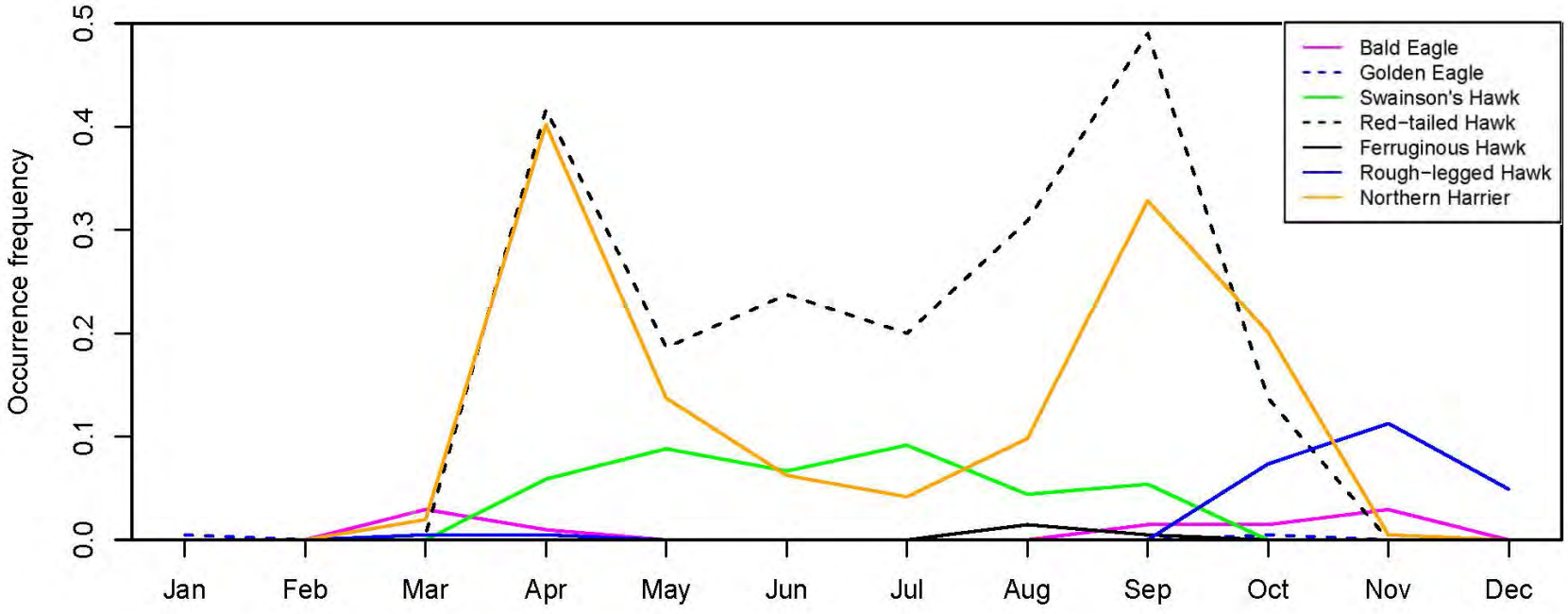
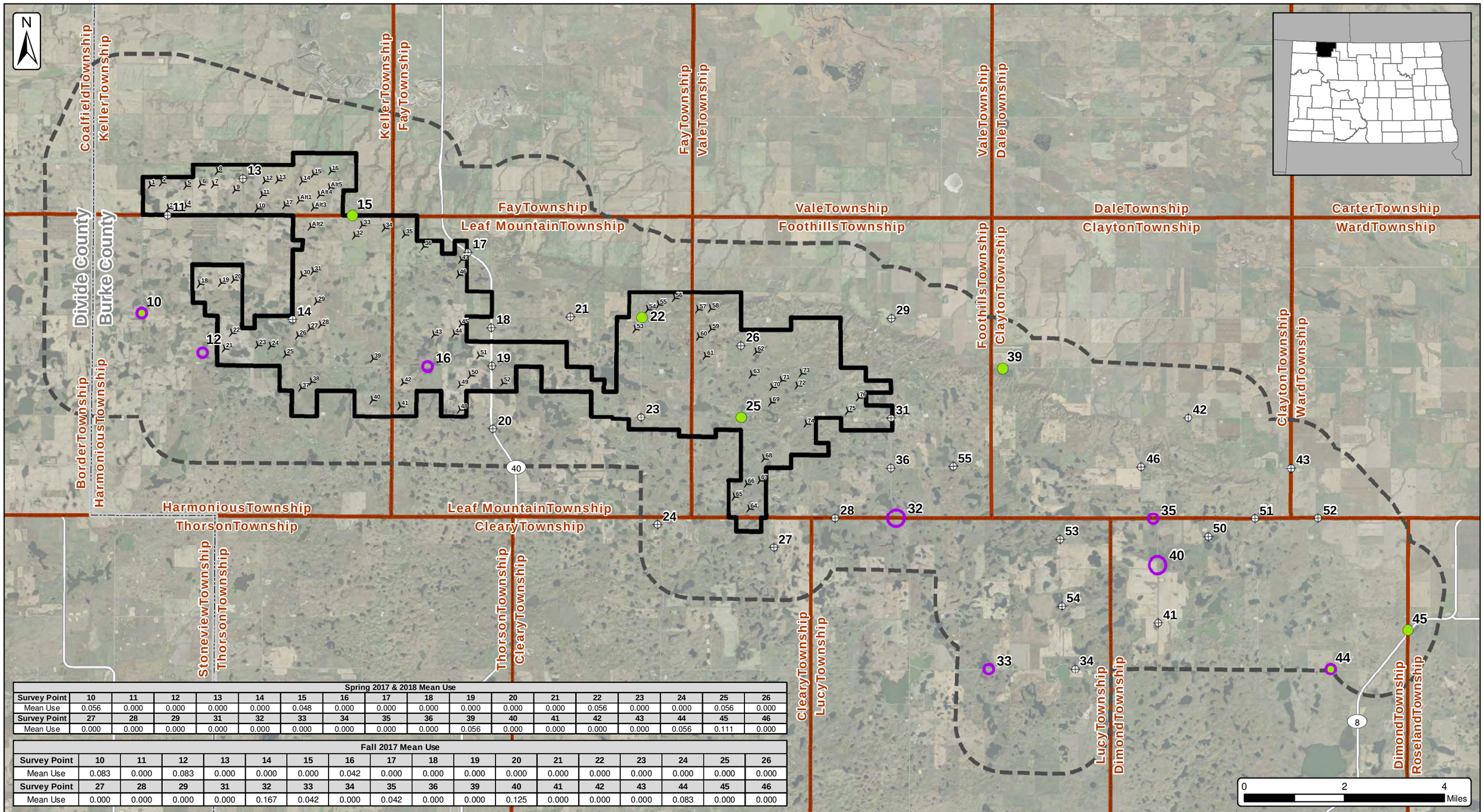


Figure 4. Raptor Species Monthly Occurrence Frequency – Burke County Wind Project (Burke County, North Dakota)





Spring 2017 & 2018 Mean Use

Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Mean Use	0.056	0.000	0.000	0.000	0.000	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.056	0.000	0.000	0.056	0.000
Survey Point	**27**	**28**	**29**	**31**	**32**	**33**	**34**	**35**	**36**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**
Mean Use	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.056	0.000	0.000	0.000	0.000	0.056	0.111	0.000

Fall 2017 Mean Use

Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Mean Use	0.083	0.000	0.083	0.000	0.000	0.000	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Survey Point	**27**	**28**	**29**	**31**	**32**	**33**	**34**	**35**	**36**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**
Mean Use	0.000	0.000	0.000	0.000	0.167	0.042	0.000	0.042	0.000	0.000	0.125	0.000	0.000	0.000	0.083	0.000	0.000

Burke County Wind Project

Figure 5a. Seasonal Bald Eagle Mean Use April 2017 through March 2018

Spring and fall only, no standardized detections during winter and summer periods

Burke County, North Dakota

Date: 1/14/2019

Client:

Burke Wind, LLC

Atwell, LLC Project:16000947

Turbine Layout (10/08/2018)

Project 10/23/2018 (±22,933 Ac.)

Avian Use Study Area (01/25/2017)

Townships

Counties

Bald Eagle Mean Use - Spring
Detections/800 m Plot/20-minute Count Segment

1.168 - 1.611
0.723 - 1.167
0.445 - 0.722
0.112 - 0.444
0.001 - 0.111

No Point Data

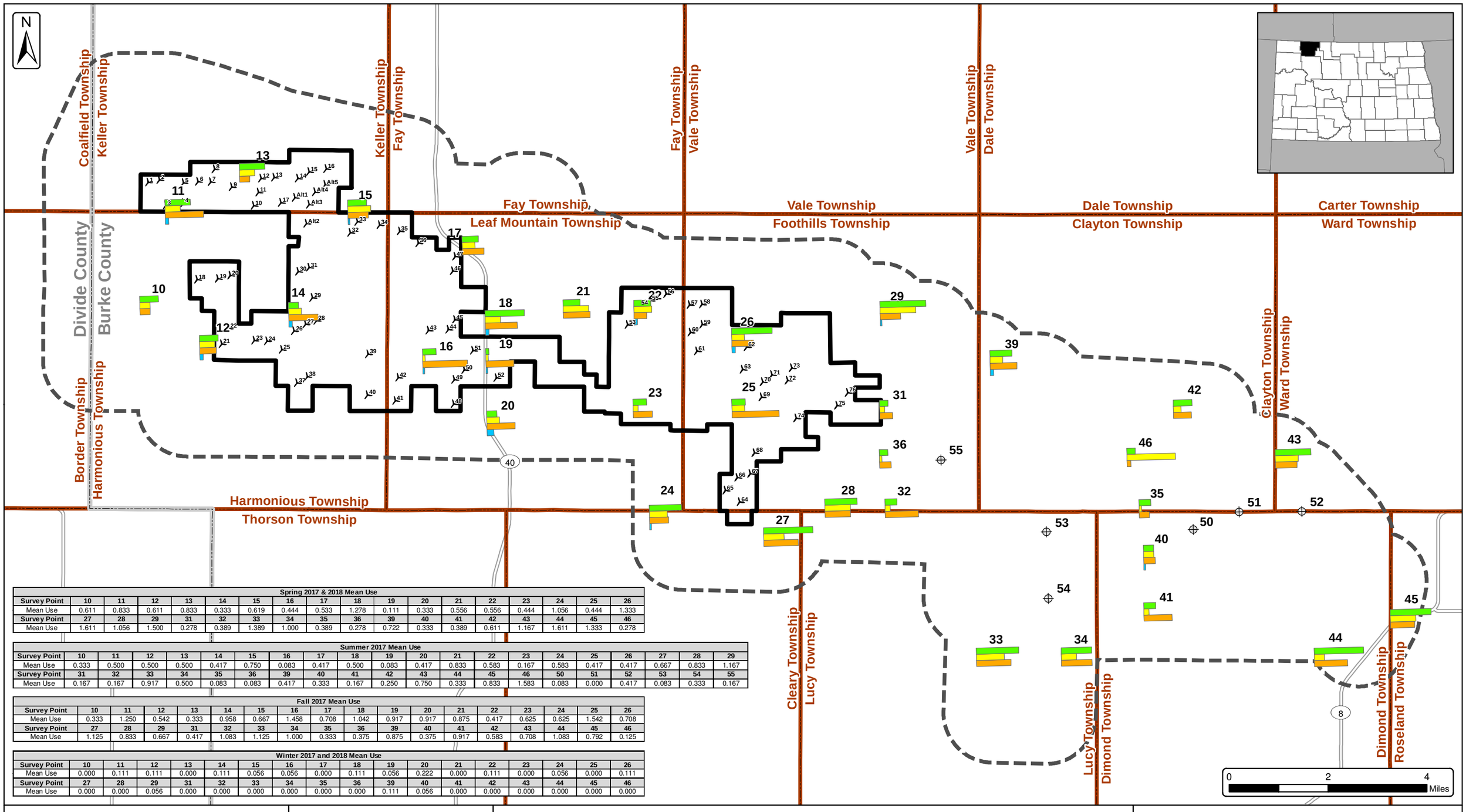
Bald Eagle Mean Use - Fall
Detections/800 m Plot/20-minute Count Segment

1.168 - 1.611
0.723 - 1.167
0.445 - 0.722
0.112 - 0.444
0.001 - 0.111

SOURCE: USDA NAIP 2017 IMAGERY

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Spring 2017 & 2018 Mean Use																	
Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Mean Use	0.611	0.833	0.611	0.833	0.333	0.619	0.444	0.533	1.278	0.111	0.333	0.556	0.556	0.444	1.056	0.444	1.333
Survey Point	27	28	29	31	32	33	34	35	36	39	40	41	42	43	44	45	46
Mean Use	1.611	1.056	1.500	0.278	0.389	1.389	1.000	0.389	0.278	0.722	0.333	0.389	0.611	1.167	1.611	1.333	0.278

Summer 2017 Mean Use																				
Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Mean Use	0.333	0.500	0.500	0.500	0.417	0.750	0.083	0.417	0.500	0.083	0.417	0.833	0.583	0.167	0.583	0.417	0.417	0.667	0.833	1.167
Survey Point	31	32	33	34	35	36	39	40	41	42	43	44	45	46	50	51	52	53	54	55
Mean Use	0.167	0.167	0.917	0.500	0.083	0.083	0.417	0.333	0.167	0.250	0.750	0.333	0.833	1.583	0.083	0.000	0.417	0.083	0.333	0.167

Fall 2017 Mean Use																	
Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Mean Use	0.333	1.250	0.542	0.333	0.958	0.667	1.458	0.708	1.042	0.917	0.917	0.875	0.417	0.625	0.625	1.542	0.708
Survey Point	27	28	29	31	32	33	34	35	36	39	40	41	42	43	44	45	46
Mean Use	1.125	0.833	0.667	0.417	1.083	1.125	1.000	0.333	0.375	0.875	0.375	0.917	0.583	0.708	1.083	0.792	0.125

Winter 2017 and 2018 Mean Use																	
Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Mean Use	0.000	0.111	0.111	0.000	0.111	0.056	0.056	0.000	0.111	0.056	0.222	0.000	0.111	0.000	0.056	0.000	0.111
Survey Point	27	28	29	31	32	33	34	35	36	39	40	41	42	43	44	45	46
Mean Use	0.000	0.000	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.111	0.056	0.000	0.000	0.000	0.000	0.000	0.000

Burke County Wind Project

Figure 5b. Seasonal Raptor Mean Use
All Raptor Species
April 2017 through March 2018
Burke County, North Dakota
Date: 1/14/2019

Client:

Burke Wind, LLC

Atwell, LLC Project: 16000947

Turbine Layout (10/08/2018)
Project 10/23/2018 (±22,933 Ac.)
Avian Use Study Area (01/25/2017)
Townships
Counties

Raptor Mean Use- Detections/800 m Plot/20-minute Count Segment
Spring Mean
Summer Mean
Fall Mean
Winter Mean

Points Surveyed during Summer Period Only

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Figure 6a. Bald Eagle Flight Direction Rose Plot for Spring Migration Observations – Burke County Wind Project (Burke County, North Dakota)

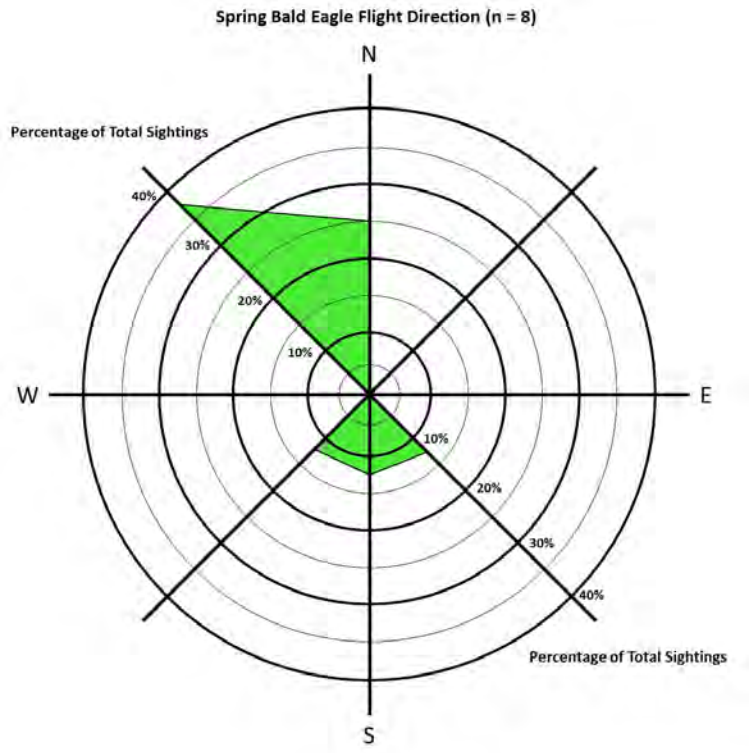
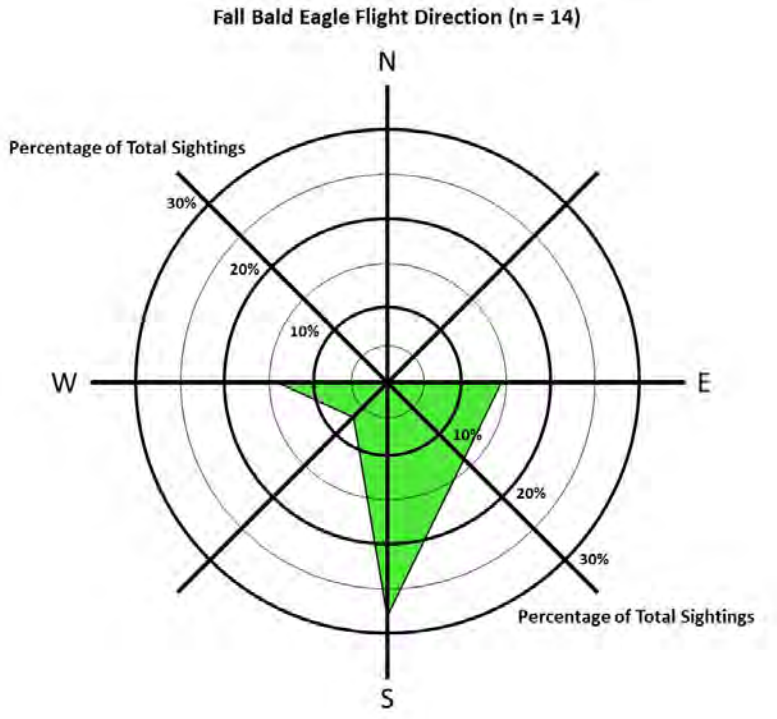


Figure 6b. Bald Eagle Flight Direction Rose Plot for Fall Migration Observations – Burke County Wind Project (Burke County, North Dakota)



APPENDIX II

Spring and Fall Avian Use Survey – Summary Statistics Tables

Table A. Seasonal Use Summary Statistics for Waterfowl within the Burke County Wind Project (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**
American Wigeon	58	27	0.644	1.275	0.267	53	17	0.442	1.823	0.100
Blue-winged Teal	117	42	1.300	2.429	0.344	308	52	2.567	6.509	0.233
Bufflehead	2	1	0.022	0.211	0.011	-	-	-	-	-
Cackling Goose	1	1	0.011	0.105	0.011	68	7	0.567	3.023	0.058
Canada Goose	102	43	1.133	2.876	0.367	467	30	3.892	16.336	0.167
Canvasback (b)	16	11	0.178	0.532	0.122	9	2	0.075	0.663	0.017
Gadwall	85	38	0.944	1.826	0.300	262	33	2.183	11.953	0.217
Green-winged Teal	18	9	0.200	0.674	0.100	10	2	0.083	0.751	0.017
Lesser Scaup (b)	307	59	3.411	8.250	0.333	56	8	0.467	2.351	0.050
Mallard	230	104	2.556	3.592	0.556	427	57	3.558	10.120	0.308
Northern Pintail (b)	35	16	0.389	1.013	0.167	73	8	0.608	3.628	0.058
Northern Shoveler	119	47	1.322	3.082	0.333	64	14	0.533	2.021	0.100
Redhead	36	10	0.400	1.889	0.100	21	3	0.175	1.591	0.017
Ring-necked Duck	25	6	0.278	1.290	0.056	38	4	0.317	2.867	0.025
Ross's Goose	-	-	-	-	-	49	2	0.408	3.736	0.017
Ruddy Duck	2	1	0.022	0.211	0.011	7	2	0.058	0.555	0.017
Snow Goose	-	-	-	-	-	35	1	0.292	3.195	0.008
Unknown Duck	-	-	-	-	-	115	7	0.958	6.412	0.050
Unknown Goose	-	-	-	-	-	242	7	2.017	11.317	0.042
Waterfowl	**1153**	**415**	**12.811**	**17.315**	**0.700**	**2304**	**256**	**19.200**	**39.496**	**0.558**

Seasonal mean use statistics by species within the Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table B. Seasonal Use Summary Statistics for Waterfowl within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Wigeon	109	50	0.534	1.237	0.211	70	22	0.257	1.350	0.059
Blue-winged Teal	224	95	1.098	2.300	0.279	833	117	3.063	9.348	0.188
Bufflehead	5	3	0.025	0.209	0.015	-	-	-	-	-
Cackling Goose	6	2	0.029	0.357	0.010	90	9	0.331	2.326	0.033
Canada Goose	437	100	2.142	15.372	0.353	688	60	2.529	11.747	0.158
Canvasback (b)	75	28	0.368	1.838	0.127	14	3	0.051	0.534	0.011
Common Merganser	1	1	0.005	0.070	0.005	-	-	-	-	-
Gadwall	181	81	0.887	1.961	0.289	587	71	2.158	10.398	0.176
Greater White-fronted Goose	-	-	-	-	-	35	2	0.129	1.599	0.007
Green-winged Teal	35	19	0.172	0.677	0.078	12	4	0.044	0.506	0.015
Hooded Merganser	1	1	0.005	0.070	0.005	-	-	-	-	-
Lesser Scaup (b)	631	126	3.093	10.202	0.284	252	19	0.926	8.017	0.051
Mallard	525	225	2.574	3.557	0.554	1552	163	5.706	20.608	0.316
Northern Pintail (b)	71	33	0.348	1.065	0.127	78	10	0.287	2.434	0.033
Northern Shoveler	181	74	0.887	2.422	0.230	129	23	0.474	2.311	0.074
Redhead	52	16	0.255	1.359	0.074	38	8	0.140	1.201	0.026
Ring-necked Duck	34	12	0.167	0.927	0.044	131	11	0.482	3.694	0.033
Ross's Goose	-	-	-	-	-	52	3	0.191	2.490	0.011
Ruddy Duck	2	1	0.010	0.140	0.005	11	4	0.040	0.405	0.015
Snow Goose	-	-	-	-	-	261	4	0.960	9.554	0.015
Tundra Swan	-	-	-	-	-	2	1	0.007	0.121	0.004

Table B. Seasonal Use Summary Statistics for Waterfowl within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**
Unknown Duck	8	1	0.039	0.560	0.005	359	14	1.320	11.058	0.048
Unknown Goose	-	-	-	-	-	306	9	1.125	8.303	0.026
Waterfowl	**2578**	**868**	**12.637**	**23.227**	**0.662**	**5500**	**557**	**20.221**	**44.057**	**0.518**

Seasonal mean use statistics by species within the Burke County Wind Project's Avian Use Study Area. The Avian Use Study Area described a 1-mile boundary around the original 300 MW Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table C. Seasonal Use Summary Statistics for Shorebirds, Waders, and Waterbirds (Shorebirds, Cranes, Herons, Pelicans, Grebes, Coots, Gulls, Terns) within the Burke County Wind Project (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Avocet (b)	3	2	0.033	0.235	0.022	4	1	0.033	0.365	0.008
American Coot	12	8	0.133	0.455	0.089	120	13	1.000	6.954	0.083
American White Pelican (b)	-	-	-	-	-	39	2	0.325	3.381	0.017
Black-crowned Night-Heron	4	4	0.044	0.207	0.044	-	-	-	-	-
Black Tern (a)	49	6	0.544	2.418	0.067	33	7	0.275	1.749	0.042
California Gull	1	1	0.011	0.105	0.011	-	-	-	-	-
Double-crested Cormorant	7	6	0.078	0.308	0.067	22	17	0.183	0.565	0.117
Franklin's Gull (a)	333	51	3.700	8.090	0.400	103	23	0.858	3.136	0.125
Great Blue Heron	-	-	-	-	-	2	2	0.017	0.129	0.017
Greater Yellowlegs	1	1	0.011	0.105	0.011	82	18	0.683	3.945	0.117
Horned Grebe (a)	1	1	0.011	0.105	0.011	-	-	-	-	-
Killdeer	34	25	0.378	0.680	0.267	64	34	0.533	1.639	0.258
Least Sandpiper	2	1	0.022	0.211	0.011	-	-	-	-	-
Lesser Yellowlegs	35	7	0.389	2.520	0.056	31	12	0.258	1.041	0.083
Long-billed Dowitcher	-	-	-	-	-	92	5	0.767	6.135	0.042
Pectoral Sandpiper	-	-	-	-	-	4	2	0.033	0.365	0.008
Pied-billed Grebe	3	3	0.033	0.235	0.022	25	12	0.208	0.961	0.092
Red-necked Grebe	-	-	-	-	-	1	1	0.008	0.091	0.008
Ring-billed Gull	18	10	0.200	0.722	0.089	24	19	0.200	0.528	0.150
Sandhill Crane	41	4	0.456	3.226	0.033	105	5	0.875	8.346	0.025
Solitary Sandpiper	1	1	0.011	0.105	0.011	-	-	-	-	-
Sora	12	12	0.133	0.455	0.100	-	-	-	-	-

Table C. Seasonal Use Summary Statistics for Shorebirds, Waders, and Waterbirds (Shorebirds, Cranes, Herons, Pelicans, Grebes, Coots, Gulls, Terns) within the Burke County Wind Project (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**
Spotted Sandpiper	-	-	-	-	-	2	2	0.017	0.129	0.017
Unknown Shorebird	4	1	0.044	0.422	0.011	7	2	0.058	0.455	0.017
Upland Sandpiper (b)	11	8	0.122	0.419	0.089	-	-	-	-	-
Virginia Rail	1	1	0.011	0.105	0.011	-	-	-	-	-
White-faced Ibis	-	-	-	-	-	219	15	1.825	14.163	0.067
Willet (b)	10	8	0.111	0.381	0.089	-	-	-	-	-
Wilson's Phalarope (a)	30	7	0.333	1.543	0.078	1	1	0.008	0.091	0.008
Wilson's Snipe	13	12	0.144	0.439	0.111	-	-	-	-	-
Shorebird	**144**	**73**	**1.600**	**3.280**	**0.467**	**287**	**77**	**2.392**	**10.613**	**0.350**
Wader	**45**	**8**	**0.500**	**3.226**	**0.078**	**326**	**22**	**2.717**	**16.340**	**0.100**
Waterbird	**437**	**99**	**4.856**	**9.577**	**0.522**	**367**	**94**	**3.058**	**9.226**	**0.350**

Seasonal mean use statistics by species within the Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table D. Seasonal Use Summary Statistics for Shorebirds, Waders, and Waterbirds (Shorebirds, Cranes, Herons, Pelicans, Grebes, Coots, Gulls, Terns) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Avocet (b)	3	2	0.015	0.156	0.010	4	1	0.015	0.243	0.004
American Coot	14	10	0.069	0.322	0.049	138	16	0.507	4.719	0.048
American White Pelican (b)	23	2	0.113	1.610	0.005	74	6	0.272	2.666	0.018
Baird's Sandpiper (a)	2	1	0.010	0.140	0.005	-	-	-	-	-
Black Tern (a)	79	17	0.387	1.879	0.064	57	15	0.210	1.567	0.037
Black-crowned Night-Heron	5	5	0.025	0.155	0.025	3	3	0.011	0.135	0.007
Buff-breasted Sandpiper	1	1	0.005	0.070	0.005	-	-	-	-	-
California Gull	3	3	0.015	0.121	0.015	-	-	-	-	-
Double-crested Cormorant	39	12	0.191	1.660	0.059	159	48	0.585	3.897	0.129
Forster's Tern	5	3	0.025	0.231	0.015	-	-	-	-	-
Franklin's Gull (a)	769	102	3.770	9.432	0.338	331	43	1.217	7.426	0.110
Great Blue Heron	-	-	-	-	-	8	8	0.029	0.169	0.029
Greater Yellowlegs	2	2	0.010	0.099	0.010	99	29	0.364	2.658	0.088
Horned Grebe (a)	1	1	0.005	0.070	0.005	-	-	-	-	-
Killdeer	83	65	0.407	0.747	0.284	109	63	0.401	1.302	0.195
Least Sandpiper	2	1	0.010	0.140	0.005	-	-	-	-	-
Lesser Yellowlegs	56	11	0.275	1.913	0.044	62	22	0.228	0.979	0.074
Long-billed Dowitcher	-	-	-	-	-	120	9	0.441	4.176	0.033
Pectoral Sandpiper	-	-	-	-	-	11	7	0.040	0.357	0.018
Pied-billed Grebe	7	6	0.034	0.230	0.025	38	24	0.140	0.689	0.077
Red-necked Grebe	3	2	0.015	0.156	0.010	1	1	0.004	0.061	0.004
Red-necked Phalarope	-	-	-	-	-	4	1	0.015	0.243	0.004

Table D. Seasonal Use Summary Statistics for Shorebirds, Waders, and Waterbirds (Shorebirds, Cranes, Herons, Pelicans, Grebes, Coots, Gulls, Terns) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**
Ring-billed Gull	70	34	0.343	1.346	0.113	123	57	0.452	2.829	0.180
Sandhill Crane	182	10	0.892	6.011	0.039	606	17	2.228	15.204	0.048
Semipalmated Plover	-	-	-	-	-	1	1	0.004	0.061	0.004
Solitary Sandpiper	2	2	0.010	0.099	0.010	1	1	0.004	0.061	0.004
Sora	17	17	0.083	0.341	0.069	-	-	-	-	-
Spotted Sandpiper	2	2	0.010	0.099	0.010	4	4	0.015	0.121	0.015
Unknown Gull	2	1	0.010	0.140	0.005	5	1	0.018	0.303	0.004
Unknown Shorebird	39	4	0.191	2.265	0.015	9	4	0.033	0.314	0.015
Upland Sandpiper (b)	22	18	0.108	0.369	0.088	-	-	-	-	-
Virginia Rail	1	1	0.005	0.070	0.005	1	1	0.004	0.061	0.004
Western Grebe	-	-	-	-	-	1	1	0.004	0.061	0.004
White-faced Ibis	-	-	-	-	-	333	29	1.224	10.203	0.059
Willet (b)	18	14	0.088	0.347	0.069	-	-	-	-	-
Wilson's Phalarope (a)	45	14	0.221	1.125	0.064	1	1	0.004	0.061	0.004
Wilson's Snipe	24	23	0.118	0.379	0.098	3	2	0.011	0.135	0.007
Shorebird	**301**	**160**	**1.475**	**3.539**	**0.446**	**428**	**145**	**1.574**	**7.318**	**0.287**
Wader	**187**	**15**	**0.917**	**6.009**	**0.064**	**950**	**57**	**3.493**	**18.167**	**0.136**
Waterbird	**1033**	**211**	**5.064**	**10.631**	**0.475**	**928**	**213**	**3.412**	**10.982**	**0.346**

Seasonal mean use statistics by species within the Burke County Wind Project's Avian Use Study Area. The Avian Use Study Area described a 1-mile boundary around the original 300 MW Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table E. Seasonal Use Summary Statistics for Large-Bodied Corvids, Large-Bodied Non-Passerines, and Upland Gamebirds within the Burke County Wind Project (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**
American Crow	21	16	0.233	0.654	0.144	8	5	0.067	0.361	0.042
Common Raven	2	2	0.022	0.148	0.022	5	4	0.042	0.239	0.033
Gray Partridge	1	1	0.011	0.105	0.011	-	-	-	-	-
Ring-necked Pheasant	14	12	0.156	0.447	0.122	2	1	0.017	0.183	0.008
Rock Pigeon	53	14	0.589	2.883	0.111	102	19	0.850	3.180	0.117
Sharp-tailed Grouse (b)	1	1	0.011	0.105	0.011	7	3	0.058	0.395	0.025
Unknown Corvid	3	2	0.033	0.316	0.011	-	-	-	-	-
Large-Bodied Corvid	**26**	**20**	**0.289**	**0.890**	**0.167**	**13**	**9**	**0.108**	**0.426**	**0.075**
Large-Bodied Non-Passerines	**53**	**14**	**0.589**	**2.883**	**0.111**	**102**	**19**	**0.850**	**3.180**	**0.117**
Upland Game	**16**	**14**	**0.178**	**0.464**	**0.144**	**9**	**4**	**0.075**	**0.433**	**0.033**

Seasonal mean use statistics by species within the Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table F. Seasonal Use Summary Statistics for Large-Bodied Corvids, Large-Bodied Non-Passerines, and Upland Gamebirds within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/800 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**
American Crow	66	34	0.324	1.265	0.142	61	11	0.224	2.746	0.040
Common Raven	7	7	0.034	0.182	0.034	19	17	0.070	0.296	0.059
Gray Partridge	1	1	0.005	0.070	0.005	9	1	0.033	0.546	0.004
Ring-necked Pheasant	19	17	0.093	0.338	0.078	4	3	0.015	0.148	0.011
Rock Pigeon	85	22	0.417	2.302	0.078	214	36	0.787	3.205	0.103
Sharp-tailed Grouse (b)	3	3	0.015	0.121	0.015	16	7	0.059	0.408	0.026
Unknown Corvid	4	3	0.020	0.221	0.010	-	-	-	-	-
Large-Bodied Corvid	**77**	**44**	**0.377**	**1.335**	**0.176**	**80**	**28**	**0.294**	**2.763**	**0.103**
Large-Bodied Non-Passerines	**85**	**22**	**0.417**	**2.302**	**0.078**	**214**	**36**	**0.787**	**3.205**	**0.103**
Upland Gamebird	**23**	**21**	**0.113**	**0.361**	**0.098**	**29**	**11**	**0.107**	**0.692**	**0.040**

Seasonal mean use statistics by species within the Burke County Wind Project's Avian Use Study Area. The Avian Use Study Area described a 1-mile boundary around the original 300 MW Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table G. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Goldfinch	7	5	0.078	0.343	0.056	64	40	0.533	1.100	0.267
American Pipit	-	-	-	-	-	1	1	0.008	0.091	0.008
American Robin	20	16	0.222	0.632	0.144	44	16	0.367	2.204	0.100
American Tree Sparrow	1	1	0.011	0.105	0.011	-	-	-	-	-
Baltimore Oriole	2	1	0.022	0.211	0.011	-	-	-	-	-
Bank Swallow	-	-	-	-	-	3	2	0.025	0.203	0.017
Barn Swallow	27	14	0.300	0.800	0.156	96	24	0.800	2.595	0.183
Black-billed Magpie	-	-	-	-	-	3	3	0.025	0.157	0.025
Bobolink (b)	11	9	0.122	0.470	0.078	1	1	0.008	0.091	0.008
Brewer's Blackbird	58	15	0.644	2.842	0.156	5	1	0.042	0.456	0.008
Brown Thrasher	1	1	0.011	0.105	0.011	-	-	-	-	-
Brown-headed Cowbird	80	29	0.889	1.969	0.278	7	2	0.058	0.490	0.017
Cedar Waxwing	-	-	-	-	-	17	11	0.142	0.569	0.075
Chestnut-collared Longspur (a)	1	1	0.011	0.105	0.011	6	1	0.050	0.548	0.008
Chipping Sparrow	1	1	0.011	0.105	0.011	1	1	0.008	0.091	0.008
Clay-colored Sparrow	26	24	0.289	0.546	0.244	29	9	0.242	1.438	0.075
Cliff Swallow	13	3	0.144	0.919	0.033	19	6	0.158	0.879	0.050
Common Grackle	164	22	1.822	8.774	0.200	2703	19	22.525	228.869	0.092
Common Redpoll	53	4	0.589	3.711	0.044	53	5	0.442	2.418	0.042
Common Yellowthroat	4	4	0.044	0.207	0.044	5	5	0.042	0.239	0.033
Downy Woodpecker	1	1	0.011	0.105	0.011	-	-	-	-	-
Eastern Kingbird	8	8	0.089	0.286	0.089	24	17	0.200	0.544	0.142

Table G. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
European Startling	16	4	0.178	1.045	0.044	26	4	0.217	1.769	0.033
Gray Catbird	-	-	-	-	-	4	4	0.033	0.180	0.033
Harris's Sparrow	-	-	-	-	-	2	1	0.017	0.183	0.008
Horned Lark	125	57	1.389	3.354	0.344	75	19	0.625	2.603	0.150
Lapland Longspur	637	12	7.078	34.128	0.122	111	7	0.925	4.981	0.042
Lark Sparrow	1	1	0.011	0.105	0.011	1	1	0.008	0.091	0.008
Least Flycatcher	2	2	0.022	0.148	0.022	2	1	0.017	0.183	0.008
Marsh Wren	3	3	0.033	0.181	0.033	3	3	0.025	0.157	0.025
Mountain Bluebird	-	-	-	-	-	2	1	0.017	0.183	0.008
Mourning Dove	15	13	0.167	0.431	0.144	52	25	0.433	1.419	0.175
Northern Flicker	2	2	0.022	0.148	0.022	2	2	0.017	0.129	0.017
Northern Rough-winged Swallow	1	1	0.011	0.105	0.011	-	-	-	-	-
Orchard Oriole	-	-	-	-	-	2	2	0.017	0.129	0.017
Red-winged Blackbird	378	173	4.200	8.995	0.611	1031	68	8.592	35.429	0.308
Rusty Blackbird	-	-	-	-	-	8	2	0.067	0.576	0.017
Savannah Sparrow	16	14	0.178	0.488	0.133	18	8	0.150	0.644	0.067
Smith's Longspur	-	-	-	-	-	10	1	0.083	0.913	0.008
Snow Bunting	48	4	0.533	4.106	0.033	34	4	0.283	1.701	0.033
Song Sparrow	32	32	0.356	0.659	0.278	15	15	0.125	0.401	0.108
Tennessee Warbler	1	1	0.011	0.105	0.011	-	-	-	-	-
Tree Swallow	22	11	0.244	0.708	0.122	3	2	0.025	0.203	0.017
Unknown Longspur	-	-	-	-	-	655	2	5.458	54.960	0.017
Unknown Passerine	2	2	0.022	0.148	0.022	2	2	0.017	0.129	0.017

Table G. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/300 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/300 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**
Unknown Sparrow	-	-	-	-	-	4	4	0.033	0.180	0.033
Vesper Sparrow	4	4	0.044	0.207	0.044	14	11	0.117	0.471	0.083
Western Kingbird	2	2	0.022	0.148	0.022	1	1	0.008	0.091	0.008
Western Meadowlark (b)	36	36	0.400	0.700	0.300	13	11	0.108	0.384	0.083
Yellow Warbler	5	5	0.056	0.230	0.056	4	3	0.033	0.222	0.025
Yellow-headed Blackbird	131	57	1.456	6.521	0.278	123	9	1.025	7.568	0.067
Yellow-rumped Warbler	-	-	-	-	-	5	3	0.042	0.272	0.025
Small-Bodied Non-Passerines	**18**	**16**	**0.200**	**0.479**	**0.167**	**54**	**27**	**0.450**	**1.419**	**0.192**
Passerines and Small-Bodied Corvids	**1939**	**579**	**21.544**	**40.112**	**0.878**	**5249**	**353**	**43.742**	**238.218**	**0.775**

Seasonal mean use statistics by species within the Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 984 ft. (300 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 984 ft. (300 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 300 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table H. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
Alder Flycatcher	1	1	0.005	0.070	0.005	-	-	-	-	-
American Goldfinch	31	14	0.152	0.789	0.059	155	95	0.570	1.147	0.257
American Pipit	-	-	-	-	-	1	1	0.004	0.061	0.004
American Robin	45	35	0.221	0.624	0.147	63	28	0.232	1.518	0.081
American Tree Sparrow	3	2	0.015	0.156	0.010	12	3	0.044	0.514	0.011
Baltimore Oriole	3	2	0.015	0.156	0.010	-	-	-	-	-
Bank Swallow	5	2	0.025	0.252	0.010	4	3	0.015	0.148	0.011
Barn Swallow	53	26	0.260	0.891	0.127	253	61	0.930	2.876	0.202
Belted Kingfisher	-	-	-	-	-	1	1	0.004	0.061	0.004
Black-billed Magpie	-	-	-	-	-	6	6	0.022	0.170	0.018
Blackpoll Warbler	-	-	-	-	-	1	1	0.004	0.061	0.004
Bobolink (b)	34	23	0.167	0.703	0.088	4	4	0.015	0.121	0.015
Bohemian Waxwing	-	-	-	-	-	14	1	0.051	0.849	0.004
Brewer's Blackbird	134	40	0.657	2.475	0.181	25	4	0.092	1.043	0.011
Brown Thrasher	2	2	0.010	0.099	0.010	-	-	-	-	-
Brown-headed Cowbird	188	66	0.922	2.529	0.275	7	2	0.026	0.326	0.007
Cedar Waxwing	-	-	-	-	-	54	24	0.199	0.853	0.081
Chestnut-collared Longspur (a)	1	1	0.005	0.070	0.005	6	1	0.022	0.364	0.004
Chipping Sparrow	1	1	0.005	0.070	0.005	1	1	0.004	0.061	0.004
Clay-colored Sparrow	48	43	0.235	0.510	0.196	38	15	0.140	0.996	0.055
Cliff Swallow	40	12	0.196	0.921	0.059	44	13	0.162	0.911	0.044
Common Grackle	270	51	1.324	6.239	0.186	2992	42	11.000	152.597	0.110

Table H. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
Common Redpoll	76	11	0.373	2.613	0.044	118	15	0.434	2.490	0.051
Common Yellowthroat	5	5	0.025	0.155	0.025	7	7	0.026	0.180	0.022
Downy Woodpecker	1	1	0.005	0.070	0.005	1	1	0.004	0.061	0.004
Eastern Bluebird	-	-	-	-	-	9	1	0.033	0.546	0.004
Eastern Kingbird	12	11	0.059	0.256	0.054	65	43	0.239	0.707	0.140
European Starling	56	14	0.275	1.691	0.064	48	10	0.176	1.371	0.037
Gray Catbird	-	-	-	-	-	10	10	0.037	0.189	0.037
Harris's Sparrow	1	1	0.005	0.070	0.005	2	1	0.007	0.121	0.004
Horned Lark	264	135	1.294	3.034	0.368	158	51	0.581	2.078	0.162
House Sparrow	1	1	0.005	0.070	0.005	6	3	0.022	0.309	0.007
House Wren	1	1	0.005	0.070	0.005	1	1	0.004	0.061	0.004
Lapland Longspur	863	26	4.230	23.733	0.118	161	14	0.592	3.618	0.044
Lark Sparrow	2	2	0.010	0.099	0.010	1	1	0.004	0.061	0.004
Least Flycatcher	5	5	0.025	0.155	0.025	3	2	0.011	0.135	0.007
Marsh Wren	3	3	0.015	0.121	0.015	3	3	0.011	0.105	0.011
Mountain Bluebird	-	-	-	-	-	2	1	0.007	0.121	0.004
Mourning Dove	38	29	0.186	0.520	0.142	119	44	0.438	2.128	0.136
Northern Flicker	4	4	0.020	0.139	0.020	5	4	0.018	0.201	0.011
Northern Rough-winged Swallow	1	1	0.005	0.070	0.005	-	-	-	-	-
Orange-crowned Warbler	-	-	-	-	-	2	2	0.007	0.086	0.007
Orchard Oriole	-	-	-	-	-	2	2	0.007	0.086	0.007
Purple Martin	1	1	0.005	0.070	0.005	-	-	-	-	-
Red-eyed Vireo	-	-	-	-	-	1	1	0.004	0.061	0.004

Table H. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
Red-winged Blackbird	768	338	3.765	7.824	0.569	1430	132	5.257	24.436	0.272
Rusty Blackbird	-	-	-	-	-	51	4	0.188	2.574	0.015
Savannah Sparrow	40	30	0.196	0.620	0.132	38	25	0.140	0.552	0.077
Smith's Longspur	-	-	-	-	-	10	1	0.037	0.606	0.004
Snow Bunting	88	10	0.431	3.659	0.044	45	6	0.165	1.226	0.022
Song Sparrow	54	54	0.265	0.569	0.211	29	29	0.107	0.374	0.092
Sprague's Pipit (a)	2	2	0.010	0.099	0.010	1	1	0.004	0.061	0.004
Tennessee Warbler	1	1	0.005	0.070	0.005	-	-	-	-	-
Tree Swallow	51	27	0.250	0.674	0.132	11	4	0.040	0.405	0.015
Unknown Blackbird	-	-	-	-	-	4	1	0.015	0.243	0.004
Unknown Longspur	-	-	-	-	-	667	3	2.452	36.525	0.011
Unknown Passerine	12	5	0.059	0.576	0.025	34	6	0.125	1.168	0.022
Unknown Sparrow	-	-	-	-	-	8	7	0.029	0.190	0.026
Unknown Swallow	2	1	0.010	0.140	0.005	4	1	0.015	0.243	0.004
Unknown Warbler	-	-	-	-	-	1	1	0.004	0.061	0.004
Vesper Sparrow	18	15	0.088	0.347	0.074	25	20	0.092	0.406	0.066
Warbling Vireo	1	1	0.005	0.070	0.005	2	2	0.007	0.086	0.007
Western Kingbird	4	4	0.020	0.139	0.020	3	2	0.011	0.135	0.007
Western Meadowlark (b)	101	98	0.495	0.772	0.368	59	40	0.217	0.889	0.107
White-breasted Nuthatch	-	-	-	-	-	1	1	0.004	0.061	0.004
White-crowned Sparrow	4	2	0.020	0.198	0.010	-	-	-	-	-
Yellow Warbler	10	10	0.049	0.216	0.049	7	6	0.026	0.180	0.022

Table H. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

	Spring					Fall				
Species Group/Species Name	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/300 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**	**Total Std. Detections**	**Total Flocks**	**Mean Use (birds/300 m plot/20 min)**	**Stan. Dev.**	**Occur. Freq.**
Yellow-headed Blackbird	166	83	0.814	4.387	0.230	179	15	0.658	5.732	0.048
Yellow-rumped Warbler	-	-	-	-	-	6	4	0.022	0.191	0.015
Small-Bodied Non-Passerines	**43**	**34**	**0.211**	**0.552**	**0.157**	**128**	**52**	**0.471**	**2.137**	**0.158**
Passerines and Small-Bodied Corvids	**3473**	**1222**	**17.025**	**29.592**	**0.877**	**6897**	**787**	**25.357**	**159.592**	**0.772**

Seasonal mean use statistics by species within the Burke County Wind Project's Avian Use Study Area. The Avian Use Study Area described a 1-mile boundary around the original 300 MW Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 984 ft. (300 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 984 ft. (300 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 300 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

APPENDIX III

Species Observed during Standardized Avian Use Surveys

Appendix III. Species Observed during Standardized Avian Use Surveys—Burke County Wind Project (Burke County, North Dakota)

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Alder Flycatcher	*Empidonax alnorum*	X*	N/A	-	N/A		
American Avocet	*Recurvirostra americana*	X	N/A	X	N/A	SCP II	
American Coot	*Fulica americana*	X	N/A	X	N/A		
American Crow	*Corvus brachyrhynchos*	X	N/A	X	N/A		
American Goldfinch	*Spinus tristis*	X	N/A	X	N/A		
American Kestrel	*Falco sparverius*	X	X*	X	-	SCP II	
American Pipit	*Anthus rubescens*	-	N/A	X	N/A		
American Robin	*Turdus migratorius*	X	N/A	X	N/A		
American Tree Sparrow	*Spizelloides arborea*	X	N/A	X*	N/A		
American White Pelican	*Pelecanus erythrorhynchos*	X*	N/A	X	N/A	SCP II	
American Wigeon	*Mareca americana*	X	N/A	X	N/A		
Baird's Sandpiper	*Calidris bairdii*	X*	N/A	-	N/A	SCP I	
Bald Eagle	*Haliaeetus leucocephalus*	X	-	X	-	SCP II	BGEPA
Baltimore Oriole	*Icterus galbula*	X	N/A	-	N/A		
Bank Swallow	*Riparia riparia*	X*	N/A	X	N/A		
Barn Swallow	*Hirundo rustica*	X	N/A	X	N/A		
Belted Kingfisher	*Megaceryle alcyon*	-	N/A	X*	N/A		
Black Tern	*Chlidonias niger*	X	N/A	X	N/A	SCP I	
Black-billed Magpie	*Pica hudsonia*	-	N/A	X	N/A		
Black-crowned Night-Heron	*Nycticorax nycticorax*	X	N/A	X*	N/A		
Blackpoll Warbler	*Setophaga striata*	-	N/A	X*	N/A		
Blue-winged Teal	*Spatula discors*	X	N/A	X	N/A		
Bobolink	*Dolichonyx oryzivorus*	X	N/A	X	N/A	SCP II	
Bohemian Waxwing	*Bombycilla garrulus*	-	N/A	X*	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Brewer's Blackbird	*Euphagus cyanocephalus*	X	N/A	X	N/A		
Broad-winged Hawk	*Buteo platypterus*	X*	-	X	-		
Brown Thrasher	*Toxostoma rufum*	X	N/A	-	N/A		
Brown-headed Cowbird	*Molothrus ater*	X	N/A	X	N/A		
Buff-breasted Sandpiper	*Calidris subruficollis*	X*	N/A	-	N/A		
Bufflehead	*Bucephala albeola*	X	N/A	-	N/A		
Cackling Goose	*Branta hutchinsii*	X	N/A	X	N/A		
California Gull	*Larus californicus*	X	N/A	-	N/A		
Canada Goose	*Branta canadensis*	X	N/A	X	N/A		
Canvasback	*Aythya valisineria*	X	N/A	X	N/A	SCP II	
Cedar Waxwing	*Bombycilla cedrorum*	-	N/A	X	N/A		
Chestnut-collared Longspur	*Calcarius ornatus*	X	N/A	X	N/A	SCP I	
Chipping Sparrow	*Spizella passerina*	X	N/A	X	N/A		
Clay-colored Sparrow	*Spizella pallida*	X	N/A	X	N/A		
Cliff Swallow	*Petrochelidon pyrrhonota*	X	N/A	X	N/A		
Common Grackle	*Quiscalus quiscula*	X	N/A	X	N/A		
Common Merganser	*Mergus merganser*	X*	N/A	-	N/A		
Common Raven	*Corvus corax*	X	N/A	X	N/A		
Common Redpoll	*Acanthis flammea*	X	N/A	X	N/A		
Common Yellowthroat	*Geothlypis trichas*	X	N/A	X	N/A		
Cooper's Hawk	*Accipiter cooperii*	X	X	X	-		
Double-crested Cormorant	*Phalacrocorax auritus*	X	N/A	X	N/A		
Downy Woodpecker	*Dryobates pubescens*	X	N/A	X*	N/A		
Eastern Bluebird	*Sialia sialis*	-	N/A	X*	N/A		
Eastern Kingbird	*Tyrannus tyrannus*	X	N/A	X	N/A		
European Starling	*Sturnus vulgaris*	X	N/A	X	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Ferruginous Hawk	*Buteo regalis*	-	-	X	-	SCP I	
Forster's Tern	*Sterna forsteri*	X*	N/A	-	N/A		
Franklin's Gull	*Leucophaeus pipixcan*	X	N/A	X	N/A	SCP I	
Gadwall	*Mareca strepera*	X	N/A	X	N/A		
Golden Eagle	*Aquila chrysaetos*	-	-	X*	X	SCP II	BGEPA
Gray Catbird	*Dumetella carolinensis*	-	N/A	X	N/A		
Gray Partridge	*Perdix perdix*	X	N/A	X*	N/A		
Great Blue Heron	*Ardea herodias*	-	N/A	X	N/A		
Great Horned Owl	*Bubo virginianus*	X	X*	X	-		
Greater White-fronted Goose	*Anser albifrons*	-	N/A	X*	N/A		
Greater Yellowlegs	*Tringa melanoleuca*	X	N/A	X	N/A		
Green-winged Teal	*Anas crecca*	X	N/A	X	N/A		
Harris's Sparrow	*Zonotrichia querula*	X*	N/A	X	N/A		
Hooded Merganser	*Lophodytes cucullatus*	X*	N/A	-	N/A		
Horned Grebe	*Podiceps auritus*	X	N/A	-	N/A	SCP I	
Horned Lark	*Eremophila alpestris*	X	N/A	X	N/A		
House Sparrow	*Passer domesticus*	X*	N/A	X*	N/A		
House Wren	*Troglodytes aedon*	X*	N/A	-	N/A		
Killdeer	*Charadrius vociferus*	X	N/A	X	N/A		
Lapland Longspur	*Calcarius lapponicus*	X	N/A	X	N/A		
Lark Sparrow	*Chondestes grammacus*	X	N/A	X	N/A		
Least Flycatcher	*Empidonax minimus*	X	N/A	X	N/A		
Least Sandpiper	*Calidris minutilla*	X	N/A	-	N/A		
Lesser Scaup	*Aythya affinis*	X	N/A	X	N/A	SCP II	
Lesser Yellowlegs	*Tringa flavipes*	X	N/A	X	N/A		
Long-billed Dowitcher	*Limnodromus scolopaceus*	-	N/A	X	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Mallard	*Anas platyrhynchos*	X	N/A	X	N/A		
Marsh Wren	*Cistothorus palustris*	X	N/A	X	N/A		
Merlin	*Falco columbarius*	X	-	X*	-		
Mountain Bluebird	*Sialia currucoides*	-	N/A	X	N/A		
Mourning Dove	*Zenaida macroura*	X	N/A	X	N/A		
Northern Flicker	*Colaptes auratus*	X	N/A	X	N/A		
Northern Goshawk	*Accipiter gentilis*	-	-	-	X		
Northern Harrier	*Circus hudsonius*	X	X	X	-	SCP II	
Northern Pintail	*Anas acuta*	X	N/A	X	N/A	SCP II	
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	X	N/A	-	N/A		
Northern Shoveler	*Spatula clypeata*	X	N/A	X	N/A		
Orange-crowned Warbler	*Oreothlypis celata*	-	N/A	X*	N/A		
Orchard Oriole	*Icterus spurius*	-	N/A	X	N/A		
Osprey	*Pandion haliaetus*	X*	-	X	-		
Pectoral Sandpiper	*Calidris melanotos*	-	N/A	X	N/A		
Peregrine Falcon	*Falco peregrinus*	X	X*	-	-	SCP III	
Pied-billed Grebe	*Podilymbus podiceps*	X	N/A	X	N/A		
Prairie Falcon	*Falco mexicanus*	-	-	X*	-	SCP II	
Purple Martin	*Progne subis*	X*	N/A	-	N/A		
Red-eyed Vireo	*Vireo olivaceus*	-	N/A	X*	N/A		
Redhead	*Aythya americana*	X	N/A	X	N/A		
Red-necked Grebe	*Podiceps grisegena*	X*	N/A	X	N/A		
Red-necked Phalarope	*Phalaropus lobatus*	-	N/A	X*	N/A		
Red-tailed Hawk	*Buteo jamaicensis*	X	X	X	-		
Red-winged Blackbird	*Agelaius phoeniceus*	X	N/A	X	N/A		
Ring-billed Gull	*Larus delawarensis*	X	N/A	X	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Ring-necked Duck	*Aythya collaris*	X	N/A	X	N/A		
Ring-necked Pheasant	*Phasianus colchicus*	X	N/A	X	N/A		
Rock Pigeon	*Columba livia*	X	N/A	X	N/A		
Ross's Goose	*Anser rossii*	-	N/A	X	N/A		
Rough-legged Hawk	*Buteo lagopus*	X	-	X	X		
Ruddy Duck	*Oxyura jamaicensis*	X	N/A	X	N/A		
Rusty Blackbird	*Euphagus carolinus*	-	N/A	X	N/A		
Sandhill Crane	*Antigone canadensis*	X	N/A	X	N/A		
Savannah Sparrow	*Passerculus sandwichensis*	X	N/A	X	N/A		
Semipalmated Plover	*Charadrius semipalmatus*	-	N/A	X*	N/A		
Sharp-shinned Hawk	*Accipiter striatus*	X	-	X	-		
Sharp-tailed Grouse	*Tympanuchus phasianellus*	X	N/A	X	N/A	SCP II	
Short-eared Owl	*Asio flammeus*	X*	-	-	X	SCP II	
Smith's Longspur	*Calcarius pictus*	-	N/A	X	N/A		
Snow Bunting	*Plectrophenax nivalis*	X	N/A	X	N/A		
Snow Goose	*Anser caerulescens*	-	N/A	X	N/A		
Snowy Owl	*Bubo scandiacus*	-	-	-	X		
Solitary Sandpiper	*Tringa solitaria*	X	N/A	X*	N/A		
Song Sparrow	*Melospiza melodia*	X	N/A	X	N/A		
Sora	*Porzana carolina*	X	N/A	-	N/A		
Spotted Sandpiper	*Actitis macularius*	X*	N/A	X	N/A		
Sprague's Pipit	*Anthus spragueii*	X*	N/A	X*	N/A	SCP I	
Swainson's Hawk	*Buteo swainsoni*	X	X	X	-	SCP I	
Tennessee Warbler	*Oreothlypis peregrina*	X	N/A	-	N/A		
Tree Swallow	*Tachycineta bicolor*	X	N/A	X	N/A		
Tundra Swan	*Cygnus columbianus*	-	N/A	X*	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Turkey Vulture	*Cathartes aura*	X	X*	X	-		
Unknown Accipiter	*Accipiter*	-	-	X*	-		
Unknown Blackbird	*Icteridae*	-	N/A	X*	N/A		
Unknown Corvid	*Corvidae*	X	N/A	-	N/A		
Unknown Duck	*Anatinae*	X*	N/A	X	N/A		
Unknown Eagle	*Aquila chrysaetos/Haliaeetus leucocephalus*	-	-	-	X*		
Unknown Falcon	*Falco*	-	-	X*	X		
Unknown Goose	*Anser/Branta*	-	N/A	X	N/A		
Unknown Gull	*Larinae sp.*	X	N/A	X	N/A		
Unknown Longspur	*Calcariidae*	-	N/A	X	N/A		
Unknown Passerine	*Passeriformes*	X	N/A	X	N/A		
Unknown Raptor	*Accipitriformes/Falconiformes*	X*	-	-	-		
Unknown Shorebird	*Charadriiformes*	X	N/A	X	N/A		
Unknown Sparrow	*Passerellidae*	-	N/A	X	N/A		
Unknown Swallow	*Hirundinidae*	X	N/A	X*	N/A		
Unknown Warbler	*Parulidae*	-	N/A	X*	N/A		
Upland Sandpiper	*Bartramia longicauda*	X	N/A	-	N/A	SCP II	
Vesper Sparrow	*Pooecetes gramineus*	X	N/A	X	N/A		
Virginia Rail	*Rallus limicola*	X	N/A	X*	N/A		
Warbling Vireo	*Vireo gilvus*	X*	N/A	X*	N/A		
Western Grebe	*Aechmophorus occidentalis*	-	N/A	X*	N/A		
Western Kingbird	*Tyrannus verticalis*	X	N/A	X	N/A		
Western Meadowlark	*Sturnella neglecta*	X	N/A	X	N/A	SCP II	
White-breasted Nuthatch	*Sitta carolinensis*	-	N/A	X*	N/A		
White-crowned Sparrow	*Zonotrichia leucophrys*	X*	N/A	-	N/A		
White-faced Ibis	*Plegadis chihi*	-	N/A	X	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Willet	*Tringa semipalmata*	X	N/A	-	N/A	SCP II	
Wilson's Phalarope	*Phalaropus tricolor*	X	N/A	X	N/A	SCP I	
Wilson's Snipe	*Gallinago delicata*	X	N/A	X*	N/A		
Yellow Warbler	*Setophaga petechia*	X	N/A	X	N/A		
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	X	N/A	X	N/A		
Yellow-rumped Warbler	*Setophaga coronata*	-	N/A	X	N/A		

Seasons Detected: An "X" within a particular seasonal column indicates that species has been detected at least once within the Project Area over the course of field studies. An asterisk (*) indicates that the species was detected outside the Project but within the Avian Use Study Area.

State conservation listing status indicates North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) Level I, II, or III

Federal Status Codes: BGEPA=Bald and Golden Eagle Protection Act

This list only includes species detected during standardized surveys. All non-raptor species receive an "N/A" in summer and winter as standardized surveys were only conducted for raptors during these seasons.

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B8. Avian Use Report

Avian Use
Northern Divide Wind Energy Center
Burke County, North Dakota

Final Report

Prepared for:

Northern Divide Wind, LLC

Prepared by:

Clayton Derby and Sofia Agudelo

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November 20, 2019

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TABLE OF CONTENTS

INTRODUCTION 1

CHARACTERIZATION OF THE PROPOSED PROJECT 1

VOLUNTARY WIND ENERGY GUIDELINES TIER 3 STUDIES 6

IMPLICATIONS FOR THE PROPOSED PROJECT 8

CONCLUSION 13

LITEATURE CITED 14

LIST OF TABLES

Table 1. Area (acres) and percent total cover (%) of 2016 National Land Cover Database (NLCD)[1] land use/land cover types in the Northern Divide Wind Energy Center Project Area compared to 200-megawatts (MW) and 300-MW Previous Projects. 3

Table 2. Summary of results of Tier 3 studies conducted at the 200-megawatt (MW) and 300-MW Previous Projects in Burke County, North Dakota. 7

Table 3. Summary of raptor species observations from raw data[1] collected at the survey points located within or near the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, during eagle and raptor use surveys conducted for the 200-megawatt (MW) and 300-MW Previous Projects from April 2017 – March 2018. 9

Table 4. Summary of sensitive non-raptor species observations from raw data[1] collected at the survey points located within and near the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, during general avian use surveys conducted for the 200-megawatt (MW) and 300-MW Previous Projects in spring and fall of 2017 and spring of 2018. 11

Table 5. Summary of the potential for avian and habitat conflicts at the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota. 13

LIST OF FIGURES

Figure 1. Location of the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota relative to 200-megawatts (MW) and 300-MW Previous Projects, and a comparison of 2016 National Land Cover Database (NLCD) land use/land cover types (Sources: Yang et al. 2018, Multi-Resolution Land Characteristics 2019). 2

Figure 2. Wetlands and water features within and around the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota. 4

Figure 3. Land ownership[1] within and around the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota. 5

Figure 4. Avian use points located within and near the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, that were surveyed during studies conducted for the Previous Projects. 10

LIST OF ATTACHMENTS

Attachment 1. Studies Conducted for the Previous Projects

INTRODUCTION

Northern Divide Wind, LLC, a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, proposes to develop the 200-megawatt (MW) Northern Divide Wind Energy Center (Project) in Burke County, North Dakota (Figure 1). The approximately (approx.) 10,897-acre (ac) Project (Project Area) partially lies within areas of recent (2018), previously proposed, but undeveloped 300- and 200-MW wind energy center projects (Previous Projects; Figure 1). Avian use studies conducted for the Previous Projects (Attachment 1) followed the US Fish and Wildlife Service (USFWS) Voluntary Wind Energy Guidelines (WEG; USFWS 2012). These surveys have applicability in evaluating avian use within the Project Area as the Previous Project's survey areas largely overlap the Project Area (Figure 1).

This report (a) describes the Project Area relative to the Previous Projects, (b) reviews information from WEG Tier 3 studies conducted for the Previous Projects to outline potential similarities/differences with the Project, and (c) applies this information contextually to the Project.

CHARACTERIZATION OF THE PROPOSED PROJECT

Compared to the 200- (22,929 ac) and 300-MW (46,510 ac) Previous Projects, the Project Area is 52–76% smaller (Table 1, Figure 1). According to the 2016 National Land Cover Database (NLCD; Yang et al 2018, Multi-Resolution Land Characteristics 2019), croplands make up over 64% of the Project Area, compared to approx. 30% of Previous Project areas (Table 1). Based on the coarser NLCD data, there are approx. 2,079 ac of grassland/herbaceous lands and approx. 191 ac of pasture/hay lands within the Project Area (Table 1), covering approx. 21% of the total, compared to approx. 50% grassland/herbaceous and pasture/hay lands within Previous Project areas (Table 1). However, detailed desktop and field analyses indicate the Project Area has limited unbroken grasslands (approx. 7% of the Project Area; data provided by AECOM). Other land cover percentages are generally similar, but the Project Area has lower percentages of wetland, open water, and woodland/forest compared to the Previous Projects (Table 1).

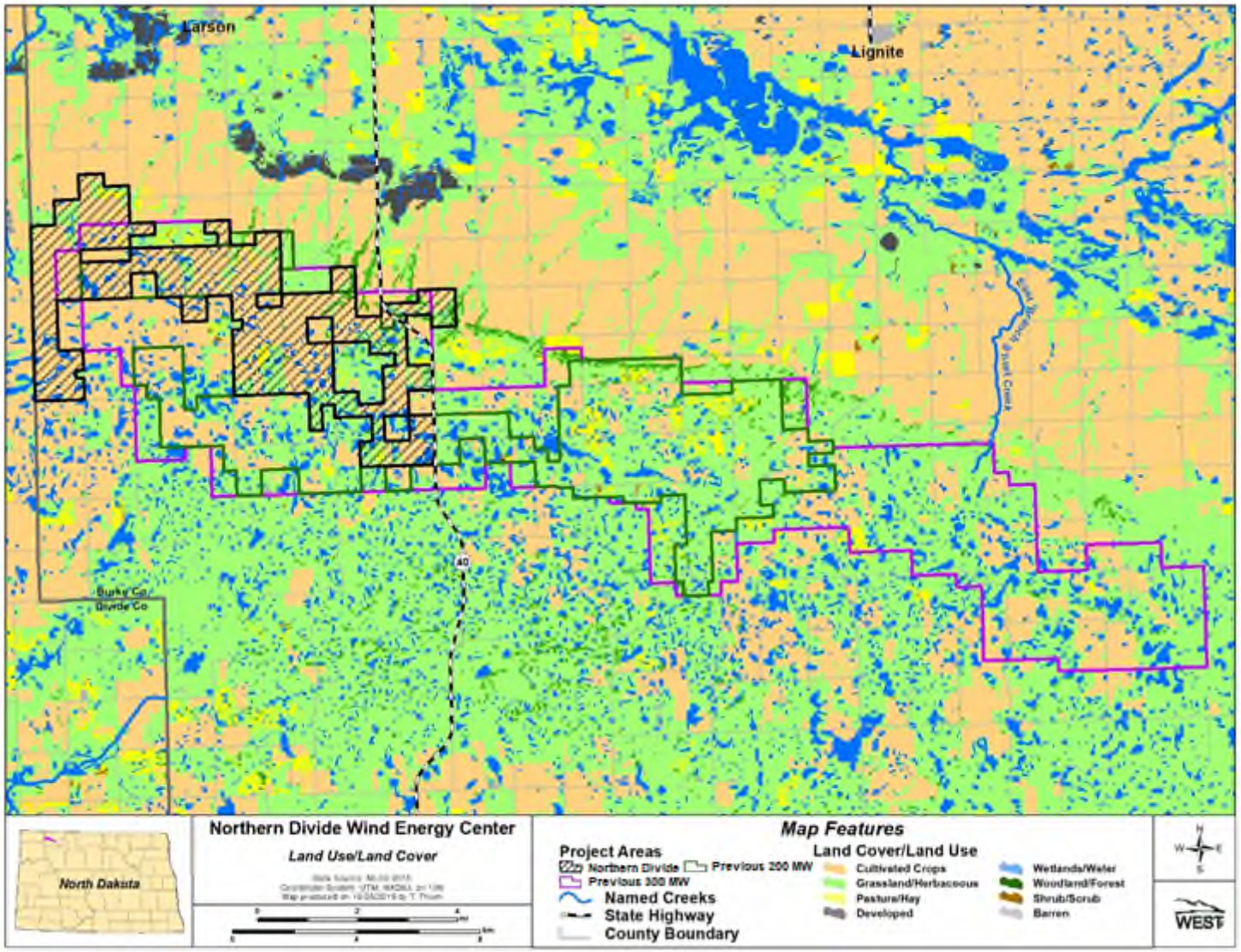


Figure 1. Location of the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota relative to 200-megawatts (MW) and 300-MW Previous Projects, and a comparison of 2016 National Land Cover Database (NLCD) land use/land cover types (Sources: Yang et al. 2018, Multi-Resolution Land Characteristics 2019).

Table 1. Area (acres) and percent total cover (%) of 2016 National Land Cover Database (NLCD)[1] land use/land cover types in the Northern Divide Wind Energy Center Project Area compared to 200-megawatts (MW) and 300-MW Previous Projects.

	Northern Divide		200-MW Previous		300-MW Previous	
Type	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**
Cultivated cropland	7,021	64.4	7,346	32.0	14,469	31.1
Grassland/Herbaceous	2,079	19.1	10,668	46.5	22,404	48.2
Open water	778	7.1	2,212	9.6	4,909	10.6
Wetland	314	2.9	765	3.3	1,428	3.1
Developed	349	3.2	708	3.1	1,301	2.8
Pasture/Hay	191	1.7	786	3.4	1,173	2.5
Woodland/Forest	155	1.4	397	1.7	745	1.6
Barren land	10	0.1	22	0.1	29	0.1
Shrub/Scrub	<0.1	<0.1	25	0.1	53	0.1
Total[2]	**10,897**	**100**	**22,929**	**100**	**46,510**	**100**

[1.] NLCD data used for comparisons. Finer scale analyses (data provided by AECOM) show acres/percentages of unbroken grass being much lower within the Project Area (approximately 7%) than the NLCD classification.

[2.] Values might not add up to totals due to rounding.

Sources: Yang et al. 2018, Multi-Resolution Land Characteristics 2019.

The Project Area has wetlands, prairie potholes, and unnamed creeks, but lacks any major watercourses (Figure 2). Relative to the Project area, the Wallin Waterfowl Production Area (WPA) is approx. 2 miles (mi) west of the nearest proposed turbine, the Bratlein WPA is approx. two mi southwest, the Harris M. Baukol Wildlife Management Area (WMA) is approx. two mi northwest, and the Leaf Mountain WMA is approx. one mi to the southeast (Figure 3). State-owned school lands occur within four mi of the Project area, but no federal- or state-owned or managed lands occur within (Figure 3).

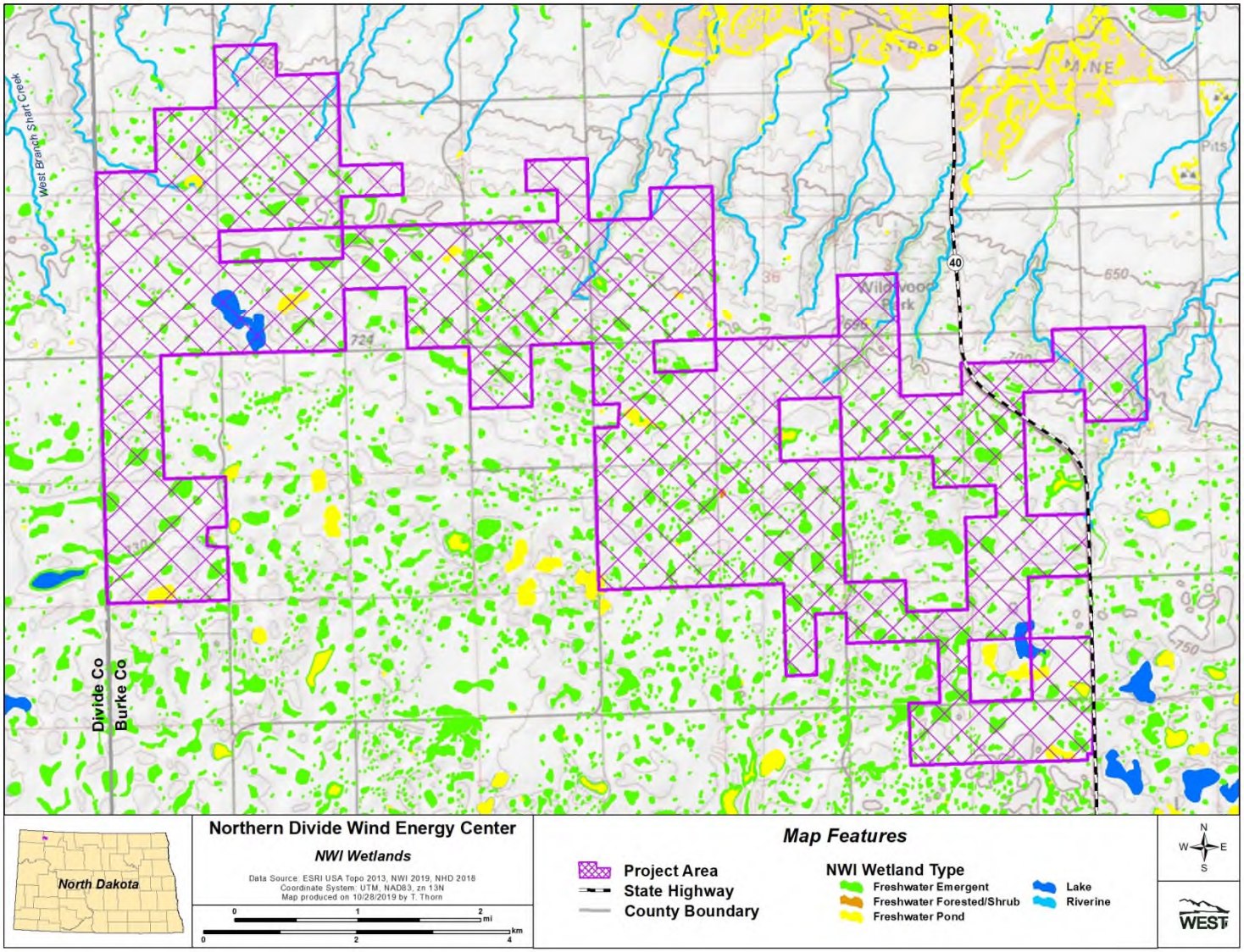


Figure 2. Wetlands and water features within and around the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota.

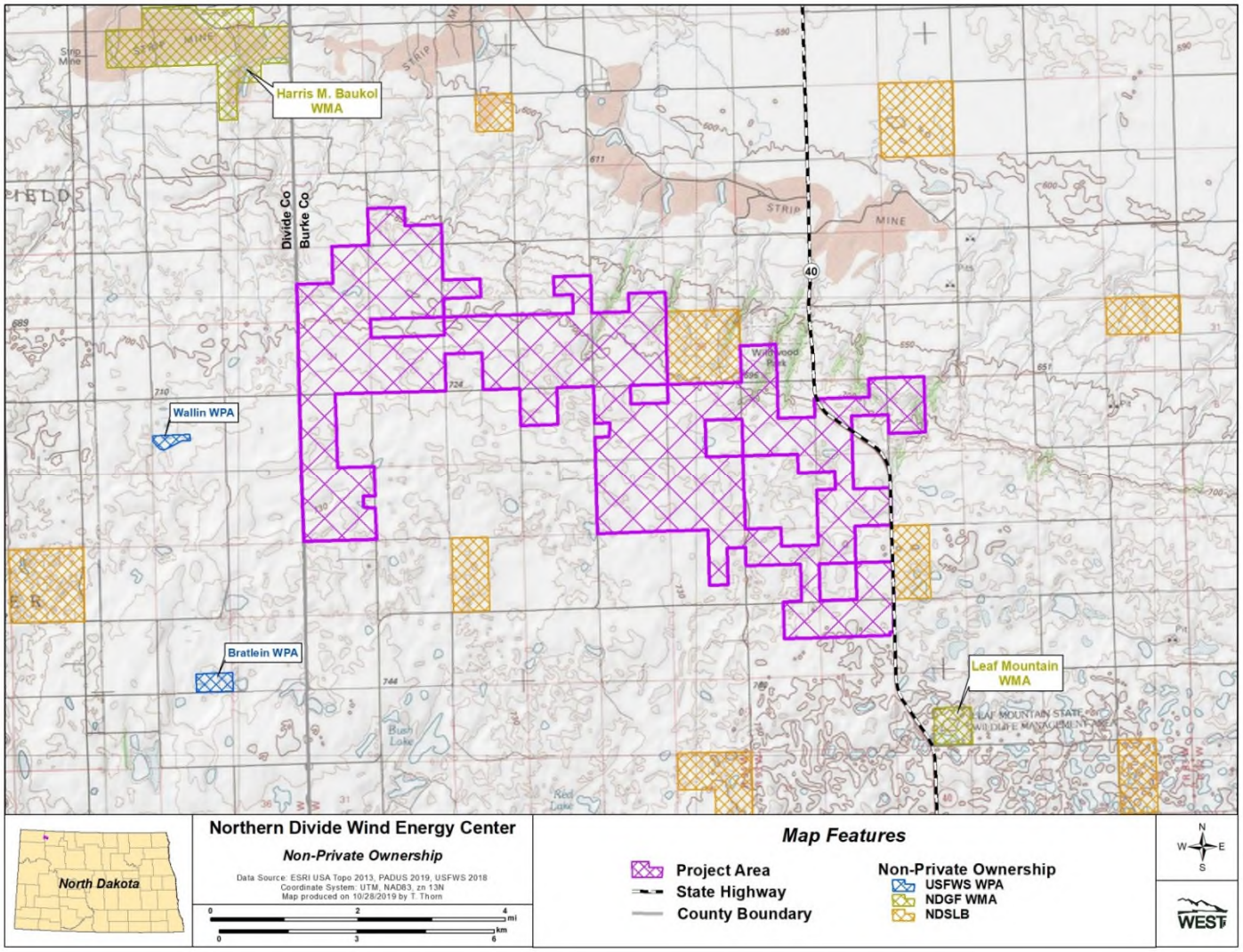


Figure 3. Land ownership[1] within and around the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota.

1. WPA = Waterfowl Production Area, WMA = Wildlife Management Area, USFWS = US Fish and Wildlife Service, NDGFD = North Dakota Game and Fish Department, NDSLB = North Dakota State Land Board - Department of Trust Lands.

VOLUNTARY WIND ENERGY GUIDELINES TIER 3 STUDIES

Northern Divide Wind is relying upon information from the Previous Project studies (Attachment 1) that largely encompass the Project Area to inform WEG Tier 3 questions. Table 2 includes a summary of results from the WEG Tier 3 avian studies (Atwell 2018; 2019a,b). These results generally indicated that avian use, species richness, and relative abundance within the 200-MW Previous Project were similar to or lower than those reported at the 300-MW Previous Project, with some seasonal and spatial patterns observed for specific bird types, avian guilds, or species.

Sandhill cranes (*Antigone canadensis*) were observed during standardized surveys within the Previous Projects, with seasonal use being lower within the 200-MW compared to the 300-MW Previous Project (Atwell 2019b). Furthermore, the highest sandhill crane concentrations occurred within the 300-MW Previous Project east of the 200-MW Previous Project (Atwell 2019b). Whooping cranes were incidentally observed flying during spring migration in early April of 2017 (Atwell 2019b); this observation occurred within the 200-MW Previous Project and within the Project Area. No cranes were observed during the summer, suggesting use by cranes in the general region is limited to the migration periods.

Table 2. Summary of results of Tier 3 studies conducted at the 200-megawatt (MW) and 300-MW Previous Projects in Burke County, North Dakota.

Study	Detections, Species Richness, and Annual Mean Use	Seasonal Mean Use	Composition, Relative abundance, and Frequency of Occurrence	Spatial Patterns	Nests
Grassland Birds	Lower mean use by grassland-associated, area-sensitive species within the 200-MW Previous Project	Similar mean use between the two Previous Project areas. Species of Habitat Fragmentation Concern tended to have lower use within the 200-MW Previous Project.	Similar between the two Previous Project areas. Species of Habitat Fragmentation Concern tended to have lower values within the 200-MW Previous Project.	No evident patterns.	
Wetland Birds (waterfowl, waterbirds, wading birds)	Slightly higher species richness and higher relative abundance within the 200-MW Previous Project. Similar annual mean use.	Seasonal mean use by waders, waterbirds, and waterfowl slightly higher within the 200-MW Previous Project across seasons.	High variability across species and seasons. Species of Conservation Priority tended to have similar or lower values within the 200-MW Previous Project.	No evident patterns.	
All Raptors	Seasonal turnover in species composition.	Mean use in spring, summer, and fall, similar between the two Previous Project areas. Winter use slightly higher within the 200-MW Previous Project.	Similar between the two Previous Project areas.	No spatial use patterns.	Nests concentrated south of the 200-MW Previous Project.
Eagles	Lower number of eagle detections during standardized surveys within the 200-MW Previous Project. Similar annual mean use between the two Previous Projects.	Low mean use across seasons. Similar between the two Previous Project areas. Eagles observed incidentally or during standardized surveys in all seasons but summer.	Similar between the two Previous Project areas.	Uniform spatial use across both Previous Project areas, with some seasonal differences.	No eagle nests recorded.
Passerines	Higher within the 200-MW Previous Project, mostly due to use by generalist, common passerine species.	Higher within the 200-MW Previous Project.	Higher across seasons within the 200-MW Previous Project.	No evident patterns.	

Sources: Atwell 2018; 2019a,b.

IMPLICATIONS FOR THE PROPOSED PROJECT

WEG Tier 3 studies conducted for the Previous Projects indicate that annual and seasonal avian use, frequency of occurrence, species richness, and relative abundance, expected at the Project would be, in general, similar or lower than those recorded at the 200-MW Previous Project, which were generally lower than those recorded in the 300-MW Previous Project area.

Raptor use was higher in the fall season, followed by spring, summer, and winter (Atwell 2019b). Survey points located to the west of the 200-MW Previous Project area (points 25, 16, 11, and 27) had the highest mean use rates in the fall, while points located to the east in the 300-MW Previous Project, had the highest summer and spring mean use rates (Atwell 2019b). Table 3 summarizes raw point count data provided from the Project Area for raptor and eagle use surveys conducted year-round for the Previous Project areas; only raptor species recorded at points within and near the Project Area (Figure 4) are included in this table. For survey points located within or near the Project Area, points 11 and 18 consistently had higher raptor observations (number of raptors per survey point) across seasons (Table 3, Figure 4).

Despite seasonal differences, use by raptors in general, and eagles in particular, did not suggest a spatial pattern that might indicate concentrated use; furthermore, topographic and habitat features within the Project Area do not appear unique compared to the surrounding region, and are slightly less pronounced compared to the Previous Project areas. These results suggest that raptors will migrate over the Project Area mostly in a broad-front fashion, and that the Project Area is not likely to congregate raptors or eagles to a greater extent than the Previous Project areas.

There was a seasonal change in diurnal raptor species composition; however, red-tailed hawks (*Buteo jamaicensis*) and northern harriers (*Circus hudsonius*) composed the majority of diurnal raptor mean use at both the 300- and 200 MW Previous Project areas. These two species were also the most commonly observed raptors within the Project Area (Table 3). The northern harrier, a Species of Conservation Priority (SCP; Dyke et al. 2015) and a Species of Habitat Fragmentation Concern (SHFC; USFWS 2013) in North Dakota, is widespread and fairly common in the State, and use within the Project Area is unlikely to be higher compared to the Previous Project areas given the higher proportion of cultivated cropland.

No eagle and few raptor nests were observed within the 200-MW Previous Project area (Atwell 2018); however, scattered woodlands and large trees surrounding wetlands and ponds within the Project Area could provide suitable eagle nesting habitat, while grassland areas could provide nesting habitats for ground-nesting raptors such as the northern harrier. Based on the results of Tier 3 studies, and on the habitat characteristics within the Project Area, use by eagles and other raptors will likely be similar or lower than the Previous Project areas.

Table 3. Summary of raptor species observations from raw data[1] collected at the survey points located within or near the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, during eagle and raptor use surveys conducted for the 200-megawatt (MW) and 300-MW Previous Projects from April 2017 – March 2018.

	Number of Observations by Survey Point								
Raptor Species (*Scientific Name*)[2]	**10**	**11**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
American kestrel (*Falco sparverius*)[b]	0	1	0	0	1	1	0	0	0
bald eagle (*Haliaeetus leucocephalus*)[b]	3	0	0	0	1	1	0	0	0
Cooper's hawk (*Accipiter cooperii*)	0	2	0	0	0	2	2	2	1
falcon sp.	0	0	0	0	1	0	0	0	0
ferruginous hawk (*Buteo regalis*)[a]	0	0	0	1	0	0	0	0	1
golden eagle (*Aquila chrysateos*)	0	0	0	0	0	1	0	0	0
great horned owl (*Bubo virginianus*)	0	0	1	0	0	0	0	0	2
merlin (*Falco columbarius*)	0	1	0	0	0	0	0	0	0
northern goshawk (*Accipiter gentilis*)	0	0	0	0	0	0	0	1	0
northern harrier (*Circus hudsonius*)*[,b,]	8	10	10	5	15	16	8	6	12
osprey (*Pandion haliaetus*)	0	0	1	0	0	0	0	0	0
peregrine falcon (*Falco peregrinus*)[c]	0	0	0	0	1	0	0	0	0
red-tailed hawk (*Buteo jamaicensis*)	6	15	11	23	10	10	17	35	6
rough-legged hawk (*Buteo lagopus*)	0	0	0	0	0	9	2	3	1
sharp-shinned hawk (*Accipiter striatus*)	0	0	0	0	0	2	0	3	0
snowy owl (*Bubo scandiacus*)	0	1	0	1	0	0	0	0	0
Swainson's hawk (*Buteo swainsoni*)[a]	4	16	2	1	9	1	0	2	1
turkey vulture (*Cathartes aura*)	0	0	2	1	0	1	2	0	2
Total	**21**	**46**	**27**	**32**	**38**	**44**	**31**	**52**	**26**

1. Raw fixed-point count data provided by Atwell.

2. North Dakota Species of Conservation Priority (SCP) denoted by superscript letters: a = SCP Level I, b = SCP Level II, and c = SCP Level III (Dyke et al. 2015); Species of Habitat Fragmentation Concern (USFWS 2013) denoted by asterisk (*). No federally listed species were observed during eagle and raptor use surveys conducted from 2017 – 2018.

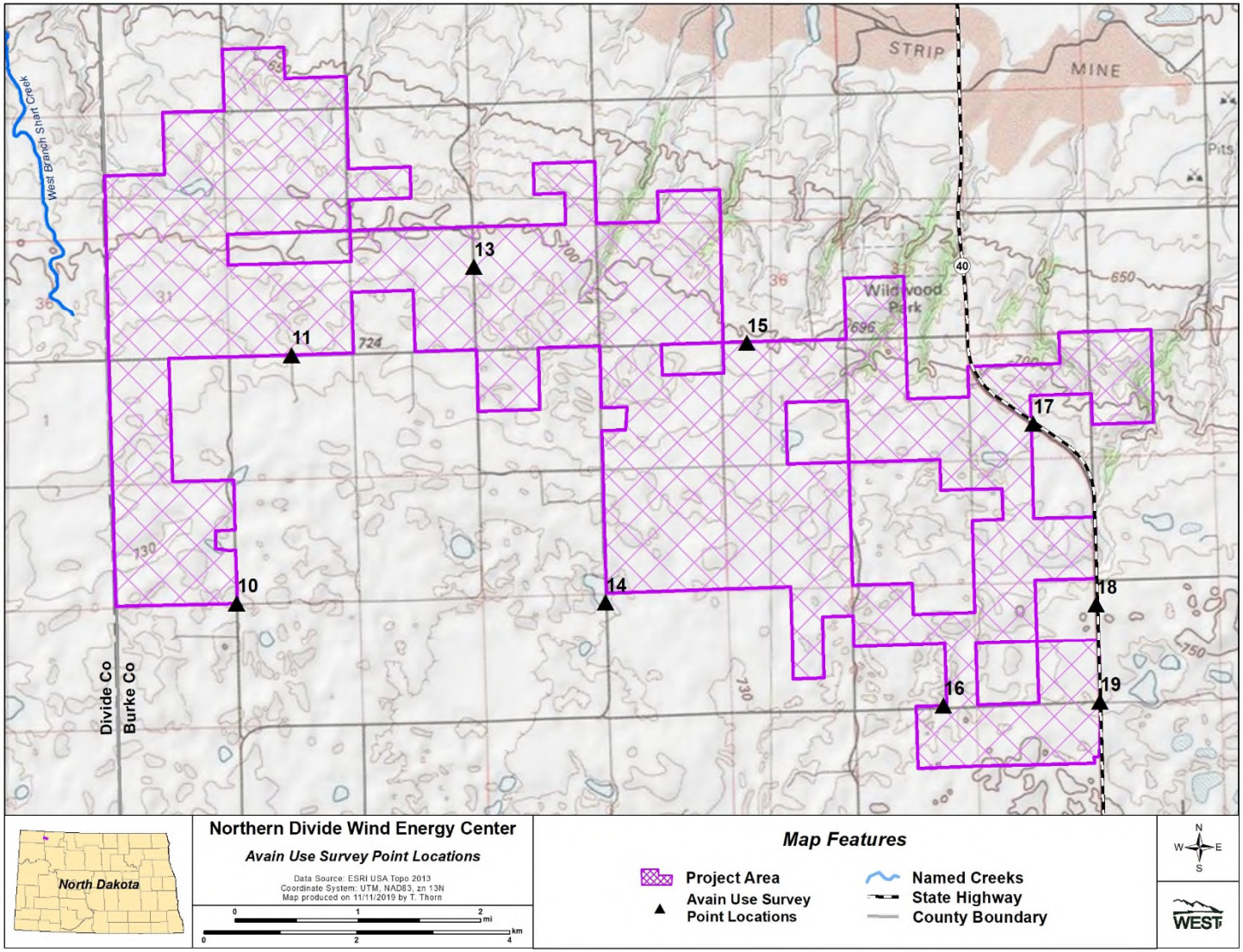


Figure 4. Avian use points located within and near the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, that were surveyed during studies conducted for the Previous Projects.

Use by grassland-associated species was in general lower within the 200-MW compared to the 300-MW Previous Project (Atwell 2019a); however, this decrease was not proportional to the significant decrease in the amount of grassland cover, and was not consistent across species or seasons. Use by grassland-associated species will likely be lower in the Project Area than in the Previous Project areas given the significantly lower amount of grasslands.

Although several SCP and SHFC could utilize the herbaceous lands present within the Project Area, use by several of these species, including Sprague's pipit (*Anthus spragueii*) and bobolink (*Dolichonyx oryzivorus*), was significantly lower within the 200-MW compared to the 300-MW Previous Project (Atwell 2019a,b). Table 4 summarizes raw point count data from the Project Area for general avian use surveys conducted in fall and spring of 2017 and spring of 2018 for the Previous Project areas; only non-raptor sensitive avian species (i.e., SHFC and SCP) recorded at points within and near the Project Area (Figure 4) are included in this table.

Table 4. Summary of sensitive non-raptor species observations from raw data[1] collected at the survey points located within and near the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota, during general avian use surveys conducted for the 200-megawatt (MW) and 300-MW Previous Projects in spring and fall of 2017 and spring of 2018.

	Number of Observations by Survey Point								
Species (*Scientific Name*)[2]	**10**	**11**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
American avocet (*Recurvirostra americana*)[b]	0	4	0	0	0	0	0	0	0
Black tern (*Chlidonias niger*)[a]	7	3	6	23	0	11	0	0	22
Bobolink (*Dolichonyx oryzivorus*)*[,b]	0	0	0	0	1	1	1	0	0
Canvasback (*Aythya valisineria*)[b]	1	1	0	2	0	2	0	0	12
Chestnut-collared longspur (*Calcarius ornatus*)*[,a]	0	1	0	0	0	0	6	0	0
Franklin's gull (*Leucophaeus pipixcan*)[a]	24	41	26	77	5	11	12	8	39
Horned grebe (*Podiceps auritus*)[a]	0	1	0	0	0	0	0	0	0
Lesser scaup (*Aythya affinis*)[b]	21	43	31	154	20	38	0	0	18
Northern pintail (*Anas acuta*)[b]	1	4	54	4	11	8	0	2	0
Sharp-tailed grouse (*Tympanuchus phasianellus*)*[,b]	1	0	0	3	3	0	0	0	0
Upland sandpiper (*Bartramia longicauda*)*[,a]	2	3	1	2	0	0	0	1	1
Western meadowlark (*Sturnella neglecta*)[b]	5	4	1	3	6	1	0	5	2
Willet (*Tringa semipalmata*)[b]	0	1	1	2	1	0	2	0	1
Wilson's phalarope (*Phalaropus tricolor*)[a]	0	0	4	0	0	12	0	0	4
Total	**62**	**106**	**124**	**270**	**47**	**84**	**21**	**16**	**99**

1. Raw fixed-point count data provided by Atwell.

2. Only sensitive non-raptor species shown. North Dakota Species of Conservation Priority (SCP) denoted by superscript letters: a = SCP Level I, b = SCP Level II, and c = SCP Level III (Dyke et al. 2015); Species of Habitat Fragmentation Concern (USFWS 2013) denoted by asterisk (*). No federally listed species were observed during general avian use surveys conducted from 2017 – 2018.

Bobolinks were mostly observed at points outside the Project Area; Sprague's pipit were only observed at points 21, 29, and 46, outside the Project Area; and western meadowlark (*Sturnella neglecta*) observations were low and similar across points (Atwell 2019b; Table 4, Figure 4). Chestnut collared longspurs (*Calcarius ornatus;* seven observations) were only observed at points 11 and 17, within the Project Area (Table 4, Figure 4). Grasshopper sparrow (*Ammodramus savannarum*), a SCP and SHFC in North Dakota, was only recorded during breeding bird surveys;

except for three grasshopper sparrows recorded at breeding bird survey point 46 (located adjacent to the Project Area's northern boundary) all other observations were recorded outside the Project Area (Atwell 2019a).

These results suggest that the smaller grassland fragments within the Project Area will likely see lower use by grassland-associated, area-sensitive species. Similarly, several SCP in North Dakota were recorded during avian use and breeding bird surveys (Atwell 2019a,b), but given the mix of tilled agriculture, grasslands, and wetlands within the Project Area, it is likely that use by these species will be lower compared to Previous Project areas.

Richness and abundance of grassland-associated species were highest in the eastern portion of the 300-MW Previous Project area, southeast of the 200-MW Previous Project area (Atwell 2019a). This area had a high proportion of grasslands, with some large, contiguous tracts of potentially native habitats suitable for area sensitive species. Although grassland habitat is still present within the Project Area, large, contiguous tracts are limited; therefore, richness and abundance of grassland-associated species is likely to be lower than those recorded at the Previous Project areas.

Despite the decrease in wetland acreage within the Project Area compared to the Previous Project areas, the percent of wetland cover among the different areas is similar (Table 1). While richness and relative abundance of wetland-associated birds was higher within the 200-MW compared to the 300-MW Previous Project, mean use by wetland-associated species was similar between the Previous Project areas, with high seasonal and species-specific variability in mean use and frequency of occurrence (Atwell 2019a). In general, use by wetland-associated SCP and SHFC species was similar or lower within the Project area compared to Previous Projects. Black terns (*Chlidonias niger*) were mostly observed at points 14 and 19, inside the Project Area, and Point 40, outside the Project Area; canvasbacks (*Aythya valisineria*) were mostly observed at points outside the Project area; and Franklin's gull (*Leucophaeus pipixcan*), upland sandpiper (*Bartramia longicauda*), and willet (*Tringa semipalmata*) observations were similar across points (Table 4). Horned grebe (*Podiceps auritus;* one observation) was only observed at Point 11 within the Project Area, while American white pelican (*Pelecanus erythrorhynchos*), was only observed at points outside of the Project Area.

These results suggest that both the local conditions specific to particular wetlands and the spatial configuration of suitable roosting and foraging habitats might be determining use by this group. No evident patterns in spatial use by wetland-associated species were detected, indicating that habitat suitability for this guild is similar across the general landscape, and suggesting that use within the Project Area will be similar to that observed at the 200-MW Previous Project.

Despite the reduced acreage of grassland and wetland habitats present within the Project Area compared to the Previous Project areas, the combination of ponds and grasslands found in the Project Area may continue to be attractive to a broad suite of birds. Harvested crops could serve as feeding areas for migrating cranes and waterfowl. These land types are found throughout the

region and their presence in the Project Area should not concentrate use by wetland-associated species more than that within the Previous Project areas.

Seasonal mean passerine use was higher within the 200-MW Previous Project; however, the majority of overall use was due to generalist, widespread species associated with agricultural landscapes, such as common grackle (*Quiscalus quiscula*) and red-winged blackbird (*Agelaius phoeniceus*). Given the higher proportion of tilled agriculture within the Project Area, generalist species associated with agricultural landscapes are also likely to be common.

CONCLUSION

Due to the Project Area's location, habitat features, and results of Tier 3 studies, overall avian use, richness and abundance, patterns of spatial use, and potential for sensitive species to occur, are likely to be equal or lower than those recorded for the Previous Projects (Table 5). Use by some avian guilds or bird types, such as area-sensitive grassland-associated birds is expected to be lower, while use by raptors and wetland-associated birds is expected to be similar to the one recorded at the 200-MW Previous Project.

Table 5. Summary of the potential for avian and habitat conflicts at the Northern Divide Wind Energy Center Project Area in Burke County, North Dakota.

Issue Potential	High	Moderate	Low	Notes
Raptor nest sites		✓		Predominantly tilled agriculture with low percent of grasslands, and scattered tall trees and wooded areas.
Concentrated raptor flight		✓		Lack of patterns in spatial use or movements indicate that the potential for concentrated raptor is unlikely.
Migratory pathway		✓		Located within the whooping crane migration corridor.
Sensitive species occurrence		✓		Predominantly tilled agriculture, but federally protected species, state sensitive species, and species of habitat fragmentation may occur.
Habitat uniqueness		✓		Predominantly tilled agriculture. Low percent of grasslands, and scattered tall trees and wooded areas are not unique to region.

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Attachment 1. Studies Conducted for the Previous Projects

List of Studies

A. Burke County Wind Energy Center – Revised Grouse Lek and Raptor Nest Survey Results for 200 MW Project Area (Atwell 2018)

B. Breeding Bird Assessment for the Burke County Wind Project, Burke County, North Dakota (Atwell 2019a)

C. [**See Appendix B7.C of the Northern Divide Wind Energy Center Application to the North Dakota Public Service Commission for a Certificate of Site Compatibility**]

B8. Attachment 1A. Burke County Wind Energy Center – Revised Grouse Lek and Raptor Nest Survey Results for 200 MW Project Area.

Technical Avian Data Summary Revision

TO: Burke Wind, LLC

FROM: Atwell, LLC

DATE: November 30, 2018

RE: Burke County Wind Energy Center – Revised Grouse Lek & Raptor Nest Survey Results for 200 MW Project Area

Burke Wind, LLC (Burke Wind), a wholly-owned, indirect subsidiary of NextEra Energy Resources, LLC, is developing the Burke County Wind Energy Center (Burke WEC or Project) in Burke County, North Dakota. The Burke WEC includes a wind resource Project Area (Figure 1). Burke Wind originally proposed to construct the Burke WEC to produce 300 megawatts (MW). The area evaluated for the 300 MW version of the project is referred to in this memo as the original Project Area. Burke Wind has recently reduced the Project size to 200 MW (referred to in this memo as 200 MW Project Area), which consists of an area of approximately 22,933 acres. This resulted in the elimination of 38 wind turbines and a reduced Project Area that is fully encompassed within the original Project Area. The purpose of this memorandum is to provide a summary of findings related to Grouse Lek and Raptor Nest Survey work completed for the Project as it relates to the 200 MW Project Area. This memorandum does not include discussion of the proposed overhead high-voltage transmission line infrastructure associated with the Project as that is presented under separate cover.

Site characterization review identified the potential for Sharp-tailed Grouse (*Tympanuchus phaisanellus*) to occur in the original Project Area. Surveys were conducted within a WEC Grouse Survey Study Area, which included the original Project Area and a 0.5-mile lek assessment buffer. Survey of the WEC Grouse Survey Area including the 0.5-mile assessment buffer is based on the 2015 North Dakota State Wildlife Action Plan[1] description of Sharp-tailed Grouse hens often nesting within 0.5-mile of a lek. The original WEC Grouse Survey Study Area was assessed for Sharp-tailed Grouse lekking grounds from April 10 to April 28, 2017.

Also, the WEC Raptor Nest Study Area (which included the original Project Area and a surrounding 10-mile raptor assessment buffer) was assessed for raptor nests, particularly for Bald Eagle (*Haliaeetus leucocephalus*) nests. Aerial lek surveys were conducted from April 24 to April 28, 2017. Eagle nests surveys were conducted aerial transects within the WEC Raptor Nest Study Area, in accordance with

[1] Dyke, S., S. Johnson, and P. Isakson (2015). North Dakota State Wildlife Action Plan 2015. [Online.] Available at http://gf.nd.gov/gnf/conservation/swap-2015/docs/swap-2015.pdf.

recommendations set forth in the USFWS *Eagle Conservation Plan Guidance*[2]. These eagle nest buffer survey transects were flown only after peak grouse lekking timing in the early morning hours.

Detailed methodologies and findings as they relate to the 200 MW Project Area are discussed below.

Ground-based and Aerial Grouse Lek Survey Methodologies

On September 21, 2017, a study plan for grouse lek and raptor nest surveys was submitted to the U.S. Fish and Wildlife Service (USFWS) (Mr. Kevin Shelly) and the North Dakota Game and Fish Department (NDGFD) (Mr. Steve Dyke) in combination with other proposed avian services task methodologies. On behalf of Burke Wind, Atwell, LLC (Atwell) requested agency review of the study plan. Atwell did not receive study plan review communication from the USFWS but did receive study plan review communication from the NDGFD on November 16, 2017 (Mr. Greg Link). The NDGFD did not pose questions or suggested alterations to the raptor nest survey or grouse lek survey methodologies. In subsequent follow-up, the NDGFD upland game bird biologist did not recommend a specific lek survey approach at that time (Rodney Gross – NDGFD, pers. comm.). Atwell consequently deemed the survey protocols as sufficient and used the proposed study plan for lek surveys.

Ground-based lek surveys were conducted from April 10 to April 26, 2017 and aerial lek surveys were conducted from April 24 to April 28, 2017. These Tier 3 surveys followed pre-survey Tier 2 site characterization analysis (as defined within the USFWS's Land-based Wind Energy Guidelines)[3] that found the original Project Area to include areas of potential lekking and nesting habitat for Sharp-tailed Grouse.

Based on Sharp-tailed Grouse species biology, prior experience with lekking grouse species, and information synthesized within Johnsgard (2016),[4] confirmed leks were defined as three (3) or more birds together with at least one male displaying. Possible leks were defined as auditory detections of multiple grouse that could not be verified visually after their initial detection on a ground-based survey.

Ground-based Roadside Surveys

Roadside lek surveys were conducted from the majority of available and safely accessible public roadways that traverse the WEC Grouse Survey Study Area and that intersect grassland habitat. Grassland habitat was determined with available land cover data and desktop review of sources including geographic information system (GIS) coverage of NDGFD's Micro Native Grassland

[2] USFWS (2013). Eagle Conservation Plan Guidance: Module 1 - Land-based Wind Energy: Version 2. [Online.] Available at http://www.fws.gov/migratorybirds/Eagle_Conservation_Plan_Guidance-Module%201.pdf.

[3] USFWS (2012). U.S. Fish and Wildlife Service Land-based Wind Energy Guidelines. [Online.] Available at http://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf.

[4] Johnsgard, Paul A. *The North American Grouse: Their Biology and Behavior*. Zea Books, 2016.

Conservation Areas[5]. Surveys were conducted within a limited window commencing 30 minutes before local sunrise and terminating between 60 and 120 minutes after sunrise, based on the suitability of survey weather conditions (e.g., wind speed, temperature,. precipitation, etc.). Biologists surveyed for lekking grouse at safe roadside pull-offs and at no greater than 0.4 mile increments[6]. Figure 2 identifies the ground based survey point locations (Sharp-tailed Grouse [STGR] Lek Survey Points).

Each ground-based survey point was surveyed for a minimum of five (5) minutes. The first round of the ground-based site visit was completed before the aerial transect survey was completed and this ground-based survey was used to help define target areas surveyed during the aerial transect surveys and second round of ground-based surveys. Ground-based surveys sites were visited twice if any of the following three criteria occurred: 1) habitat corresponded to the NDGFD macro native grassland conservation areas model (Figure 2) and habitat appeared to be consistent with grassland with elevated flat topography that could offer ideal lekking locations; 2) audio detections were made during the first visit; or 3) only a single grouse was observed during the first visit. Each ground-survey event was separated by at least 10 days between visits.

Aerial Transect Surveys

Aerial transect surveys were conducted by Atwell biologists and were flown by Double M Helicopters at low speeds (i.e., 30 – 40 knots)[7]. Survey transects were flown in 0.5-mile intervals across the WEC Grouse Survey Study Area. A 0.25-mile (400-meter [m]) visibility threshold existed on either side of the aircraft. Transect routes were oriented on a north-south axis and were flown at heights of 200 to 250 feet above the ground surface (60 – 76 m). A small number of transects were within Lostwood National Wildlife Refuge; refuge personnel and county sheriff's department personnel were contacted ahead of time to indicate that refuge airspace would be transected via helicopter. It was recommended that transects within Lostwood National Wildlife Refuge be flown at heights of roughly 500 feet (150 m). Transects began at 5-10 minutes before sunrise and ended two hours after sunrise. Two Atwell biologists surveyed simultaneously, one from each side of the aircraft.

The large majority of lek locations were plotted to a precision of 0- 50 m, and all leks were within 100-150 m of plotted coordinates. Landmarks in aerial images that were used to assist mapping precision during the survey (such as hilltops, potholes, trees, rock outcrops, or roads) were in some cases lacking in grassland-dominated lek habitats.

[5] North Dakota Game and Fish Department (2014). North Dakota Game and Fish Department Native Grassland - Micro. *Micro Native Grassland Conservation Areas*. [Online.] Available at https://ndgov.maps.arcgis.com/home/item.html?id=fb597cc6c2154f3fbc1f52514ef92074

[6] Hamilton, S., D. Manzer, B. K. Sandercock, K. Martin, and G. Segelbacher (2011). Estimating lek occurrence and density for sharp-tailed grouse. Ecology, conservation, and management of grouse. Studies in Avian Biology. University of California Press, Berkeley, USA:31–49.

[7] http://www.doublemhelicopters.com

Bald Eagle & Raptor Nest Survey Methodology

Pre-survey site characterization Tier 2 analysis concluded that the WEC Raptor Nest Study Area could potentially contain Bald Eagle nesting habitat[8]. As such, Tier 3 aerial raptor nest surveys were conducted. Aerial transect surveys were conducted by Atwell biologists and were flown by Double M Helicopters at low speeds (30 – 40 knots). Survey transects were conducted in 1-mile intervals across the WEC Raptor Nest Study Area as recommended by the Eagle Conservation Plan Guidance: Module 1-Land-based Wind Energy, v.2[9]. A 0.5-mile (800 m) visibility threshold existed on either side of the helicopter. Visibility constraints were minimal during surveys and deciduous leaf-out conditions never exceeded initial bud-break phase.

RESULTS

Sharp-tailed Grouse Lek Survey Results Summary

The reduced 200 MW project area now contains only six (6) confirmed leks (Figure 2). Reducing the original Project Area from the 300 MW configuration to the 200 MW Project Area resulted in six (6) leks no longer in the Project Area. Fourteen (14) confirmed leks were located outside the 200 MW Project Area but within a 0.5 mile lek assessment buffer, equaling 20 total confirmed leks found within the 200 MW Project Area and the 0.5-mile buffer. Confirmed leks found within the WEC Grouse Survey Study Area boundary averaged 12.8 individuals/lek (*Standard Deviation* = 6.7, *n* = 12).

Biologists located four (4) possible lek locations during ground-based surveys within the 200 MW Project Area. Two (2) additional possible lek locations were identified within 0.5 miles of the 200 MW Project Area. Additionally, individuals (sightings of one or two Sharp-tailed Grouse that were not linked directly to a lek) were recorded in 12 instances throughout the 200 MW Project Area and are plotted in Figure 2.

Eagle Nest Survey Results Summary

Atwell did not detect any Bald Eagle nests within the WEC Raptor Nest Study Area during April 2017 aerial surveys. Atwell also did not detect any individual eagles that were using habitats within the WEC Raptor Nest Study Area during these aerial surveys.

Other Nesting Raptor Species Results Summary

The reduced 200 MW project area now contains only six (6) active Red-tailed Hawk (*Buteo jamaicensis*) nests and five (5) active Great Horned Owl (*Bubo virginianus*) nests as located by Atwell (Figure 2). Each of these active nests was observed with either: an incubating adult, an adult defending the nest, or a nest containing eggs or nestlings. Reducing the original Project Area from the 300 MW configuration to the 200 MW Project Area resulted in eight (8) Red-tailed Hawk and two (2) Great Horned Owl nests no

[8] Johnson, S. (2009). North Dakota Bald Eagle Nest Summary. [Online.] Available at https://efotg.sc.egov.usda.gov/references/public/ND/ND_Bald_Eagle_Nest_Summary_2009.pdf.

[9] USFWS (2012). U.S. Fish and Wildlife Service Land-based Wind Energy Guidelines. [Online.] Available at http://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf.

longer in the 200 MW Project Area. All nests within one mile of the currently proposed Project Area and a 0.25-mile raptor nest buffer are shown on Figure 3.

Four (4) of the raptor nests located within the 200 MW Project Area were associated with an unknown raptor species. These nests were described as large enough to be raptor nests (though likely too small to be eagle nests), and of recent construction (2016 or 2017, based on the condition of nesting material and nest cup structure), yet were unattended by hawks or owls at the time of observation. In addition to Red-tailed Hawks and Great Horned Owls, Ferruginous Hawks (*Buteo regalis*), Swainson's Hawks (*Buteo swainsoni*), Cooper's Hawks (*Accipiter cooperii*), and Long-eared Owls (*Asio otus*) are all potential breeders within the proposed Project Area and may use these structures later in the season[10, 11].

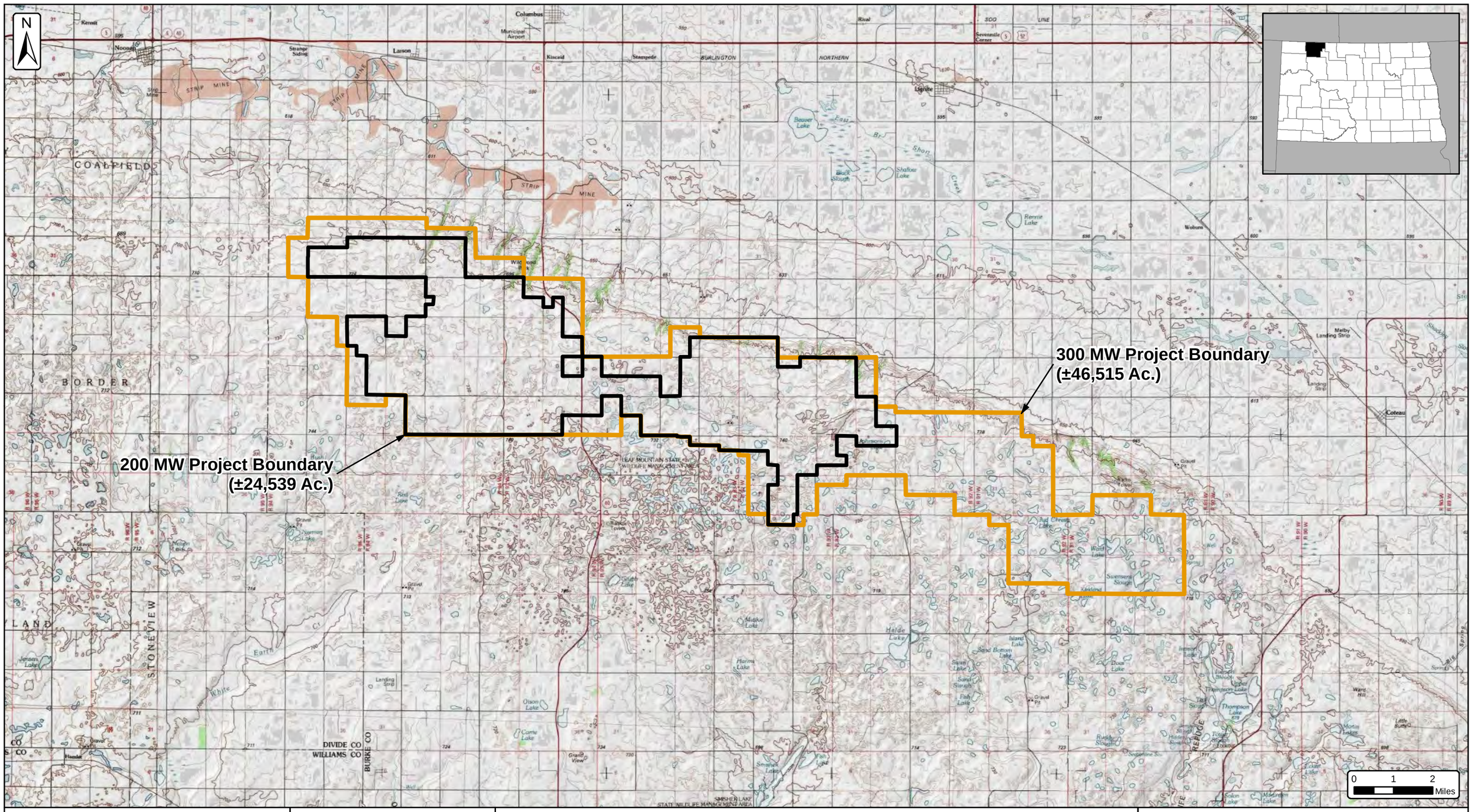
Overall nest density within the WEC Raptor Nest Study Area was approximately 9.0 nests/square-kilometer. Cursory visual assessment indicates that distribution of these nest structures was not uniform (Figure 3). Upon review of incidental raptor nest density within the 10-mile eagle nest assessment buffer, raptor nests appear to be concentrated primarily south of the 200 MW Project Area.

Large-bodied Colonial Nesting Species Results Summary

Atwell located one Double-crested Cormorant (*Phalacrocorax auritus*) rookery within the 200 MW Project Area (Figure 3). The rookery contained approximately 30 nests and was situated in standing snags in a glacial pothole in Harmonious Township, east of the corner of 94th St NW and 99th Ave NW.

[10] Atwell unpublished data.

[11] AKN (2017). Avian Knowledge Network (AKN). [Online.] Available at www.avianknowledge.net.



Burke County Wind Energy Center

Figure 1. Site Location Map

Burke County, North Dakota

Date: 11/30/2018

Client:

Burke Wind, LLC

Atwell, LLC Project: 16000947

200 MW Project Area
10/16/2018 (± 24,539 Ac.)

300 MW Project Area
07/18/2018 (±46,515 Ac.)

SOURCE: USGS TOPOGRAPHIC QUADS

ATWELL

The information contained on this map is proprietary and confidential. The use or disclosure of this information by you to third parties is prohibited by law and may give rise to civil or criminal liability.

N

Keller Township

Fay Township

Fay Township

Vale Township

Fay Township

Vale Township

Leaf Mountain Township

Foothills Township

Burke County

Harmonious Township

Harmonious Township

Thorson Township

Leaf Mountain Township

Cleary Township

0 1 2 Miles

Burke County Wind Energy Center

Figure 2. Sharp-tailed Grouse Lek Survey

Burke County, North Dakota

Date: 11/30/2018

Client:

Burke Wind, LLC

Atwell, LLC Project: 16000947

STGR Lek Survey Point

Sharp Tailed Grouse

Individual

Confirmed Lek

Possible Lek

0.5 Mile Lek Constraints Buffer

Native Grasslands-Micro

0%-20%

20%-40%

40%-60%

60%-80%

80%-100%

USFWS Easements

Wetland Easement

Grassland/Wetland Easement

200 MW Project Area 10/16/2018 (± 24,539 Ac.)

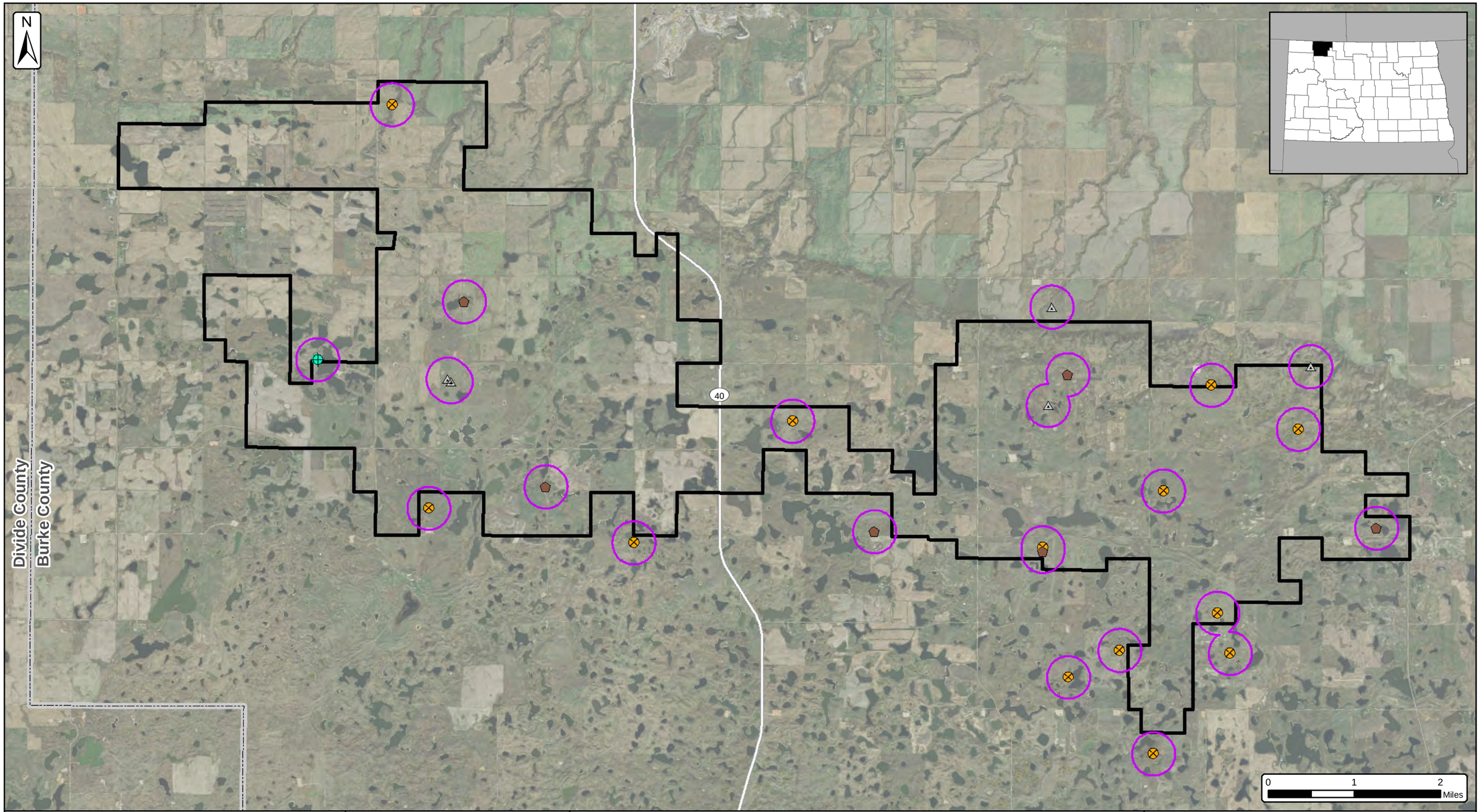
Township Boundaries

County Boundaries

SOURCE: GRASSLANDS MICRO LAYER; NDGF

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Burke County Wind Energy Center

Figure 3. Raptor Nest Survey Map

Burke County, North Dakota

Date: 11/30/2018

Client:

Burke Wind, LLC

Atwell, LLC Project: 16000947

Raptor Nests (Atwell Identified 05/04/2017)

- Double-crested Cormorant
- Great Horned Owl
- Red-tailed Hawk
- Unknown

- Raptor Nest 0.25 Mile Buffer
- 200 MW Project Area 10/16/2018 (± 24,539 Ac.)
- County Boundaries

SOURCE: USDA NAIP IMAGERY, 2017

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The information contained on this map is proprietary and confidential. The use or disclosure of this information by you to third parties is prohibited by law and may give rise to civil or criminal liability.

B8. Attachment 1B. Breeding Bird Assessment for the Burke County Wind Project, Burke County, North Dakota.

Breeding Bird Assessment

for the

BURKE COUNTY WIND PROJECT
Burke County, North Dakota

Prepared for

Burke Wind, LLC
700 Universe Boulevard
Juno Beach, FL 33408

Submitted by Atwell, LLC – Atwell Project No. 16000947

January 31, 2019

TABLE OF CONTENTS

Section Page

EXECUTIVE SUMMARY II

1.0 INTRODUCTION 1

2.0 METHODS 2

2.1 Project Setting 2
2.2 Road-Based Breeding Bird Assessments 3
2.3 Data Management 3
2.4 Data Analysis 3

3.0 RESULTS AND DISCUSSION 5

3.1 Federally Listed Threatened and Endangered Species 5
3.2 Grassland-Associated Bird Species 5
3.2.1 Species Richness and Relative Abundance 5
3.2.2 Grassland Species of Conservation Priority 5
3.3 Waterfowl and Other Wetland-Associated Bird Species 7
3.3.1 Species Richness and Relative Abundance 7
3.3.2 Wetland Species of Conservation Priority 8

4.0 REFERENCES 10

APPENDICES

Appendix I. Figures

Figure 1. Breeding Bird Assessment Survey Plan
Figure 2. Grassland Bird Species Richness
Figure 3. Grassland Bird Species Relative Abundance
Figure 4. Waterfowl Species Richness
Figure 5. Waterfowl Species Relative Abundance
Figure 6. All Wetland Bird Species Richness
Figure 7. All Wetland Bird Species Relative Abundance

Appendix II. Average Species Richness and Relative Abundance for Habitat-Associated Species Groups within and outside the Burke County Wind Project

Appendix III. Species Observed during Breeding Bird Assessments

EXECUTIVE SUMMARY

This report summarizes the results of breeding bird surveys conducted for the proposed Burke County Wind Project (the Project) in Burke County, North Dakota. The surveys were performed between June 22 and July 5, 2017, by Atwell, LLC on behalf of Burke Wind, LLC, a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC. All surveys took place within the Avian Use Study Area, defined as the original 300-megawatt (MW) wind turbine configuration plus a 1-mile (1.6 km) boundary area. In late 2018, the Project was reduced in size to 200 MW, and all subsequent references to the Project refer to this 200 MW configuration. Results of the breeding bird surveys are presented in this report for both the Avian Use Study Area and the 200 MW Project configuration.

In addition to avian use point count surveys completed during the spring and fall migration seasons, the breeding bird surveys were completed at the request of the U.S. Fish and Wildlife Service, to characterize avian use across a greater portion of the Project during the breeding season. The surveys not only documented the frequency of occurrence, species richness, and relative abundance of grassland and wetland-associated avian species across the Project and Avian Use Study Area, but the results can be used to inform infrastructure siting considerations.

While the surveys included species of concern, the focus of this effort was to document all avian use of these habitats. The results could then be compared with the proposed turbine array(s) to determine areas of overlap, with the goal of avoiding potential impacts to avian species and assist with project planning.

Key Results

- A total of 104 bird species were detected during the breeding bird surveys. Ninety-seven of these species were detected at points within the Project, and 101 were detected outside the Project but within the Avian Use Study Area.
- No federally listed threatened or endangered species were observed during the breeding season survey. Twenty-one North Dakota Species of Conservation Priority were detected, including 18 observed within the Project area.
- Survey locations with the highest observed species richness and relative abundance for grassland-related avian species tended to be distributed in the eastern half of the Avian Use Study Area, east of the Project.
- Relative abundance and proportion or frequency of occurrence was lower at points within the Project than at points outside the Project for several grassland-associated bird species, including the Bobolink, Grasshopper Sparrow, Sprague's Pipit, Upland Sandpiper, and Western Meadowlark.

- Survey locations with the highest observed species richness and relative abundance for wetland-related avian species (including waterfowl) were distributed throughout the Avian Use Study Area, suggesting that the highest wetland avian use was correlated to local characteristics of individual pothole wetlands or groups of wetlands, rather than the larger-scale landscape trends seen with grassland-associated bird species.
- Relative abundance and proportion of occurrence of the Black Tern and Franklin's Gull was lower at points within the Project than at points outside the Project. One Black Tern nesting colony was found within the Avian Use Study Area but outside the Project. Franklin's Gull nesting activity was not observed during the breeding bird surveys in the Avian Use Study Area.

1.0 INTRODUCTION

Atwell, LLC (Atwell) was contracted in 2017 by Burke Wind, LLC, a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, to conduct breeding bird assessments for the proposed Burke County Wind Project (the Project) in Burke County, North Dakota. All surveys were conducted within the Avian Use Study Area, defined as the original 300 megawatt (MW) wind turbine project area plus an additional 1-mile (1.6 km) boundary. In late 2018, the Project was reduced in size to 200 MW, and all subsequent references to the Project refer to this 200 MW configuration. This resulted in a smaller Project area (approximately 22,933 acres [9,281 hectares]) and the elimination of 38 wind turbines. In Figure 1 (**Appendix I**), the Avian Use Study Area is shown with a dashed line and the 200 MW Project is delineated with a solid black line.

The objective of the surveys summarized in this report was to document avian use during the breeding season within the Avian Use Study Area, with a specific focus on characterizing species composition, relative abundance, and species richness of grassland and wetland–associated bird species. Emphasis was placed on accessing as much of the Avian Use Study Area as possible from roadside survey vantages adjacent to grassland and wetland habitats, with the purpose of increasing survey coverage beyond areas assessed by ongoing avian use point count surveys.

2.0 METHODS

Based on discussions with Mr. Kevin Shelly of the U.S. Fish and Wildlife Service in early 2017, breeding season avian use surveys were conducted for the proposed Project—in addition to the spring and fall avian use studies—to specifically document avian species' composition and use of grassland and wetland habitats during the breeding season across the Avian Use Study Area. For the purposes of this report, species of concern include those defined as such under the *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines* (WEG) (USFWS 2012) and species identified by the state of North Dakota as Species of Conservation Priority (SCP). The WEG define species of concern as any species that (a) is listed as endangered, threatened, or as a candidate species under the Endangered Species Act, subject to the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act; designated by law, regulation, or other formal process for protection and/or management by the relevant agency or other authority; or has been shown to be significantly adversely affected by wind energy development, and (b) is determined to be possibly affected by a project (USFWS 2012). SCP are designated in the 2015 North Dakota State Wildlife Action Plan produced by the North Dakota Game and Fish Department (Dyke et al. 2015).

The studies summarized in this report are consistent with recommendations for Tier 3 studies under the WEG. Under Tier 3, field studies are conducted to develop a better understanding of avian use of a site. For this Project, Tier 3 breeding assessment studies were conducted within areas identified as potentially suitable nesting and foraging habitat for wetland-associated (including waterfowl) and grassland–associated bird species, including species of concern. Specifically, surveys were designed to summarize species composition across the Avian Use Study Area and identify areas that had higher proportions or frequencies of species occurrence, richness, and relative abundance. The results of these surveys could then be compared with the proposed turbine arrays to determine areas of overlap with high avian use, informing the formulations of measures to avoid potential impacts to avian species.

This report adheres to taxonomy outlined in the American Ornithological Society's online *Checklist of North and Middle American Birds*, 59th supplement (Chesser et al. 2018).

2.1 Project Setting

The Project is situated on approximately 22,933 acres (9,281 hectares) in Burke County, northwest North Dakota (Figure 1, **Appendix I**). The Project land area is predominantly agricultural cropland and grassland within a regional prairie pothole wetland system. The general topography of the Project slopes along a ridgeline that is oriented southeast-northwest. Elevations within the Project range from approximately 2,159 to 2,502 ft (658 to 762 m) above mean sea level.

According to the 2011 National Land Cover Database – Land Use Land Cover data set, approximately 54.1% of the Project land area is grassland-type habitat (approximately 12,400 acres [5,018

hectares] of herbaceous and hay/pasture land cover types), and 32.0% is classified as cultivated crops (7,346 acres [2,973 hectares]) (Homer et al. 2015). Additional cover classifications found within the Project include open water (4.7%), emergent herbaceous wetlands (4.1%), aggregated development classifications (3.4%), deciduous forest (1.5%), and woody wetlands (0.2%).

2.2 Road-Based Breeding Bird Assessments

Road-based breeding bird assessments followed a fixed-point protocol to document species composition across the Avian Use Study Area, a protocol that followed guidelines in the United States Geologic Survey's *North American Breeding Bird Survey* (USGS 2001) and the regionally specific Saskatchewan Ministry of Environment's *Grassland Birds Survey Protocol* (Saskatchewan Ministry of Environment 2014).

The study plan established 115 survey points adjacent to grassland/pasture and/or wetland habitats in the Avian Use Study Area (Figure 1, **Appendix I**). Fifty-four of the 115 survey points are within the current Project configuration. Eighty-eight survey points are within 328 ft (100 m) of a pothole wetland. Point count stations were located along roads with low traffic levels, with reasonable survey vantages of the surrounding landscape. Because land acquisition was in the early stages at the time of study plan development, point count stations were restricted to roadside locations. Point count stations were selected at half-mile (805 m) intervals across the Avian Use Study Area, along public roads at locations bordered by grassland/pasture and/or wetland habitat. If such habitats were not found at a half-mile segment location (e.g., the road was instead bordered by tilled agriculture), the surveyor continued to the next closest location where grassland/pasture or wetland was present and resumed surveys at that location. Survey locations were occasionally less than a half-mile apart to accommodate for limited sight lines caused by rolling terrain, or for the presence of habitat that appeared of relatively higher quality and that merited further survey effort.

Surveys were conducted during the breeding season, from June 22 to June 26 and July 1 to July 5, 2017. Surveyors recorded counts for all bird species heard or seen over a five-minute survey duration at each station. Any breeding behaviors observed were also recorded, e.g., singing, nesting material carry, and food carry to dependent young.

2.3 Data Management

The survey protocols described above were performed by two avian biologists over the course of the study. All completed data forms were proofread, with data subsequently entered into an electronic database and proofread as part of a quality assurance/quality control program.

2.4 Data Analysis

Survey data were organized and analyzed using Microsoft Excel. The following metrics were then calculated and are summarized in this report:

- *Species richness* is reported as the total number of species observed, averaged per visit, for each of the 115 survey locations.
- *Proportion of occurrence* is reported as the number of survey locations at which the species was recorded divided by the total number of survey locations.
- *Relative abundance* is reported as the total number of individuals observed for each species within a 500 m radius of the point, averaged per visit, for each of the 115 survey locations assessed during the study.

Species richness and relative abundance are summarized for groups of species associated with grassland or wetland habitats to facilitate data analysis and presentation of results. The grassland group includes passerines (perching birds such as songbirds) as well as grouse and specific raptor and shorebird species associated with grassland habitats. Birds associated with wetland habitats were grouped into waterfowl and waterbird subgroups. The waterbird subgroup includes waders such as herons and bitterns; birds of the Rallidae family, such as coots and rails; birds of the Laridae family, such as gulls and terns, grebes, pelicans, and cormorants.

3.0 RESULTS AND DISCUSSION

3.1 Federally Listed Threatened and Endangered Species

Atwell biologists did not observe any federally endangered or federally threatened bird species during the breeding bird assessments.

3.2 Grassland-Associated Bird Species

3.2.1 Species Richness and Relative Abundance

Survey locations with the highest grassland-associated avian species richness and abundance values tended to be in the eastern half of the Avian Use Study Area and outside the Project, suggesting that higher quality grassland habitats are more widespread in that area. Twenty-six of 61 survey points (42.6%) outside the Project reported grassland species richness of at least six species/visit. Fifteen of 54 points (27.8%) within the Project reported grassland species richness of at least six species per visit. Conversely, 11 of 61 (18.0%) survey points outside the Project reported a species richness of three or fewer species per visit, and 23 of 54 (42.6%) survey points within the Project reported a species richness of three or fewer species per visit.

Grassland-associated species richness ranged from one to eight species per visit at points within the Project and one to nine species per visit at points outside the Project but within the Avian Use Study Area (Figure 2, **Appendix I; Appendix II**). Relative abundance for grassland-associated species ranged from 4 to 88 individuals/visit at points within the Project and from 5 to 91 individuals/visit at points outside the Project (Figure 3, **Appendix I**; **Appendix II**).

3.2.2 Grassland Species of Conservation Priority

Five grassland Level I SCP were observed during the breeding bird surveys, including the Grasshopper Sparrow (*Ammodramus savannarum*), Marbled Godwit (*Limosa fedoa*), Nelson's Sparrow (*Ammospiza nelson*), Sprague's Pipit (*Anthus spragueii*), and Swainson's Hawk (*Buteo swainsoni*). Six grassland Level II SCP species were observed during the assessments, including the Bobolink (*Dolichonyx oryzivorus*), Northern Harrier (*Circus hudsonius*), Sharp-tailed Grouse (*Tympanuchus phasianellus*), Upland Sandpiper (*Bartramia longicauda*), Western Meadowlark (*Sturnella neglecta*), and Willet (*Tringa semipalmata*). The following sections discuss general patterns observed for grassland-associated SCP species observed during the breeding bird surveys.

Bobolink

Bobolinks were detected at a lower proportion of points within the Project (29.6%) than outside the Project (49.2%). Average counts were lower within the Project (0.76 individuals/visit, standard deviation [SD] = 1.74) than outside the Project (0.94 individuals/visit, SD = 1.46).

Grasshopper Sparrow

Twenty-three Grasshopper Sparrows were detected at seven locations during the breeding bird surveys. Only one of these locations (point 46, with three detections) is within the Project. Twenty detections occurred outside the Project.

Marbled Godwit

Nine Marbled Godwits were detected at four locations during the breeding bird surveys. Three godwits were detected at two points within the Project, and six were detected at two points outside the Project.

Nelsons Sparrow

Three Nelson's Sparrows were detected at two locations during the study: one pair was observed at point 61, and a singing male was observed at point 32. Point 61 is approximately 3.8 miles (6.1 km) southeast of the Project; point 32 is within the Project.

Northern Harrier

Northern Harriers were detected at a similar proportion of points within the Project (7.4%) and outside the Project (6.6%). Average counts were also similar at points within the Project (0.07 individuals/visit, SD = 0.26) and outside the Project (0.04 individuals/visit, SD = 0.20).

Sharp-Tailed Grouse

Five Sharp-tailed Grouse were observed at five locations during the breeding bird surveys. Three of these locations were within the Project.

Sprague's Pipit

Four Sprague's Pipits were observed at one location over two visits during the study, at point 90. Multiple displaying males were observed during the second visit to this point. This location is in the eastern portion of the Avian Use Study Area and is approximately 9.0 miles (14.5 km) east of the Project.

Swainson's Hawk

Four Swainson's Hawks were detected at four locations during the study. Two of these detections represent a single individual observed at adjacent points. All four points are located outside the Project, and Swainson's Hawks were not observed within the Project during the breeding bird surveys.

Upland Sandpiper

Upland Sandpipers were detected at a lower proportion of points within the Project (16.7%) than at points outside the Project (39.3%). Average counts were also lower within the Project (0.25 individuals/visit, SD = 0.89) than outside the Project (0.56 individuals/visit, SD = 1.07).

Western Meadowlark

Western Meadowlarks were detected at a lower proportion of points within the Project (31.5%) than outside the Project (47.5%). Average counts were lower within the Project (0.42 individuals/visit, SD = 0.86) than outside the Project (1.22 individuals/visit; SD = 1.58).

Willet

Willets were detected at a higher proportion of points within the Project (16.7%) than outside the Project (11.5%). Average counts per visit were also higher within the Project (Project: 0.25 individuals/visit, SD = 0.75; outside the Project: 0.10 individuals/visit, SD = 0.39).

3.3 Waterfowl and Other Wetland-Associated Bird Species

3.3.1 Species Richness and Relative Abundance

Pothole wetlands occur throughout the Avian Use Study Area (Figure 1, **Appendix I**). Waterfowl and other wetland-associated species' richness and abundance are influenced by landscape-level features of the pothole wetland system (Niemuth and Solberg 2003) and by characteristics of individual pothole wetlands, which can influence wet grassland habitat important for nesting of many bird species (Fairbairn and Dinsmore 2001). Furthermore, upland grasslands adjacent to pothole wetlands provide important nesting habitat for ducks (Reynolds et al. 2001).

Species richness and relative abundance are depicted for waterfowl species and for all wetland-associated species, including waterfowl, wading birds, shorebirds, gulls and terns, rallids, grebes, and cormorants. (See Section 2.4 for descriptions of these species groups, and Figures 4 through 7 [**Appendix I]**). Wetland points with the highest richness and abundance values were distributed throughout the Avian Use Study Area, suggesting that highest wetland avian use corresponded with local conditions specific to the wetland or group of wetlands rather than larger landscape-scale trends across the Avian Use Study Area.

Waterfowl species richness ranged from 0 to 11 species per visit for points both within the Project and for points outside the Project but within the Avian Use Study Area (Figure 4, **Appendix I**; **Appendix II**). Relative abundance for waterfowl species ranged from 0 to 254 individuals/visit within the Project and from 0 to 119 individuals/visit at points outside of the Project (Figure 5, **Appendix I**; **Appendix II**). Figures 4 and 5 depict waterfowl richness and relative abundance for survey points across the Avian Use Study Area.

Wetland species richness ranged from 0 to 24 species for points within the Project and from 0 to 15 species for points outside the Project (Figure 6, **Appendix I**; **Appendix II**). Relative abundance for all wetland species ranged from 0 to 433 individuals/visit at points within the Project and from 0 to 237 individuals/visit at points outside the Project (Figure 7, **Appendix I**; **Appendix II**). In general,

several of the points with the highest richness and abundance values were in the eastern half of the Avian Use Study Area and southeast of the Project.

3.3.2 Wetland Species of Conservation Priority

Five wetland-associated Level I SCP were observed during the breeding bird surveys, including the American Bittern (*Botaurus lentiginosus*), Black Tern (*Chlidonias niger*), Franklin's Gull (*Leucophaeus pipixcan*), Horned Grebe (*Podiceps auritus*), and Wilson's Phalarope (*Phalaropus tricolor*). Five wetland-associated Level II SCP were observed during the assessments, including the American Avocet (*Recurvirostra americana*), American White Pelican (*Pelecanus erythrorhynchos*), Canvasback (*Aythya valisineria*), Lesser Scaup (*Aythya affinis*), and Northern Pintail (*Anas acuta*). The following sections discuss general patterns observed for wetland-associated SCP species observed during the breeding bird surveys.

American Avocet

Fifteen American Avocets were observed at five locations during the breeding bird surveys. Flock sizes ranged from one to seven individuals. One individual was detected at point 109, more than 1 mile (1.6 km) east of the Project. The other 14 individuals were observed within the Project,

American Bittern

One American Bittern was observed during the surveys. This observation occurred at point 112, more than 1.1 miles (1.8 km) east of the Project.

American White Pelican

Six American White Pelicans were observed in groups of two, at three locations (points 7, 68, and 108) during the breeding bird surveys. Two of these individuals were observed within the Project; the other four pelicans were observed within the Avian Use Study Area but more than 5.5 miles (8.9 km) east of the Project.

Black Tern

Black Terns were observed at a lower proportion of points within the Project (20.4%) than within the Avian Use Study Area (49.2%). Mean counts were also lower within the Project (0.56 individuals/visit, SD = 1.69) than within the Avian Use Study Area (2.37 individuals/visit, SD = 4.41). One Black Tern nesting colony was found during the assessments at point 62. At this location, approximately 7.2 miles (11.6 km) southeast of the Project, terns were observed on nests; they were vocal, aggressive, and frequently mobbed (i.e., aggressively approached and/or surrounded) the observer. These behaviors were not observed at any of the other points surveyed during wetland breeding bird assessments, including those within the Project.

Canvasback

Surveyors recorded lower occurrence rates for Canvasbacks within the Project (observed at 7.4% of points) than outside the Project (19.7% of points). Average counts were also lower within the Project (0.23 individuals/visit, SD = 1.06) than outside the Project (0.79 individuals /visit, SD = 2.51).

Franklin's Gull

Franklin's Gulls were observed at the majority of points during roadside surveys (observed at 68.5% of points within the Project and at 83.6% of points outside the Project), but nesting colonies were not observed within the Avian Use Study Area. At point 56, a single individual exhibited agitated behavior over the course of several minutes, which can be suggestive of a nearby nesting attempt. However, this individual did not approach a nest or fledglings during extended observation and it eventually left the point. Point 56 is outside the Project. The closest known Franklin's Gull nesting colony is 4 miles (6.4 km) north of the Avian Use Study Area, near Lignite, North Dakota (48.8610° N, 102.6226° W).

Horned Grebe

Three Horned Grebes were observed during the breeding bird surveys. One individual was observed at point 7 within the Project. A nesting pair was observed on both visits to point 87, approximately 5.4 miles (8.9 km) southeast of the Project.

Lesser Scaup

Lesser Scaup occurrence rates were similar within the Project (observed at 64.8% of points) and outside of the Project (67.2%). Average counts were slightly higher within the Project (Project: 5.80 individuals/visit, SD = 8.94; outside the Project: 4.28 individuals/visit, SD = 6.81).

Northern Pintail

Northern Pintail occurrence rates were higher within the Project (observed at 18.5% of points) than outside the Project (6.6%). Average counts were also higher within the Project (0.52 individuals/visit, SD = 1.58) than outside the Project (0.08 individuals/visit, SD = 0.47).

Wilson's Phalarope

Wilson's Phalaropes were encountered throughout the Avian Use Study Area and were reported at 24.1% of points within the Project and 16.4% of points outside the Project. Average counts per visit were also higher within the Project (mean = 0.41, SD = 1.55) than outside the Project (mean = 0.23, SD = 0.81).

4.0 REFERENCES

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APPENDIX I

Figures

Burke County Wind Project

Figure 1. Breeding Bird Assessment Survey Plan

Burke County, North Dakota

Date: 1/18/2019

Client:

Burke Wind, LLC

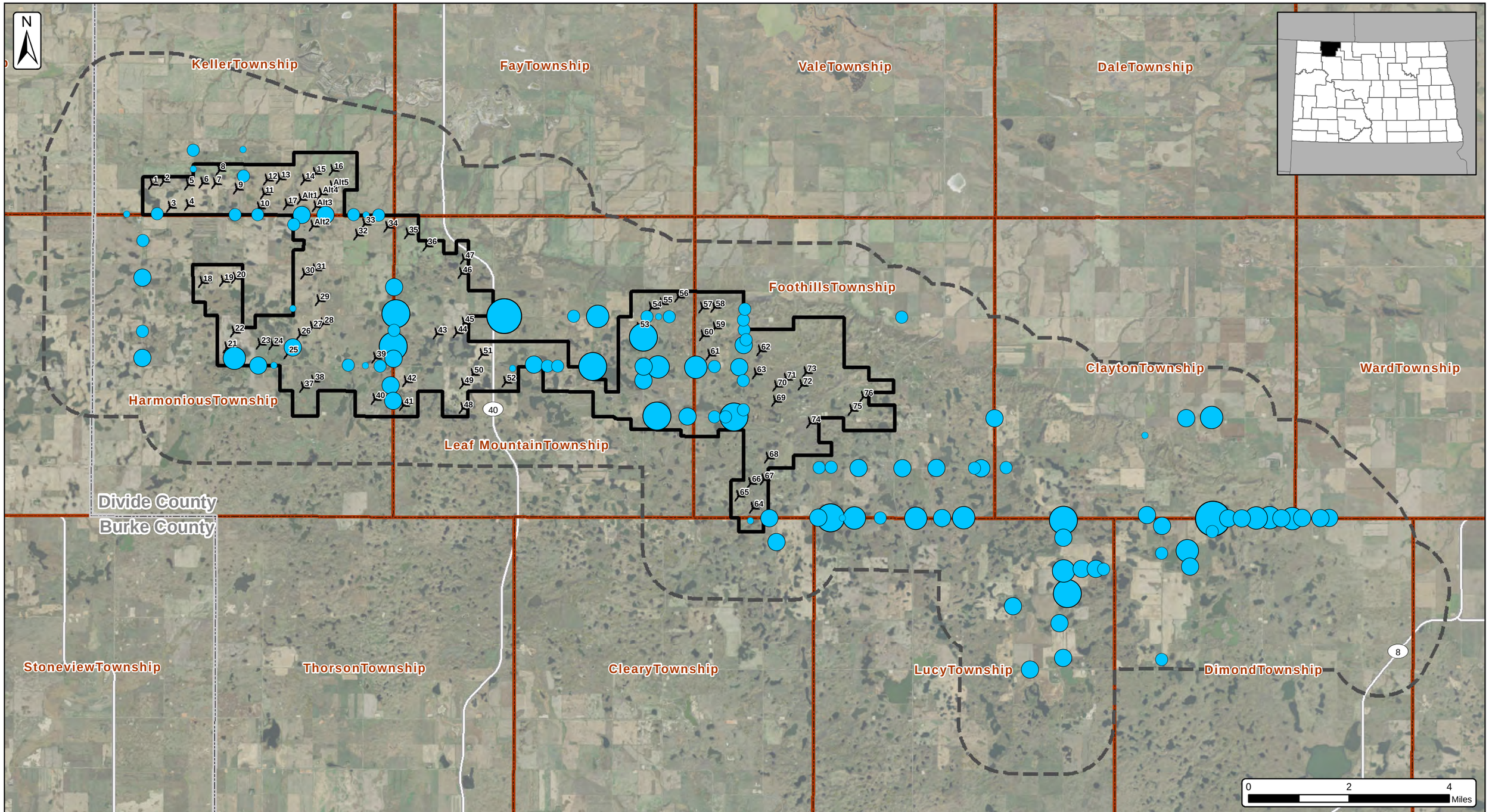
Atwell, LLC Project: 16000947

- Breeding Bird Point Count Station (01/15/2019)
- Turbine Layout (10/08/2018)
- Project 10/23/2018 (±22,933 Ac.)
- Avian Use Study Area (01/25/2017)
- Townships
- Counties

SOURCE: USDA NAIP 2017 IMAGERY

ATWELL

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Burke County Wind Project

Figure 2. Grassland Bird Species Richness

Burke County, North Dakota

Date: 1/18/2019

Client:

Burke Wind, LLC

Atwell, LLC Project: 16000947

Turbine Layout (10/08/2018)

Project 10/23/2018 (±22,933 Ac.)

Avian Use Study Area (01/25/2017)

Townships

Counties

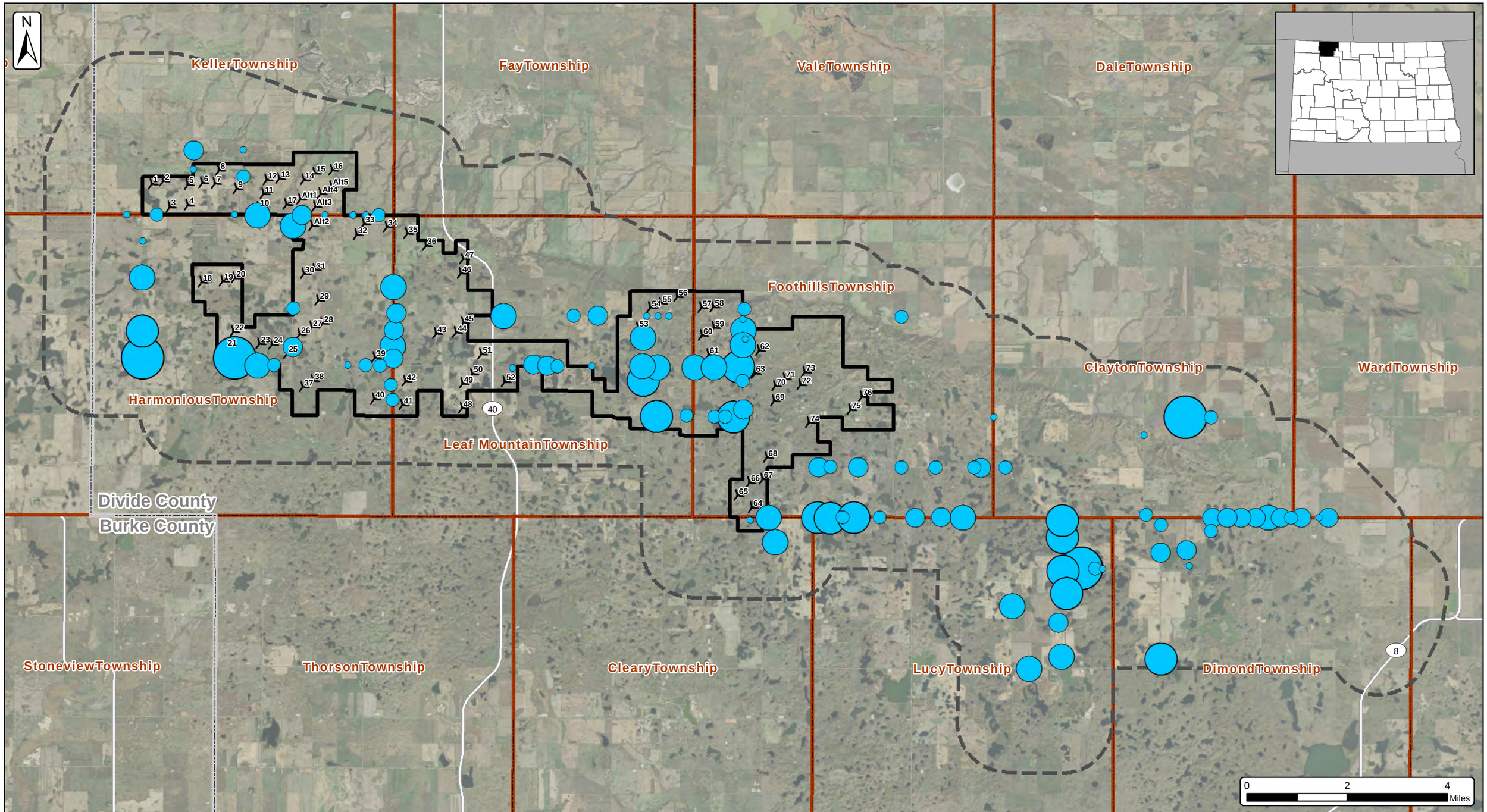
Grassland Bird Species Richness

8.01 - 9.00
7.01 - 8.00
6.01 - 7.00
4.01 - 6.00
2.01 - 4.00
1.00- 2.00

SOURCE: USDA NAIP 2017 IMAGERY

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The information contained on this map is proprietary and confidential. The use or disclosure of this information by you to third parties is prohibited by law and may give rise to civil or criminal liability.



Burke County Wind Project

Figure 3. Grassland Bird Species Relative Abundance

Burke County, North Dakota

Date: 1/18/2019

Client:

Burke Wind, LLC

Atwell, LLC Project: 16000947

Turbine Layout (10/08/2018)

Project 10/23/2018 (±22,933 Ac.)

Avian Use Study Area (01/25/2017)

Townships

Counties

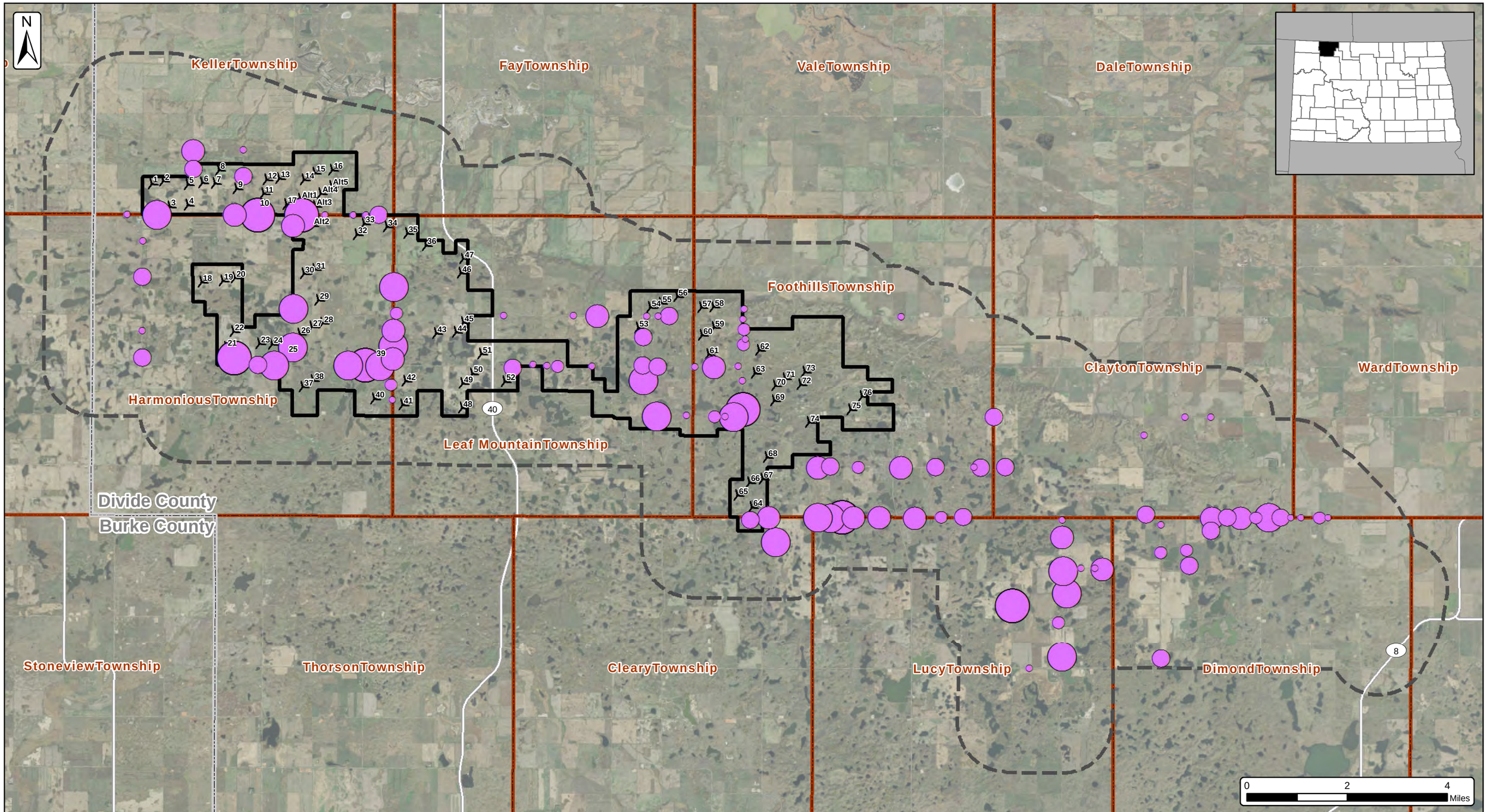
Grassland Bird Species Relative Abundance

60.01 - 91.00
39.01 - 60.00
26.01 - 39.00
18.01 - 26.00
11.01 - 18.00
4.00 - 11.00

SOURCE: USDA NAIP 2017 IMAGERY

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Burke County Wind Project

Figure 4. Waterfowl Species Richness

Burke County, North Dakota

Date: 1/18/2019

Client:

Burke Wind, LLC

Atwell, LLC Project: 16000947

Turbine Layout (10/08/2018)

Project 10/23/2018 (±22,933 Ac.)

Avian Use Study Area (01/25/2017)

Townships

Counties

Waterfowl Species Richness

8.01 - 11.00
5.51 - 8.00
4.51 - 5.50
2.51 - 4.50
1.01 - 2.50
0.00 - 1.00

SOURCE: USDA NAIP 2017 IMAGERY

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N

KellerTownship
FayTownship
ValeTownship
DaleTownship
FoothillsTownship
ClaytonTownship
WardTownship
HarmoniousTownship
Leaf MountainTownship
Divide County
Burke County
StoneviewTownship
ThorsonTownship
ClearyTownship
LucyTownship
DimondTownship

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 Alt1 Alt2 Alt3 Alt4 Alt5

40

8

0 2 4 Miles

Burke County Wind Project

Figure 5. Waterfowl Species Relative Abundance

Burke County, North Dakota
Date: 1/18/2019

Client:

Burke Wind, LLC

Atwell, LLC Project: 16000947

Turbine Layout (10/08/2018)
Project10/23/2018 (±22,933 Ac.)
Avian Use Study Area (01/25/2017)
Townships
Counties

Waterfowl Species Relative Abundance
120.01 - 254.00
60.01 - 120.00
40.01 - 60.00
27.01 - 40.00
12.01 - 27.00
1.00 - 12.00

SOURCE: USDA NAIP 2017 IMAGERY

ATWELL

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KellerTownship
FayTownship
ValeTownship
DaleTownship
FoothillsTownship
ClaytonTownship
WardTownship
HarmoniousTownship
Leaf MountainTownship
Divide County
Burke County
StoneviewTownship
ThorsonTownship
ClearyTownship
LucyTownship
DimondTownship
40
8
0 2 4 Miles

Burke County Wind Project

Figure 6. All Wetland Bird Species Richness

Burke County, North Dakota

Date: 1/18/2019

Client:

Burke Wind, LLC

Atwell, LLC Project: 16000947

Turbine Layout (10/08/2018)

Project 10/23/2018 (±22,933 Ac.)

Avian Use Study Area (01/25/2017)

Townships

Counties

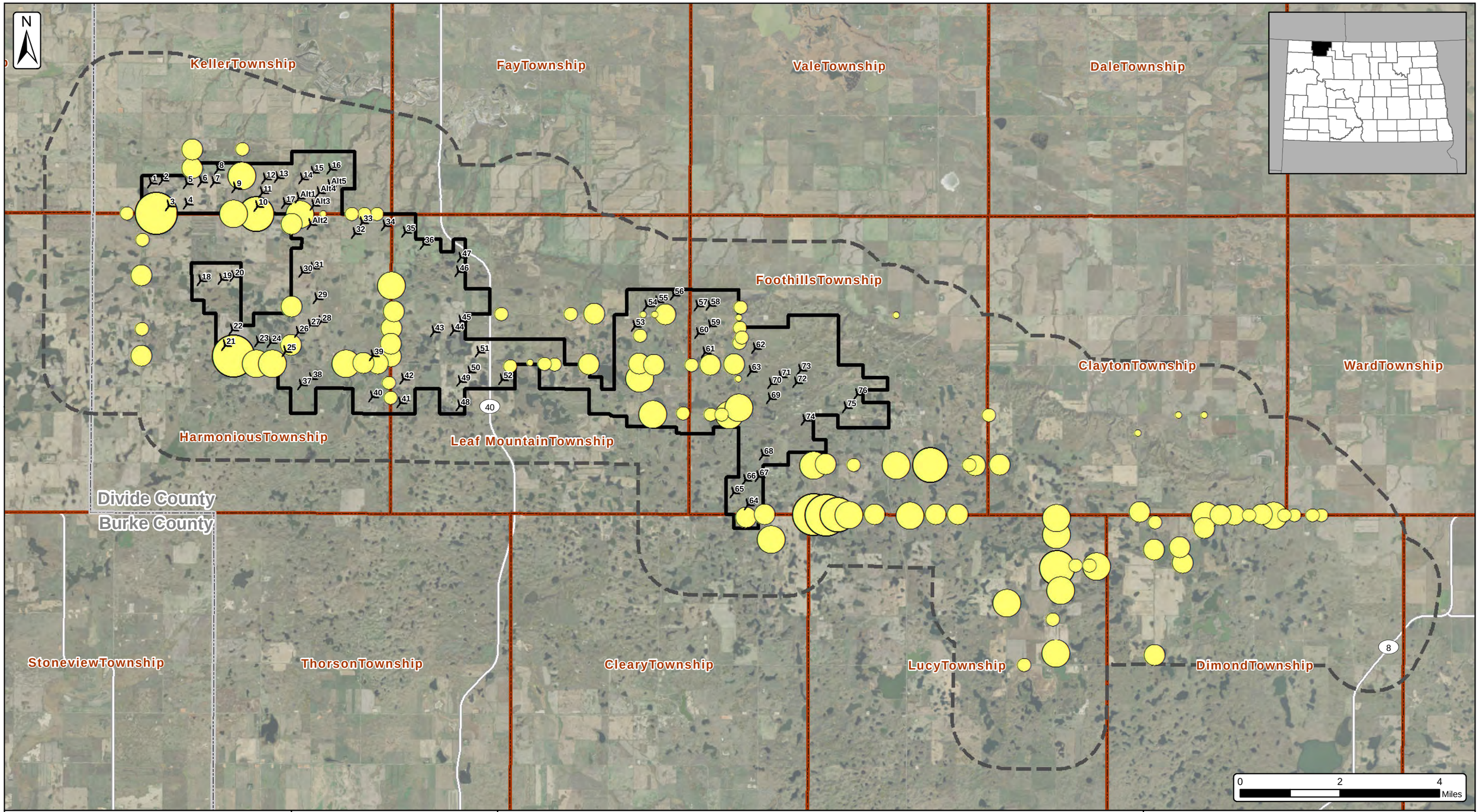
All Wetland Bird Species Richness

17.01 - 24.00
12.01 - 17.00
8.01 - 12.00
3.01 - 8.00
1.01 - 3.00
0.00 - 1.00

SOURCE: USDA NAIP 2017 IMAGERY

ATWELL

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Burke County Wind Project

Figure 7. All Wetland Bird Species Relative Abundance

Burke County, North Dakota

Date: 1/18/2019

Client:

Burke Wind, LLC

Atwell, LLC Project: 16000947

Turbine Layout (10/08/2018)

Project 10/23/2018 (±22,933 Ac.)

Avian Use Study Area (01/25/2017)

Townships

Counties

All Wetland Bird Species Relative Abundance

159.01 - 433.00
105.01 - 159.00
49.01 - 105.00
20.01 - 49.00
1.01 - 20.00
0.00 - 1.00

SOURCE: USDA NAIP 2017 IMAGERY

ATWELL

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APPENDIX II

Average Species Richness and Relative Abundance for Habitat-Associated Species Groups within and outside the Burke County Wind Project

Table A. Average Species Richness and Relative Abundance for Habitat-Associated Species Groups within the Burke County Wind Project (Burke County, North Dakota)

						Grassland Birds		Waterfowl		Waterbirds		Waterfowl + Waterbirds Combined	
Point Count Station	Count Station Field ID	Lat.	Long.	Habitat	No. Visits	Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance
1	101	48.760	-102.656	Gr/We	1	4.00	17.00	0.00	0.00	1.00	1.00	1.00	1.00
2	102	48.764	-102.693	Gr/We	1	7.00	30.00	3.00	21.00	3.00	3.00	6.00	24.00
3	103	48.764	-102.721	Gr/We	1	8.00	11.00	1.00	4.00	2.00	21.00	3.00	25.00
4	105	48.764	-102.737	Gr/We	1	3.00	14.00	2.00	12.00	1.00	1.00	3.00	13.00
5	106	48.764	-102.741	Gr/We	1	4.00	22.00	0.00	0.00	3.00	9.00	3.00	9.00
6	109	48.807	-102.912	Ag/We	2	2.50	13.50	6.00	45.00	3.50	191.50	9.50	236.50
7	111	48.766	-102.878	Ag/We	1	7.00	88.00	11.00	254.00	13.00	179.00	24.00	433.00
8	118	48.720	-102.652	Gr/We	1	2.00	9.00	4.00	20.00	3.00	7.00	7.00	27.00
9	147	48.720	-102.644	Gr/We	2	5.00	39.00	5.50	17.00	1.00	6.50	6.50	23.50
10	150	48.764	-102.658	Gr/We	1	5.00	54.00	0.00	0.00	2.00	28.00	2.00	28.00
11	155	48.749	-102.660	Ag/We	2	7.50	58.50	7.00	91.50	1.50	3.50	8.50	95.00
12	156	48.749	-102.664	Gr/We	1	3.00	14.00	0.00	0.00	2.00	3.00	2.00	3.00
13	157	48.750	-102.668	Gr/We	2	4.00	17.50	1.50	6.00	2.00	4.50	3.50	10.50
14	158	48.764	-102.677	Gr/We	1	7.00	27.00	1.00	2.00	2.00	2.00	3.00	4.00
15	159	48.764	-102.668	Ag/Gr/We	1	3.00	27.00	5.00	24.00	2.00	2.00	7.00	26.00
16	164	48.778	-102.693	Ag/Gr/We	1	2.00	6.00	0.00	0.00	1.00	1.00	1.00	1.00
17	165	48.750	-102.680	Gr/We	2	5.00	17.50	0.00	0.00	2.00	8.00	2.00	8.00
18	166	48.778	-102.688	Ag/Gr/We	1	3.00	9.00	3.00	28.00	0.00	0.00	3.00	28.00
19	168	48.778	-102.698	Gr/We	1	3.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
20	169	48.750	-102.694	Gr/We	2	7.50	42.00	6.00	79.00	3.50	15.00	9.50	94.00
21	181	48.752	-102.656	Ag/We	1	3.00	22.00	9.00	90.00	1.00	1.00	10.00	91.00
22	182	48.754	-102.809	Gr/We	1	5.00	14.00	1.00	5.00	1.00	2.00	2.00	7.00

Table A. Average Species Richness and Relative Abundance for Habitat-Associated Species Groups within the Burke County Wind Project (Burke County, North Dakota)

						Grassland Birds		Waterfowl		Waterbirds		Waterfowl + Waterbirds Combined	
Point Count Station	Count Station Field ID	Lat.	Long.	Habitat	No. Visits	Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance
23	184	48.758	-102.810	Gr/We	1	6.00	17.00	2.00	4.00	2.00	2.00	4.00	6.00
24	185	48.760	-102.699	Gr/We	1	6.00	43.00	6.00	32.00	4.00	69.00	10.00	101.00
25	187	48.770	-102.656	Gr/We	2	6.00	32.00	1.50	3.00	2.50	3.00	4.00	6.00
26	188	48.772	-102.655	Gr/We	1	3.00	11.00	0.00	0.00	1.00	6.00	1.00	6.00
27	189	48.775	-102.655	Gr/We	1	4.00	36.00	2.00	9.00	3.00	8.00	5.00	17.00
28	191	48.766	-102.809	Gr/We	2	5.00	23.50	5.50	45.50	2.00	3.50	7.50	49.00
29	193	48.764	-102.699	Gr/We	2	4.50	30.00	4.00	33.00	2.50	3.00	6.50	36.00
30	194	48.772	-102.699	Ag/Gr/We	2	7.50	29.00	3.00	9.50	1.50	6.00	4.50	15.50
31	195	48.769	-102.852	Ag/We	1	6.00	22.00	7.00	37.00	2.00	3.00	9.00	40.00
32	198	48.765	-102.747	Gr/We	1	6.00	24.00	0.00	0.00	1.00	1.00	1.00	1.00
33	199	48.770	-102.809	Ag/Gr/We	1	8.00	28.00	6.00	26.00	3.00	4.00	9.00	30.00
34	200	48.774	-102.808	Ag/Gr/We	3	3.33	24.67	5.00	30.67	2.33	3.33	7.33	34.00
35	201	48.763	-102.756	Gr/We	1	2.00	4.00	3.00	7.00	2.00	6.00	5.00	13.00
36	202	48.778	-102.656	Gr/We	1	3.00	8.00	1.00	1.00	0.00	0.00	1.00	1.00
37	203	48.779	-102.807	Gr/We	1	8.00	22.00	2.00	30.00	2.00	3.00	4.00	33.00
38	206	48.780	-102.852	Gr/We	1	2.00	16.00	6.00	24.00	1.00	15.00	7.00	39.00
39	207	48.787	-102.808	Ag/Gr/We	2	5.00	26.50	8.00	81.00	2.50	5.00	10.50	86.00
40	208	48.805	-102.852	Ag/We	1	3.00	32.00	5.00	28.00	0.00	0.00	5.00	28.00
41	209	48.819	-102.874	Ag/We	2	2.50	16.00	4.00	38.00	2.50	19.50	6.50	57.50
42	210	48.764	-102.814	Ag/We	1	3.00	17.00	6.00	28.00	4.00	12.00	10.00	40.00
43	211	48.764	-102.821	Gr/We	1	1.00	12.00	9.00	24.00	2.00	2.00	11.00	26.00
44	212	48.764	-102.828	Gr/We	1	4.00	5.00	6.00	44.00	4.00	17.00	10.00	61.00
45	213	48.807	-102.826	Ag/Gr/We	1	3.00	7.00	1.00	3.00	1.00	1.00	2.00	4.00

Table A. Average Species Richness and Relative Abundance for Habitat-Associated Species Groups within the Burke County Wind Project (Burke County, North Dakota)

						Grassland Birds		Waterfowl		Waterbirds		Waterfowl + Waterbirds Combined	
Point Count Station	Count Station Field ID	Lat.	Long.	Habitat	No. Visits	Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance
46	214	48.807	-102.815	Ag/Gr	2	3.50	12.00	4.00	8.00	1.50	2.00	5.50	10.00
47	216	48.807	-102.821	Ag	1	2.00	6.00	0.00	0.00	1.00	5.00	1.00	5.00
48	217	48.820	-102.896	Ag/We	2	2.00	4.00	4.00	24.50	3.00	15.00	7.00	39.50
49	221	48.808	-102.838	Ag/We	1	5.00	11.00	0.00	0.00	1.00	1.00	1.00	1.00
50	222	48.807	-102.849	Ag/We	1	5.00	20.00	9.00	46.00	4.00	12.00	13.00	58.00
51	224	48.807	-102.868	Ag/We	1	3.00	38.00	11.00	61.00	6.00	90.00	17.00	151.00
52	225	48.764	-102.860	Ag/We	1	2.00	18.00	6.00	54.00	2.00	7.00	8.00	61.00
53	226	48.764	-102.867	Ag	1	6.00	38.00	4.00	14.00	3.00	49.00	7.00	63.00
54	227	48.807	-102.878	Ag/We	2	2.50	7.50	5.50	36.00	3.50	41.00	8.50	77.00

Point Count Station is the location number used to identify individual survey points. Count Station Field ID, the internal identification number for each survey visit, is not necessarily sequential, as some point count stations contained multiple visits and some visits were considered incidental and therefore not included in the analyses.

Habitat codes: Ag = agriculture, Gr= grassland, We= wetland. Slash codes indicate that multiple habitat types are present at the point.

No. Visits is the number of times a particular point was visited during the surveys.

Species Richness is the average number of species within a particular species group observed at a particular point count station.

Relative Abundance is the total number of individual birds within a particular species group observed at each point count station divided by the total number of visits to that point count station.

Table B. Average Species Richness and Relative Abundance for Habitat-Associated Species Groups outside the Burke County Wind Project (Burke County, North Dakota)

Point Count Station	Count Station Field ID	Lat.	Long.	Habitat	No. Visits	Grassland Birds		Waterfowl		Waterbirds		Waterfowl + Waterbirds Combined	
						Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance
55	110	48.807	-102.925	Ag/We	1	1.00	7.00	1.00	5.00	3.00	5.00	4.00	10.00
56	112	48.735	-102.623	Ag/Gr/We	1	4.00	23.00	5.00	34.00	6.00	48.00	11.00	82.00
57	113	48.735	-102.617	Gr/We	2	4.00	18.00	4.00	32.00	2.50	5.50	6.50	37.50
58	115	48.707	-102.461	Gr/We	1	5.00	6.00	4.00	34.00	0.00	0.00	4.00	34.00
59	116	48.711	-102.462	Gr/We	2	6.50	23.50	1.50	5.00	4.50	21.00	6.00	26.00
60	117	48.715	-102.516	Gr/We	2	5.00	46.00	5.00	46.00	3.50	15.00	8.50	61.00
61	119	48.720	-102.516	Gr/We	1	8.00	41.00	1.00	49.00	2.00	10.00	3.00	59.00
62	125	48.720	-102.438	Gr/We	3	5.33	21.00	4.67	8.00	6.67	38.33	11.33	46.33
63	126	48.720	-102.432	Gr/We	3	6.33	25.00	2.33	3.00	3.33	11.00	5.67	14.00
64	127	48.720	-102.444	Gr/We	3	5.67	20.00	3.67	16.33	3.67	17.67	7.33	34.00
65	128	48.720	-102.451	Gr/We	3	9.00	24.33	4.67	38.00	5.33	21.67	10.00	59.67
66	140	48.699	-102.514	Ag/We	2	7.50	44.00	6.50	57.00	7.50	25.00	14.00	82.00
67	145	48.735	-102.606	Gr/We	1	6.00	19.00	2.00	4.00	4.00	12.00	6.00	16.00
68	151	48.710	-102.473	We	2	3.00	22.50	2.00	5.50	4.00	15.50	6.00	21.00
69	154	48.717	-102.451	Gr/We	2	4.00	16.00	4.00	26.00	5.00	20.00	9.00	46.00
70	160	48.705	-102.516	Ag/We	2	6.50	48.50	6.00	26.50	1.50	132.50	7.50	159.00
71	161	48.706	-102.499	Gr/We	1	3.00	8.00	5.00	51.00	8.00	52.00	13.00	103.00
72	162	48.706	-102.508	Ag	1	6.00	91.00	1.00	1.00	2.00	8.00	3.00	9.00
73	163	48.706	-102.502	Ag/We	1	6.00	12.00	0.00	0.00	2.00	2.00	2.00	2.00
74	172	48.749	-102.546	Ag/Gr/We	1	5.00	11.00	3.00	13.00	1.00	1.00	4.00	14.00
75	176	48.735	-102.541	Gr/We	2	4.00	14.00	3.00	18.50	1.50	14.00	4.50	32.50
76	177	48.735	-102.552	Ag/Gr/We	1	5.00	19.00	3.00	39.00	1.00	3.00	4.00	42.00
77	178	48.735	-102.555	Gr/We	1	3.00	12.00	1.00	2.00	1.00	2.00	2.00	4.00

Table B. Average Species Richness and Relative Abundance for Habitat-Associated Species Groups outside the Burke County Wind Project (Burke County, North Dakota)

Point Count Station	Count Station Field ID	Lat.	Long.	Habitat	No. Visits	Grassland Birds		Waterfowl		Waterbirds		Waterfowl + Waterbirds Combined	
						Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance
78	179	48.735	-102.572	Gr/We	2	5.00	16.00	4.50	48.00	4.00	94.00	8.50	142.00
79	180	48.735	-102.586	Ag/Gr/We	2	5.00	16.50	5.00	48.00	3.00	9.50	8.00	57.50
80	183	48.778	-102.730	Ag/We	1	4.00	14.00	1.00	2.00	1.00	1.00	2.00	3.00
81	192	48.778	-102.760	Ag/Gr	2	8.50	30.50	0.00	0.00	2.00	2.50	2.00	2.50
82	204	48.781	-102.655	Gr	1	3.00	12.00	0.00	0.00	1.00	3.00	1.00	3.00
83	205	48.800	-102.918	Ag/We	1	4.00	7.00	1.00	4.00	1.00	13.00	2.00	17.00
84	220	48.826	-102.896	Gr/We	2	2.50	18.50	5.00	19.50	2.00	6.00	7.00	25.50
85	223	48.826	-102.874	Gr	1	2.00	8.00	0.00	0.00	2.00	2.00	2.00	2.00
86	230	48.718	-102.473	Gr/We	1	6.00	14.00	1.00	3.00	2.00	5.00	3.00	8.00
87	500	48.721	-102.480	Gr/We	4	5.50	16.50	4.25	25.50	2.25	7.00	6.50	32.50
88	501	48.778	-102.719	Ag/Gr/We	2	7.00	19.00	5.00	21.50	1.00	3.50	6.00	25.00
89	108	48.789	-102.918	Ag/We	1	5.00	36.00	4.00	17.00	2.00	12.00	6.00	29.00
90	120	48.720	-102.400	Ag/Gr/We	3	6.00	20.00	0.00	0.00	2.33	7.00	2.33	7.00
91	121	48.720	-102.404	Ag/Gr/We	1	5.00	9.00	2.00	4.00	0.00	0.00	2.00	4.00
92	122	48.720	-102.412	Gr	3	6.00	20.00	0.67	1.00	2.00	14.67	2.67	15.67
93	123	48.720	-102.416	Gr/We	2	6.50	16.00	0.50	1.00	2.00	5.50	2.50	6.50
94	124	48.720	-102.421	Gr/We	2	6.00	22.50	4.00	35.50	3.50	26.50	7.50	62.00
95	129	48.721	-102.426	Gr/We	1	7.00	34.00	7.00	28.00	4.00	13.00	11.00	41.00
96	130	48.749	-102.452	Ag	1	7.00	13.00	0.00	0.00	1.00	1.00	1.00	1.00
97	131	48.749	-102.463	Ag/We	1	5.00	67.00	0.00	0.00	1.00	1.00	1.00	1.00
98	132	48.720	-102.569	Gr/We	2	5.50	19.00	1.50	5.00	3.50	24.00	5.00	29.00
99	133	48.721	-102.560	Gr/We	2	7.00	29.00	4.00	19.00	6.00	21.50	10.00	40.50

Table B. Average Species Richness and Relative Abundance for Habitat-Associated Species Groups outside the Burke County Wind Project (Burke County, North Dakota)

Point Count Station	Count Station Field ID	Lat.	Long.	Habitat	No. Visits	Grassland Birds		Waterfowl		Waterbirds		Waterfowl + Waterbirds Combined	
						Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance	Species Richness	Relative Abundance
100	134	48.677	-102.531	Ag	2	5.00	29.00	0.50	4.00	1.00	2.00	1.50	6.00
101	135	48.778	-102.587	Ag	1	3.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00
102	136	48.721	-102.596	Gr/We	1	4.00	18.00	5.00	31.00	6.00	11.00	11.00	42.00
103	137	48.720	-102.607	Gr/We	1	7.00	52.00	5.00	28.00	8.00	60.00	13.00	88.00
104	138	48.695	-102.538	Gr/We	1	6.00	27.00	11.00	95.00	2.00	10.00	13.00	105.00
105	139	48.690	-102.518	Gr/We	1	5.00	22.00	2.00	4.00	1.00	2.00	3.00	6.00
106	141	48.720	-102.618	Gr/We	1	8.00	58.00	8.00	119.00	7.00	118.00	15.00	237.00
107	142	48.720	-102.612	Gr/We	1	2.00	14.00	11.00	75.00	3.00	66.00	14.00	141.00
108	143	48.680	-102.516	Gr/We	2	4.50	29.00	6.50	75.50	3.50	6.50	10.00	82.00
109	144	48.720	-102.623	Ag/We	1	6.00	60.00	6.00	108.00	6.00	203.00	12.00	311.00
110	146	48.680	-102.473	Gr/We	1	4.00	46.00	3.00	7.00	4.00	26.00	7.00	33.00
111	148	48.713	-102.641	Gr/We	2	6.00	32.00	6.50	41.00	5.00	30.50	11.50	71.50
112	170	48.720	-102.580	Gr/We	2	7.00	18.50	5.00	23.50	4.50	41.50	9.50	65.00
113	175	48.744	-102.481	Gr	1	2.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
114	196	48.766	-102.918	Ag/We	1	6.00	77.00	4.00	35.00	1.00	1.00	5.00	36.00
115	197	48.774	-102.918	Gr/We	1	3.00	54.00	1.00	2.00	2.00	8.00	3.00	10.00

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Habitat codes: Ag = agriculture, Gr= grassland, We= wetland. Slash codes indicate that multiple habitat types are present at the point.

No. Visits is the number of times a particular point was visited during the surveys.

Species Richness is the average number of species within a particular species group observed at a particular point count station.

Relative Abundance is the total number of individual birds within a particular species group observed at each point count station divided by the total number of visits to that point count station.

APPENDIX III

Species Observed during Breeding Bird Assessments

Appendix III. Species Observed during Breeding Bird Assessments—Burke County Wind Project (Burke County, North Dakota)

Common Name	Scientific Name	Proportion of Occurrence-200 MW	Proportion of Occurrence-Outside 200 MW	Relative Abundance-200 MW	Std. Dev.	Relative Abundance-Outside 200 MW	Std. Dev.	State Status
Alder Flycatcher†	*Empidonax alnorum*	1.9%	0.0%	0.01	0.12	0.00	0.00	
American Avocet	*Recurvirostra americana*	7.4%	1.6%	0.20	0.98	0.01	0.10	SCP II
American Bittern	*Botaurus lentiginosus*	0.0%	1.6%	0.00	0.00	0.01	0.10	SCP I
American Coot	*Fulica americana*	25.9%	32.8%	1.31	3.64	0.87	2.34	
American Crow†	*Corvus brachyrhynchos*	11.1%	21.3%	0.10	0.34	0.26	0.67	
American Goldfinch†	*Spinus tristis*	37.0%	44.3%	0.65	1.32	0.62	1.06	
American Robin†	*Turdus migratorius*	35.2%	29.5%	0.42	0.69	0.33	0.70	
American White Pelican	*Pelecanus erythrorhynchos*	1.9%	3.3%	0.03	0.24	0.04	0.29	SCP II
American Wigeon	*Mareca americana*	35.2%	21.3%	0.77	1.49	0.69	2.19	
Baltimore Oriole†	*Icterus galbula*	3.7%	4.9%	0.03	0.17	0.03	0.17	
Bank Swallow†	*Riparia riparia*	3.7%	9.8%	0.03	0.17	0.11	0.52	
Barn Swallow†	*Hirundo rustica*	42.6%	42.6%	1.15	2.15	1.09	2.02	
Black Tern	*Chlidonias niger*	20.4%	49.2%	0.56	1.69	2.37	4.41	SCP I
Black-billed Magpie†	*Pica hudsonia*	1.9%	4.9%	0.07	0.59	0.10	0.74	
Black-crowned Night-Heron	*Nycticorax nycticorax*	18.5%	9.8%	0.24	0.84	0.06	0.24	
Blue-winged Teal	*Spatula discors*	59.3%	57.4%	6.41	8.19	2.93	5.60	
Bobolink	*Dolichonyx oryzivorus*	29.6%	49.2%	0.76	1.74	0.94	1.46	SCP II
Brewer's Blackbird	*Euphagus cyanocephalus*	11.1%	34.4%	0.34	1.18	1.23	3.27	
Brown Thrasher†	*Toxostoma rufum*	11.1%	8.2%	0.08	0.28	0.06	0.28	
Brown-headed Cowbird	*Molothrus ater*	48.1%	75.4%	1.32	2.32	1.86	4.34	
Bufflehead	*Bucephala albeola*	1.9%	4.9%	0.15	0.92	0.21	1.65	
California Gull	*Larus californicus*	3.7%	1.6%	0.03	0.17	0.03	0.30	
Canada Goose	*Branta canadensis*	7.4%	9.8%	0.44	2.36	2.44	11.41	
Canvasback	*Aythya valisineria*	7.4%	19.7%	0.23	1.06	0.79	2.51	SCP II
Cedar Waxwing†	*Bombycilla cedrorum*	9.3%	16.4%	0.13	0.51	0.24	0.83	

Appendix III. Species Observed during Breeding Bird Assessments—Burke County Wind Project (Burke County, North Dakota)

Common Name	Scientific Name	Proportion of Occurrence-200 MW	Proportion of Occurrence-Outside 200 MW	Relative Abundance-200 MW	Std. Dev.	Relative Abundance-Outside 200 MW	Std. Dev.	State Status
Chipping Sparrow†	*Spizella passerina*	1.9%	3.3%	0.01	0.12	0.02	0.14	
Clay-colored Sparrow	*Spizella pallida*	68.5%	75.4%	2.46	2.69	2.05	2.54	
Cliff Swallow†	*Petrochelidon pyrrhonota*	11.1%	16.4%	0.18	0.64	0.16	0.55	
Common Grackle†	*Quiscalus quiscula*	37.0%	47.5%	1.62	3.89	2.57	7.22	
Common Raven†	*Corvus corax*	1.9%	4.9%	0.06	0.37	0.15	0.88	
Common Yellowthroat	*Geothlypis trichas*	40.7%	29.5%	0.49	0.73	0.26	0.51	
Cooper's Hawk†	*Accipiter cooperii*	1.9%	1.6%	0.01	0.12	0.01	0.10	
Double-crested Cormorant	*Phalacrocorax auritus*	9.3%	27.9%	0.45	2.98	0.62	1.55	
Eared Grebe	*Podiceps nigricollis*	7.4%	8.2%	0.93	6.58	0.12	0.58	
Eastern Kingbird†	*Tyrannus tyrannus*	51.9%	47.5%	0.66	0.94	0.60	0.76	
Eastern Phoebe†	*Sayornis phoebe*	1.9%	1.6%	0.01	0.12	0.01	0.10	
European Starling†	*Sturnus vulgaris*	3.7%	13.1%	0.14	0.85	0.30	1.28	
Forster's Tern	*Sterna forsteri*	0.0%	4.9%	0.00	0.00	0.24	1.47	
Franklin's Gull	*Leucophaeus pipixcan*	68.5%	83.6%	12.25	44.72	14.87	37.80	SCP I
Gadwall	*Mareca strepera*	59.3%	55.7%	5.15	8.02	2.57	4.99	
Grasshopper Sparrow	*Ammodramus savannarum*	1.9%	8.2%	0.04	0.36	0.21	0.75	SCP I
Gray Catbird†	*Dumetella carolinensis*	9.3%	6.6%	0.08	0.33	0.04	0.20	
Gray Partridge†	*Perdix perdix*	0.0%	1.6%	0.00	0.00	0.01	0.10	
Great Blue Heron$^{\Delta}$	*Ardea herodias*	n/a	n/a	-	-	-	-	
Greater Scaup	*Aythya marila*	0.0%	1.6%	0.00	0.00	0.02	0.20	
Greater Yellowlegs$^{\alpha}$	*Tringa melanoleuca*	14.8%	6.6%	0.27	0.96	0.06	0.35	
Green-winged Teal	*Anas crecca*	16.7%	23.0%	0.49	1.40	0.66	2.08	
Herring Gull	*Larus argentatus*	0.0%	1.6%	0.00	0.00	0.01	0.10	
Horned Grebe	*Podiceps auritus*	1.9%	1.6%	0.01	0.12	0.04	0.29	SCP I
Horned Lark†	*Eremophila alpestris*	14.8%	14.8%	0.18	0.57	0.26	0.85	

Appendix III. Species Observed during Breeding Bird Assessments—Burke County Wind Project (Burke County, North Dakota)

Common Name	Scientific Name	Proportion of Occurrence-200 MW	Proportion of Occurrence-Outside 200 MW	Relative Abundance-200 MW	Std. Dev.	Relative Abundance-Outside 200 MW	Std. Dev.	State Status
House Sparrow†	*Passer domesticus*	1.9%	1.6%	0.01	0.12	0.02	0.20	
House Wren†	*Troglodytes aedon*	25.9%	11.5%	0.21	0.44	0.09	0.36	
Killdeer†	*Charadrius vociferus*	55.6%	62.3%	0.83	1.29	0.92	1.36	
Least Flycatcher†	*Empidonax minimus*	13.0%	13.1%	0.13	0.41	0.14	0.54	
Least Sandpiper[α]	*Calidris minutilla*	1.9%	0.0%	0.03	0.24	0.00	0.00	
Lesser Scaup	*Aythya affinis*	64.8%	67.2%	5.80	8.94	4.28	6.81	SCP II
Lesser Yellowlegs[α]	*Tringa flavipes*	18.5%	19.7%	0.87	3.44	0.32	1.24	
Mallard	*Anas platyrhynchos*	63.0%	62.3%	3.76	6.97	3.87	5.95	
Marbled Godwit	*Limosa fedoa*	3.7%	3.3%	0.04	0.26	0.06	0.38	SCP I
Marsh Wren†	*Cistothorus palustris*	31.5%	26.2%	0.58	1.40	0.37	0.93	
Mourning Dove†	*Zenaida macroura*	20.4%	41.0%	0.27	0.83	0.45	1.06	
Nelson's Sparrow	*Ammospiza nelsoni*	1.9%	1.6%	0.01	0.12	0.02	0.20	SCP I
Northern Flicker†	*Colaptes auratus*	3.7%	4.9%	0.03	0.17	0.03	0.17	
Northern Harrier	*Circus hudsonius*	7.4%	6.6%	0.07	0.26	0.04	0.20	SCP II
Northern Pintail	*Anas acuta*	18.5%	6.6%	0.52	1.58	0.08	0.47	SCP II
Northern Shoveler	*Spatula clypeata*	38.9%	31.1%	1.70	3.68	0.73	1.98	
Orchard Oriole†	*Icterus spurius*	7.4%	3.3%	0.06	0.23	0.03	0.23	
Pied-billed Grebe	*Podilymbus podiceps*	20.4%	18.0%	0.28	0.70	0.46	1.55	
Purple Martin†	*Progne subis*	0.0%	3.3%	0.00	0.00	0.02	0.14	
Redhead	*Aythya americana*	29.6%	31.1%	1.65	5.24	2.34	6.11	
Red-necked Grebe	*Podiceps grisegena*	7.4%	18.0%	0.15	0.53	0.45	1.38	
Red-tailed Hawk†	*Buteo jamaicensis*	20.4%	27.9%	0.21	0.53	0.25	0.58	
Red-winged Blackbird	*Agelaius phoeniceus*	90.7%	88.5%	13.90	13.91	13.32	15.77	
Ring-billed Gull	*Larus delawarensis*	25.9%	36.1%	0.30	0.72	0.51	1.55	
Ring-necked Duck	*Aythya collaris*	1.9%	6.6%	0.03	0.24	0.15	0.81	

Appendix III. Species Observed during Breeding Bird Assessments—Burke County Wind Project (Burke County, North Dakota)

Common Name	Scientific Name	Proportion of Occurrence-200 MW	Proportion of Occurrence-Outside 200 MW	Relative Abundance-200 MW	Std. Dev.	Relative Abundance-Outside 200 MW	Std. Dev.	State Status
Ring-necked Pheasant†	*Phasianus colchicus*	25.9%	16.4%	0.37	0.87	0.11	0.35	
Rock Pigeon†	*Columba livia*	3.7%	1.6%	0.35	2.40	0.03	0.30	
Ruddy Duck	*Oxyura jamaicensis*	31.5%	29.5%	1.87	6.64	1.03	3.11	
Savannah Sparrow	*Passerculus sandwichensis*	61.1%	73.8%	1.82	2.31	2.41	2.57	
Say's Phoebe†	*Sayornis saya*	1.9%	1.6%	0.03	0.24	0.01	0.10	
Sedge Wren	*Cistothorus platensis*	11.1%	1.6%	0.10	0.34	0.01	0.10	
Semipalmated Sandpiper[α]	*Calidris pusilla*	1.9%	0.0%	0.01	0.12	0.00	0.00	
Sharp-tailed Grouse	*Tympanuchus phasianellus*	5.6%	3.3%	0.04	0.20	0.02	0.14	SCP II
Song Sparrow†	*Melospiza melodia*	59.3%	50.8%	0.80	0.95	0.90	1.41	
Sora	*Porzana carolina*	11.1%	9.8%	0.10	0.34	0.10	0.42	
Spotted Sandpiper	*Actitis macularius*	18.5%	13.1%	0.18	0.49	0.09	0.29	
Sprague's Pipit	*Anthus spragueii*	0.0%	1.6%	0.00	0.00	0.04	0.32	SCP I
Swainson's Hawk	*Buteo swainsoni*	0.0%	6.6%	0.00	0.00	0.04	0.20	SCP I
Tree Swallow†	*Tachycineta bicolor*	25.9%	26.2%	0.73	1.89	0.46	1.51	
Turkey Vulture†	*Cathartes aura*	0.0%	1.6%	0.00	0.00	0.01	0.10	
Upland Sandpiper	*Bartramia longicauda*	16.7%	39.3%	0.25	0.89	0.56	1.07	SCP II
Veery[Δ]	*Catharus fuscescens*	n/a	n/a	-	-	-	-	
Vesper Sparrow	*Pooecetes gramineus*	22.2%	37.7%	0.20	0.47	0.42	0.76	
Warbling Vireo†	*Vireo gilvus*	5.6%	13.1%	0.06	0.23	0.10	0.37	
Western Grebe	*Aechmophorus occidentalis*	0.0%	1.6%	0.00	0.00	0.01	0.10	
Western Kingbird	*Tyrannus verticalis*	9.3%	11.5%	0.10	0.38	0.09	0.36	
Western Meadowlark	*Sturnella neglecta*	31.5%	47.5%	0.42	0.86	1.22	1.58	SCP II
White-faced Ibis[α]	*Plegadis chihi*	0.0%	3.3%	0.00	0.00	0.06	0.52	
Willet	*Tringa semipalmata*	16.7%	11.5%	0.25	0.75	0.10	0.39	SCP II
Willow Flycatcher†	*Empidonax traillii*	3.7%	0.0%	0.04	0.26	0.00	0.00	

Appendix III. Species Observed during Breeding Bird Assessments—Burke County Wind Project (Burke County, North Dakota)

Common Name	Scientific Name	Proportion of Occurrence-200 MW	Proportion of Occurrence-Outside 200 MW	Relative Abundance-200 MW	Std. Dev.	Relative Abundance-Outside 200 MW	Std. Dev.	State Status
Wilson's Phalarope	*Phalaropus tricolor*	24.1%	16.4%	0.41	1.55	0.23	0.81	SCP I
Wilson's Snipe	*Gallinago delicata*	16.7%	45.9%	0.17	0.45	0.62	0.82	
Yellow Warbler†	*Setophaga petechia*	44.4%	36.1%	0.49	0.73	0.51	0.88	
Yellow-headed Blackbird†	*Xanthocephalus xanthocephalus*	44.4%	47.5%	4.54	8.60	1.92	4.04	

A dagger (†) following a species common name indicates that the species was not included in analyses for species groupings in Appendix II.

A superscript delta (Δ) following a species common name indicates that the species was only detected incidentally.

A superscript alpha (α) following a species common name indicates that the species does not breed locally and was detected during surveys as an early fall migrant, and was not included in Appendix II species groupings.

Proportion of occurrence is equal to the total number of point count stations where the species was observed divided by the total number of point count stations (54 for the Project and 61 for outside the Project but within the Avian Use Study Area), shown in the table as a percentage.

Relative abundance is equal to the total number of individuals observed for each species divided by the total number of visits (71 for the Project and 97 for outside the Project but within the Avian Use Study Area). The total number of visits is greater than the number of point count stations as some stations were visited multiple times. Standard deviation (Std. Dev.) is also provided.

State conservation listing status indicates North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) Level I, II, or III. No federally threatened or endangered species were detected during surveys.

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B8. Attachment 1C. Pre-Construction Eagle and Avian Use Study, April 2017 through March 2018, for the Burke County Wind Project, Burke County, North Dakota.

[See Appendix B7.C of the Northern Divide Wind Energy Center Application to the North Dakota Public Service Commission for a Certificate of Site Compatibility]

B9. Northern Long-Eared Bat Habitat Assessment

Northern Long-Eared Bat Desktop Habitat Assessment Northern Divide Wind Energy Center, Burke County, North Dakota

Final Report

Prepared for:

Northern Divide Wind, LLC

Prepared by:

Clayton Derby, Terri Thorn, and Sofia Agudelo

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

November 2019

STUDY PARTICIPANTS

Western EcoSystems Technology, Inc.

Clayton Derby	Project Manager
Terri Thorn	GIS Specialist/Report Writer
Sofia Agudelo	Reviewer, Technical Editor

REPORT REFERENCE

Derby, C., T. Thorn, and S. Agudelo. 2019. Northern Long-Eared Bat Desktop Habitat Assessment, Northern Divide Wind Energy Center, Burke County, North Dakota. Prepared for Northern Divide Wind, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. October 29, 2019.

TABLE OF CONTENTS

INTRODUCTION 1
Northern Long-eared Bat Summer Habitat Requirements 1
PROJECT AREA 2
METHODS 2
Habitat Assessment 2
RESULTS 3
CONCLUSIONS 3
REFERENCES 6

LIST OF FIGURES

Figure 1. Potential northern long-eared bat habitat within and 2.5 miles (mi) from the proposed Northern Divide Wind Energy Center Project Area in Burke County, North Dakota. 5

INTRODUCTION

Northern Divide Wind, LLC (Northern Divide Wind), a wholly-owned, indirect subsidiary of NextEra Energy Resources, LLC, is considering the development of the Northern Divide Wind Energy Center (Project) in west-central Burke County, North Dakota. To evaluate potential northern long-eared bat (NLEB; *Myotis septentrionalis*) habitat and use within the proposed 10,897-acre (ac) Project (Project Area), and to address past recommendations from the US Fish and Wildlife Service (USFWS) and North Dakota Game and Fish Department, Northern Divide Wind requested that Western Ecosystems Technology, Inc. (WEST) evaluate potential habitat for NLEB within the Project Area during the summer months.

This report describes the results of the NLEB desktop habitat assessment completed for the Project by WEST, which was done following the Phase 1 survey recommendations found in the USFWS' *Northern Long-Eared Bat Interim Conference and Planning Guidance* (Guidance; USFWS 2014) and *2016 Range-Wide Indiana Bat Summer Survey Guidelines* (Guidelines; USFWS 2016).

Northern Long-eared Bat Summer Habitat Requirements

The NLEB is a federally threatened species throughout its range listed under the Endangered Species Act (1973), but take due to operation of wind projects is exempt under a 4(d) rule (81 Federal Register 9: 1900–1922 2016). The NLEB is a forest-dependent species that tends to avoid open habitats, generally relying on forest features for both foraging and roosting during the summer months (Owen et al. 2003, USFWS 2017), and requiring forest interior habitat with adequate canopy closure for both roost and foraging (Lausen 2009). Abundance of NLEB prey items, particularly beetles and moths, are typically higher in more closed forest stands than in forest openings, and wing morphology makes this bat species ideally suited for the high maneuverability required for gleaning-type foraging within a cluttered forest interior (Henderson and Broders 2008). Additionally, riparian areas are considered critical resource areas for many species of bats because they support higher concentrations of prey, provide drinking areas, and act as unobstructed commuting corridors (Grindal et al. 1999).

It is unlikely that NLEB would cross over large open areas (i.e., land lacking suitable habitat) to search for foraging and roosting habitats. Henderson and Broders (2008) found that NLEB did not travel more than 255 feet (ft) from the edge of intact forest structure; however, they also have been documented to occur in agricultural settings where forest habitats have been highly fragmented. A study of nine female NLEB using an intensively managed forest in West Virginia found this species forages in areas with forest patch sizes between 114–161 acres (ac; Owen et al. 2003), while studies in landscapes dominated by agricultural activities found NLEB used woodlots and riparian zones with as little as 15–50 ac of forest cover (Foster and Kurta 1999, Henderson and Broders 2008).

During the summer months, NLEB roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees (USFWS 2014). In general, NLEB seem opportunistic in

selecting roosts, using tree species that retain bark or provide cavities or crevices. Rarely, NLEB have also been found roosting in structures like barns and sheds (USFWS 2015); however, any structures that may be used as roosts would be expected to be located relatively close to wooded habitat that would be used for foraging. Cooler roost locations such as caves and mines may be used by non-reproductive females and males (Bat Conservation International 2019). While coal strip or surface mines are in the Project Area vicinity, no caves or underground mines that could serve as hibernacula are known to occur within the Project Area or 2.5-mile (mi) buffer.

PROJECT AREA

The analysis was completed based on the Project Area provided by Northern Divide Wind in October 2019. The Project is located in northwest Burke County, North Dakota about 5 mi southeast of the City of Noonan. The landscape area is generally rolling to flat. Elevations range from 2,118–2,483 ft above sea level with higher elevations in the southern part of the Project (US Geological Survey 2019). The region where the Project is located has been largely converted to agricultural use with crop production (mainly corn, soybeans, sunflowers, canola, and alfalfa) the primary land use, and livestock grazing a secondary use (Griffith 2010, Sayler 2016). Trees and shrubs can be found around farmsteads, within planted shelter belts, and along/within drainages; wetlands and prairie potholes are present throughout the Project Area and surrounding areas.

METHODS

The NLEB Guidance provides an estimate of the average maximum movement distance of 1.5 mi for NLEB and 2.5 mi for Indiana bats (*Myotis sodalis*). Using US Department of Agriculture's (USDA) 2018 National Agricultural Imagery Program imagery (USDA 2018) and 2016 National Land Cover Database (NLCD; Yang et al. 2018, Multi-Resolution Land Characteristics 2019) data, WEST digitized trees, considered potential NLEB summer habitat, within the Project Area and selected those areas identified as deciduous forest, evergreen forest, mixed-forest, or shrub/scrub in the NLCD within a 2.5 mi buffer around the Project Area. The larger 2.5 mi buffer was used to provide a conservative estimate of the potential foraging range of NLEB and to depict any potential corridors of connected habitat in the vicinity of the Project.

Habitat Assessment

WEST conducted a habitat analysis to assess connectivity of suitable foraging (i.e., woodlots, forested riparian corridors, and areas adjacent to these habitats), roosting, or commuting (i.e., shelterbelts/tree-lines, wooded hedgerows) habitats. Given that NLEB have similar habitat requirements as Indiana bats, the approach used in this habitat evaluation followed recommendations for habitat assessment included in the USFWS' *Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects* (USFWS 2011). This guidance assesses the potential for bats to use the Project Area based on presence of travel/commuting corridors and connectivity to foraging or roosting habitat within a 2.5 mi buffer of the Project. Connectivity is defined in the Indiana bat guidance as commuting habitat within 1,000 ft and connected to roosting or foraging habitat within 2.5 mi of the Project boundary (USFWS 2011). The 1,000 ft distance is

based on studies of Indiana bat and NLEB behavior using telemetry data on foraging activity, which indicated that isolated trees or small patches might only be suitable as habitat when they are less than 1,000 ft from other forested/wooded habitats (USFWS 2011). Therefore, it is reasonable to conclude that these bats are unlikely to occur within areas located more than 1,000 ft from roosting/foraging habitat (USFWS 2014).

For purposes of this review, WEST categorized habitat patches as follows: less than 15 ac as potential commuting/travel corridors (generally shelterbelts or small woodlots); 15–50 ac as small roosting/foraging areas (larger woodlots or riparian forests); and greater than 50 ac as medium-large roosting/foraging areas (larger contiguous forests or riparian corridors).

RESULTS

There are parts of three 50 ac or greater and one 15–50 ac wooded areas within the Project Area (Figure 1). Additionally, one 50 ac or greater and three 15–50 ac wooded areas are within the 2.5-mi Project buffer (Figure 1). All of these wooded areas represent potential summer habitat for NLEB, but none are connected or near to more contiguous habitat (e.g., Missouri River riparian corridor and breaks) that NLEB may use for migrating along between distant and unknown hibernacula locations and summer breeding areas. All but one of these areas can be found within or along the northeast boundary of the Project; the other area is along the north-central boundary (Figure 1). Based on the imagery analysis, these potential NLEB summer habitats are associated with naturally occurring woody draws which contain a variety of tress sizes and species. Nine of the 10 potential habitat areas are interconnected (i.e., within 1,000 ft buffer) by smaller wooded areas and thus are part of a single potential foraging area (Figure 1).

CONCLUSIONS

Some believe that the range of the NLEB includes all of North Dakota. However, recent studies from North Dakota State University (NDSU) indicate that NLEB do not occur throughout North Dakota and may be limited to the western badland areas (Dr. E. Gillam, pers. comm). Although there is potential summer habitat in and around the Project Area, the lack of hibernacula in the vicinity of the Project and lack of connectivity from other potential habitat (e.g., Missouri River, badlands) may preclude the presence of NLEB from the Project Area and be consistent with conclusions drawn through the research by NDSU. Overall, impacts to bat species, including NLEB of which there have been none, are anticipated to be within the overall range of other Midwestern facilities, particularly those in North and South Dakota.

To assess level of impact, a minimum of one year of post-construction fatality monitoring will be conducted to identify wildlife species, including bats, found as fatalities and to estimate fatality rates at the Project. Fatality monitoring will begin after all the turbines have been commissioned and are fully operational, and will be consistent with general wind industry standard practices as described in the USFWS's Land-Based Wind Energy Guidelines (USFWS 2012). Additionally, Northern Divide Wind will develop a Wildlife Response and Reporting System as a proactive method of monitoring and recording wildlife impacted during Project operation. This system has

a specific set of processes, procedures, and training for monitoring, responding to, and reporting wildlife injuries and fatalities at wind turbines.

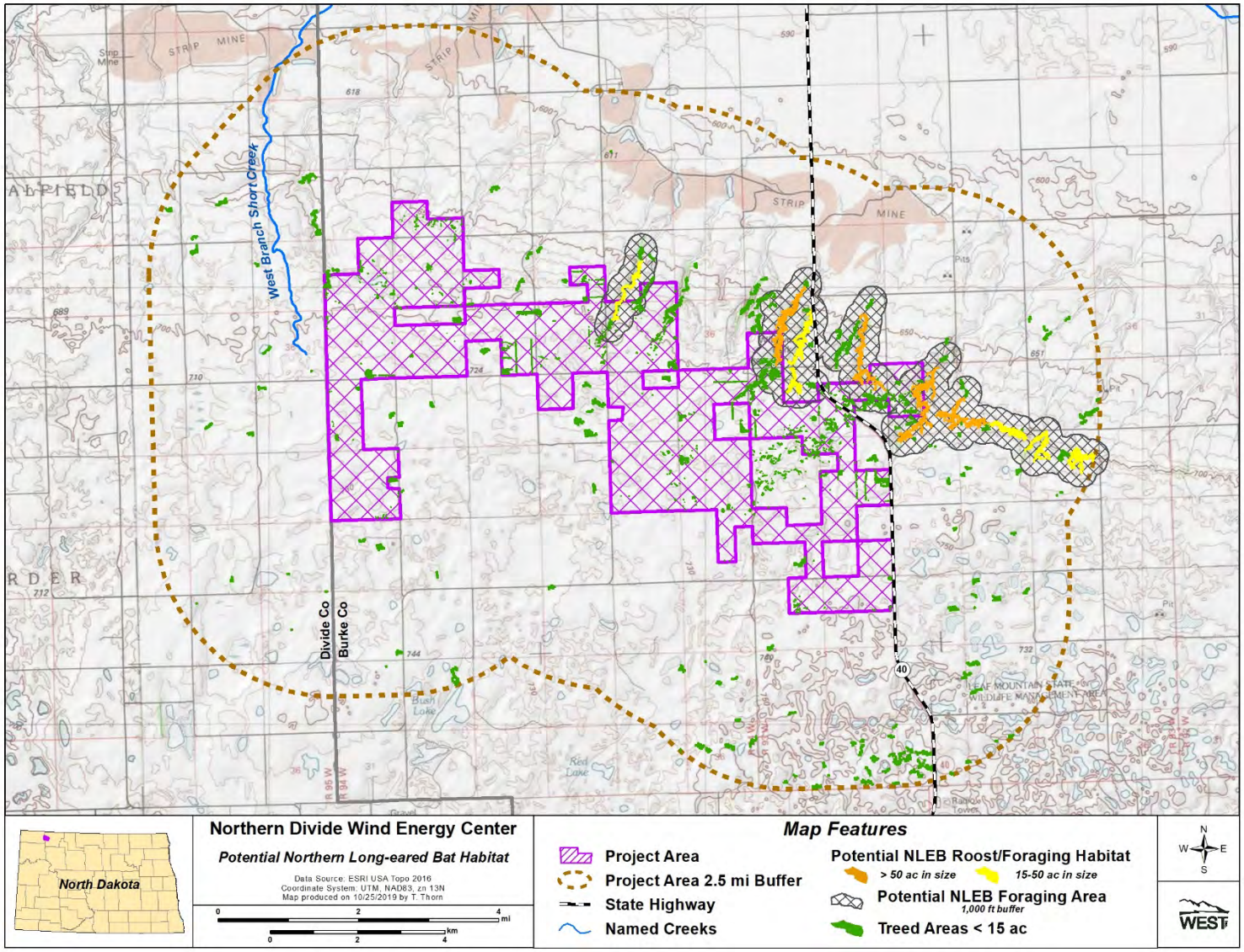


Figure 1. Potential northern long-eared bat habitat within and 2.5 miles (mi) from the proposed Northern Divide Wind Energy Center Project Area in Burke County, North Dakota.

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Appendix C

Agency Notification Letters and Correspondence

C1. Agency Notification Template

EXAMPLE AGENCY LETTER

AECOM
1000 East Calgary Ave
Bismarck, ND 58503
aecom.com

(701) 221-4148 tel
(701) 221-4155 fax

August 27, 2019

Subject: Northern Divide Wind Energy Center and 345 kV Transmission Line Project Burke and Mountrail Counties, ND

Northern Divide Wind, LLC (Northern Divide Wind), a wholly-owned, indirect subsidiary of NextEra Energy Resources, LLC, is proposing to develop the Northern Divide Wind Energy Center (Wind Energy Center) and the approximately 41-mile, 345 kV transmission line (Transmission Line, and collectively with the Wind Energy Center, the "Project") in Burke and Mountrail Counties, ND. Northern Divide Wind plans to complete North Dakota Public Service Commission permitting and construction in 2020.

The Wind Energy Center will have a nameplate capacity of approximately 200 megawatts, consisting of wind turbines and associated infrastructure. The Wind Energy Center will be located entirely within Burke County, ND. The Transmission Line will connect the Wind Energy Center to the electrical grid at the Basin Electric Tande Substation in west Mountrail County. The Transmission Line will be located in Burke and Mountrail Counties, ND. Northern Divide Wind requests the consideration of the Project shown on the attached map (Figure 1). The Wind Energy Center Project Area and 1-mile wide Transmission Line Corridor encompass the following legal locations:

County	Township	Range	Sections
Burke	159 N	93 W	2-11, 16-21, 27-35
	160 N	93 W	3-5, 8-11, 14-17, 21-23, 25-28, 33-36
	161 N	92 W	19, 30, 31
	161 N	93 W	3-11, 12-29, 34-36
	161 N	94 W	1-24, 28-30
	162 N	93 W	29-34
	162 N	94 W	15-36
Mountrail	157 N	93 W	2-10, 15-20
	157 N	94 W	9-24, 27-30, 32, 33
	158 N	93 W	2-5, 8-11, 14-17, 20-23, 26-29, 32-35

To ensure that all social, economic, and environmental effects are considered and per Section 69-06-01-05 of the North Dakota Administrative Code, we are soliciting your comments on the Project. We are particularly interested in any property which your agency may own or have an interest in located within or adjacent to the Project. We would also appreciate being made aware of any proposed developments your agency may be contemplating in the areas under consideration for the Project. Any information that might help us in our siting studies and permit applications would be appreciated. We would appreciate a response within 30 days of receipt of this letter. If no reply is received by this date, it will be assumed that you have no comment on this Project.

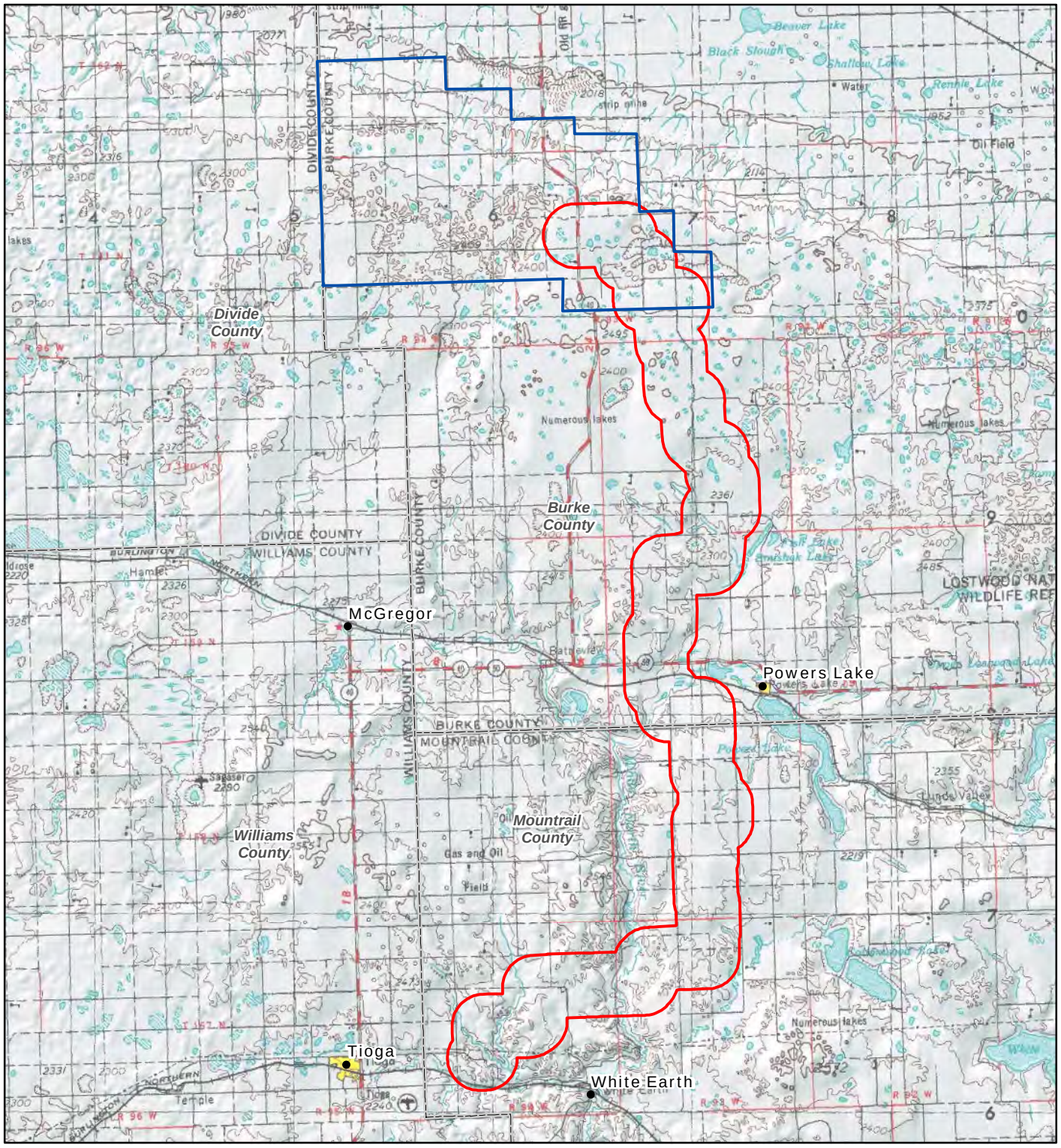
If further information is desired regarding the proposed Project, please contact Lindsey Churchill at (701) 221-4148 in Bismarck, ND, or at the email and address below.

Sincerely,



Lindsey Churchill, PhD, PWS
AECOM
Environmental Project Manager
1000 East Calgary Avenue Suite 1
Bismarck, ND 58503
lindsey.churchill@aecom.com

Enclosure:
Figure 1 - Project Location Map

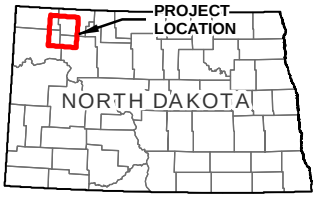


Northern Divide Wind Energy Center and 345 kV Transmission Line Burke & Mountrail Counties, North Dakota

Figure 1
Project Location

Legend

- Northern Divide Project Area
- Transmission Line Corridor
- County Boundary
- City/Town



N

0 2 4
Miles

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C2. Tribal Notification Template

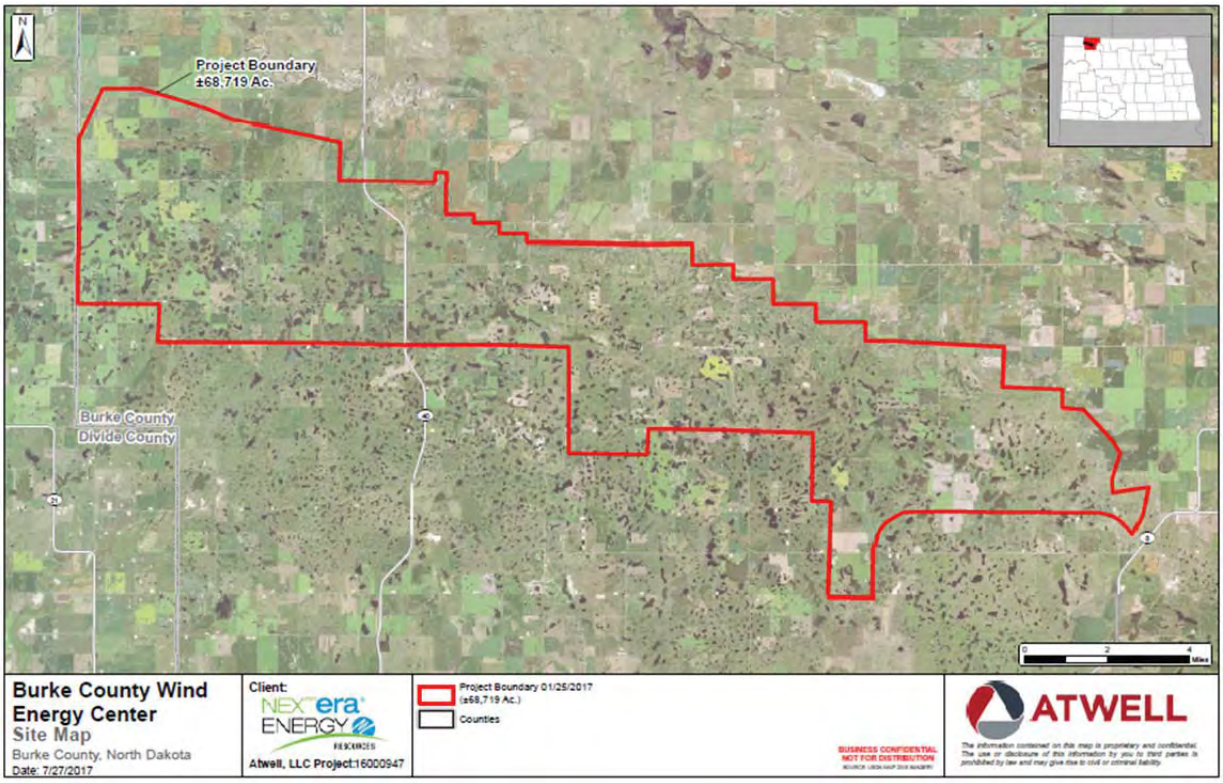
EXAMPLE TRIBAL OUTREACH LETTER

August 2, 2017

Subject: Proposed Burke Wind Energy Center in Burke County, North Dakota

Burke Wind, LLC (Burke) is an indirect, wholly-owned subsidiary of NextEra Energy Resources, LLC (NextEra) that is in the process of developing the proposed 300 MW Burke Wind Energy Center in Burke County, ND as shown below in Figure 1. The project will be located on approximately 68,719 acres of private land southwest of Bowbells, ND in Keller, Fay, Harmonious, Leaf Mountain, Foothills, Clayton, Ward, Lucy, Diamond, Roseland, Kandiyohi, Thorson, and Cleary Townships.

Figure 1



The Project would consist of up to 120 wind turbine generators, with a total nameplate capacity of up to 300 megawatts (MW). Additional facilities include access roads, electrical collection systems and cabling, a collection substation, an operation and maintenance (O&M) yard, a batch plant location, one temporary laydown yard, and meteorological (MET) towers. The Project will connect to Basin Electric Power Company's Tande substation via a 32-mile generation tie line.

Burke would like to complete cultural surveys in the late August/September timeframe prior to initial turbine micro-siting in October 2017 so that the layout of all project facilities can be relatively finalized before snow falls in the late fall of 2017. Burke anticipates initiating permitting through the North Dakota Public Service Commission in the second half of 2018, with construction scheduled to start in 2019. At this time, we are not expecting to coordinate with any Federal agencies, as no Federal permits are anticipated.

Consistent with NextEra's policy to reach out to Tribes in the area of its projects, I wanted to provide you with information about the Project and ask whether you have an interest in receiving further information and/or would like to participate in upcoming project surveys.

Project Area
The Project Area is located within a rural area situated several miles from the small communities of Columbus (approximately 6 miles north), Lignite (approximately 7 miles north) and Powers Lake (approximately 10.5 miles south). Small farmsteads are scattered throughout the Project Area. Public roads are generally situated in a grid-like arrangement.

Overall the Project Area and surrounding vicinity is sparsely populated, and supports a mix of grasslands and cultivated cropland/hayfields/pasturelands within an extensive prairie pothole wetland system. Agricultural use (cultivated crops and hay/pasture) is the primary land use within the Project Area with several oil pump jacks and batteries scattered throughout. Forested habitats and riparian corridors are limited and concentrated along the northern boundary. The topography of the region and the Project Area is generally flat but contains undulating relief, with approximate elevations between 2,100 and 2,470 feet above mean sea level (MSL).

The Project Area is located mostly within the Northern Dark Brown Prairie ecoregion of the Northern Glaciated Plains, and partially within the Northern Missouri Coteau ecoregion of the Northwestern Glaciated Plains. According to Environmental Protection Agency Ecoregion mapping data, the Northern Glaciated Plains ecoregion is characterized by a flat to gently rolling landscape composed of glacial drift. The sub-humid conditions foster a grassland transitional between the tall and shortgrass prairie. The surficial geology in the project region is primarily undulating to very steep topography with knolls, ridges, an occasional drainage-way, and some very poorly drained soils in depressions and potholes.

Proposed Project
As described above, the proposed Project would consist of an array of wind turbines, each with an associated transformer. Proposed Project facilities would include the following components:

- Up to 120 wind turbines;
- All-weather access roads to each turbine site;
- A collection substation (approximately 5 acres);
- Underground electrical collection lines and fiber optic cables from each turbine to the collection substation;
- An O&M yard (approximately 10 acres);
- A batch plant location (up to 5 additional acres);
- A temporary laydown yard (up to 15 acres);
- Up to 4 temporary and 3 permanent SCADA MET towers; and
- A generation tie-line of approximately 32 miles in length

Although the Project layout is still preliminary, based on similar projects in the region, we anticipate that no more than 5 percent of the proposed Project area would be temporarily disturbed during construction of the Project. Our typical operational facilities generally have no more than 1 percent of the area permanent impacted by infrastructure. Construction activities may temporarily disturb soils and vegetation to an extent that would require some regrading, compaction mitigation, and reseeding following completion of operations. Additionally, the areas temporarily affected could be restored to crop production or grassland, depending on landowner preferences.

Land would be graded on-site for the turbine pads with native vegetation. Access roads, operations and maintenance buildings, and temporary construction/laydown areas would be installed as necessary to fully accommodate all aspects of Project construction, operation, and maintenance.

Cultural Resources Studies

NextEra contracted Atwell, LLC (Atwell) to conduct a Class I Cultural Resources Inventory for the approximately 68,719-acre site, hereafter referred as the Project Area. For the purpose of this report, a two-mile buffer was included surrounding the Project Area (hereafter referred as Review Area).

Atwell conducted the Class I Cultural Resources Inventory through an initial file search of the North Dakota Cultural Resources Survey (NDCRS) data files maintained by the SHSND. Review of NDCRS data files included review of Archaeological, Historical, and Architectural resource forms and cultural resources survey reports available at the SHSND in Bismarck, ND within the Project Area and Review Area. Atwell also reviewed the National Register of Historic Places (NRHP) records maintained by the National Park Service to find listings of Historic Properties listed on the NRHP within the Review Area.

Approximately 87 cultural resources survey reports for compliance projects are on file in NDCRS records for projects conducted within the Review Area. Oil and gas related projects (wells, pipelines, etc.) comprise the majority of compliance reports in the Review Area (33 reports), followed by transportation related projects (17 reports), material borrow locations (10 reports), mining related projects (8 reports) and electrical transmission/distribution projects (8 reports). Atwell reviewed the location of previous cultural resources survey projects within the Project Area and determined that the majority of the Project Area has not been previously surveyed to determine if cultural resources are present. Therefore, further cultural resources investigations will likely be necessary to further evaluate the presence/absence of cultural resources within the Project Area.

In its Class I surveys, Atwell identified 17 archaeological sites within the Project Area and an additional seven archaeological sites located within two miles of the Project Area. Several of the archaeological sites within the Project Area contain stone circle and/or cairn features. Archaeological sites 32BK0001, 32BK0002, 32BK0003, 32BK0004, 32BK0005 and 32BK0006 consist of Late Prehistoric stone circle sites with multiple stone circles. Examination of the spatial distribution of archaeological sites 32BK0001, 32BK0002, 32BK0003, 32BK0004, and 32BK0005 indicates that they are possibly related and appear to be located on slightly elevated landforms interspersed by prairie potholes. Archaeological sites 32BK0001, 32BK0002, and 32BK0003 are located within the southwestern portion of the Project Area. Archaeological site 32BK0004 is bisected by the Project Area boundary in the southwest portion of the Project Area. Archaeological sites 32BK0005 and 32BK0006 are located approximately 0.25 mile and 1.8 mile south of the Project Area respectively, in the southwestern portion of the Project Area.

Archaeological site 32BK0081 consists of a single stone circle that was recorded in 2009 and is located just over 2 miles from the Project Area. Data presented in the archaeological site form for 32BK0081 indicates that this site may be associated with archaeological site 32BK0023 which is located outside of

the Review Area and consists of eight stone circles. Due to the potential association of 32BK0023 with 32BK0081, it is possible that additional unrecorded archaeological sites associated with this potential cultural landscape may be present in the vicinity of sites 32BK0023 and 32BK0081.

Archaeological site 32BK0109 consists of multiple stacked stone cairns and rock piles (dispersed stone cairns) which were recorded within the Project Area in 2011. Archaeological site 32BK0109 is located approximately 0.8 mile southwest of sites 32BK0110, 32BK0111, 32BK0112, and 32BK0113 which consist of multiple stone circles overlooking a prairie pothole that were also recorded within the Project Area in 2011. Based on the spatial distribution of archaeological sites 32BK0110, 32BK0111, 32BK0112, and 32BK0113, it is possible that these four sites are related and may indicate a cultural landscape of Native American importance rather than individual discrete archaeological site locations. The association of site 32BK0109 to the four associated sites is unclear.

Archaeological site 32BK0161 consists of two stone circles; archaeological site 32BK0162 consists of a single cairn on a high ridge; and archaeological site 32BK0163 consists of a single stone circle. Archaeological site 32BK0128 consists of multiple stone circles and cairns which were recorded in 2013 approximately 1.0 mile east of the Project Area. Archaeological site 32BK0182 is located approximately 0.8 mile southeast of site 32BK0128 and it is unclear if these two sites are related. Site 32BK0182 consists of multiple stone circles recorded in 2015 approximately 1.7 miles from the Project Area. Archaeological site 32BK0022 consists of a stone circle site recorded in 1992 that is located within the Project Area. Archaeological site 32BK0125 consists of multiple stone circles and cairns which were recorded within the Project Area in 2010.

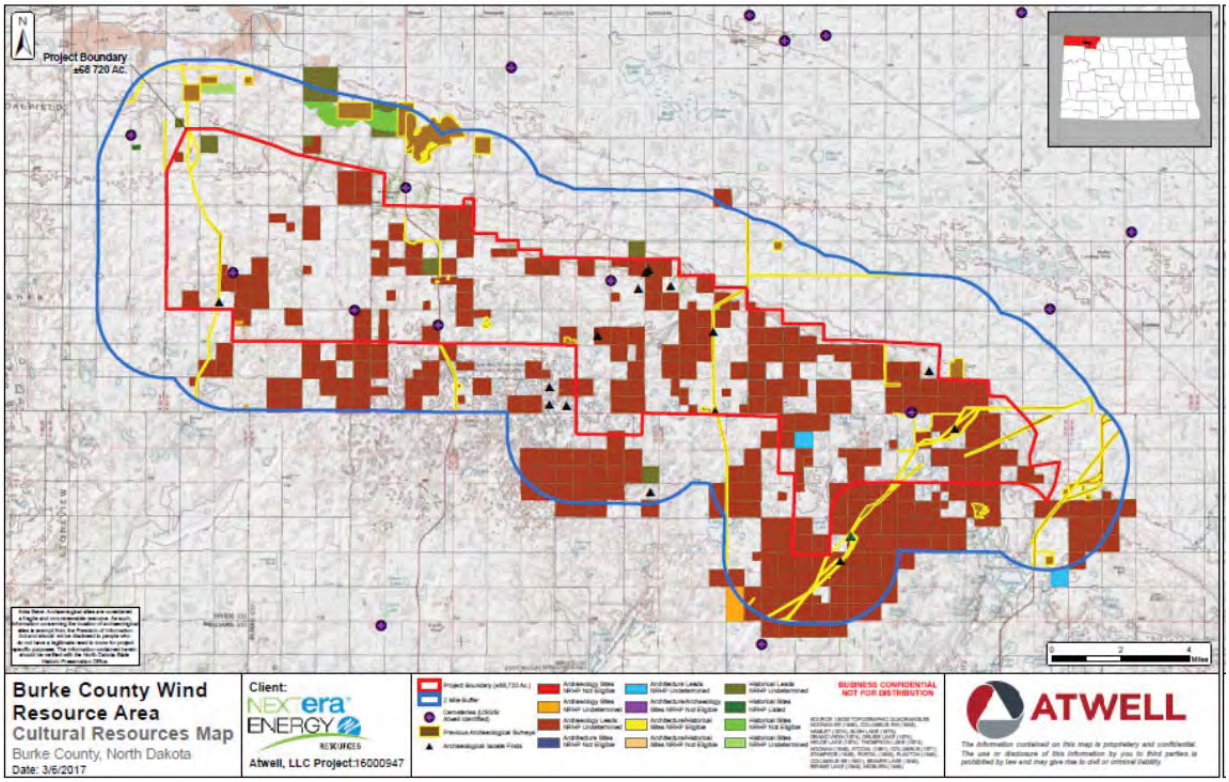
Archaeological site 32BK0170 consists of a stone circle recorded in 2014 approximately 0.4 mile west of the Project Area boundary. Archaeological sites 32BK0022, 32BK0125, and 32BK0170 do not appear to be associated with other stone circle or cairn archaeological sites.

Archaeological site 32BK0010 is cross listed as an architectural and an archaeological resource that consists of a historic mining site that was recorded in 1987 and is located approximately 1.8 miles north of the Project Area. Archaeological site 32BK0117 consists of a historic artifact scatter recorded within the Project Area in 2011. Archaeological site 32BK0176 consists of a historic stone foundation and artifact scatter that was recorded within the Project Area in 2014.

Archaeological sites 32BK0001, 32BK0002, 32BK0003, 32BK00004, 32BK00005, 32BK0006, 32BK0022, 32BK0081, 32BK0109, 32BK0110, 32BK0111, 32BK0112, 32BK0113, 32BK0128, 32BK0161, 32BK0162, 32BK0163, 32BK0170, and 32BK0182 were recommended “Undetermined” for NRHP eligibility and additional archaeological investigations would be necessary to determine NRHP eligibility. Archaeological sites 32BK0010, 32BK0117, 32BK0121, 32BK0125, and 32BK0176 were recommended “Not Eligible” for listing on the NRHP.

Atwell identified 184 site leads within the Project Area and an additional 161 site leads within two miles of the Project Area. Of these site leads, 161 are characterized as cultural material scatters, 169 are characterized as depressions, 1 is characterized as a cultural material scatter/depression, 2 are characterized as graves (32BKX0339 and 32BKX0427), and 6 are of unknown function. Archaeological site lead 32BKX0339 is located approximately 0.25 mile south of the Project Area boundary and archaeological site lead 32BKX0427 is located within the southeastern portion of the Project Area. Both have very little information available in the record and the exact location of the potential grave at each lead is unknown. The map below in Figure 2 identifies locations of identified cultural resources.

Figure 2



Emmons Logan commits to avoid any newly documented sites and the previously-documented cultural resources within the Project area. Any sites avoided during construction would be fenced to reduce the potential that they would be inadvertently disturbed.

****

I hope this information has been helpful to you. Again, as it is NextEra's policy to reach out to Tribes in the vicinity of its projects, I wanted to provide you this information about the Project. Please let me know if you have an interest in the project area and would like to be involved in further discussions, so that we can answer any questions, provide you additional information, discuss any concerns you may have about the Project location, and plan any requested tribal participation accordingly. I can be reached at (224) 251-7580 or via e-mail at Carolyn.Stewart@NextEraEnergy.com.

Regards,

Carolyn T. Stewart
Director, Tribal Relations

Cc: Clay Cameron, NextEra
Richard Estabrook, NextEra

C3. North Dakota Aeronautics Commission

From: Lund, Nels C. <nlund@nd.gov>

Sent: Friday, August 30, 2019 9:37

AM **To:** Churchill, Lindsey

Subject: Northern Divide Wind Energy Center and 345 kV Transmission Line Project

Good morning Lindsey,

We received your letter on the Northern Divide Wind Energy Center and 345 kV Transmission Line Project.**Due to the proximity to Tioga Municipal Airport we recommend you file an airspace case to the FAA**. I do not see a proposed height of transmission line or construction equipment on the letter you sent, but if the height is above 200' AGL then you need to submit a case to the FAA for review. And if the project falls into any of the category's below in FAR Part 77 then you must file a case with the FAA. You can do so on this websitehttps://oeaaa.faa.gov/oeaaa/external/portal.jsp

Below are the rules in determining whether a case needs to be filed or not. You can file a case on the above website and also find instructions on how to do so. Please let me know if you have any questions.

Who Needs to File

The requirements for filing with the Federal Aviation Administration for proposed structures vary based on a number of factors: height, proximity to an airport, location, and frequencies emitted from the structure, etc. For more details, please reference 14 CFR Part 77.9.

Please click here to use the FAA's Notice Criteria Tool to determine if you meet the requirements to file notice of your construction or alteration

OR

In accordance with 14 CFR Part 77.9, if you propose any of the following types of construction or alteration, you must file notice with the FAA at least 45 days prior to beginning construction:

- any construction or alteration that exceeds an imaginary surface extending outward and upward at any of the following slopes:
  - 100 to 1 for a horizontal distance of 20,000 ft. from the nearest point of the nearest runway of each airport described in 14 CFR 77.9(d) with its longest runway more than 3,200 ft. in actual length, excluding heliports
  - 50 to 1 for a horizontal distance of 10,000 ft. from the nearest point of the nearest runway of each airport described in 14 CFR 77.9(d) with its longest runway no more than 3,200 ft. in actual length, excluding heliports
  - 25 to 1 for a horizontal distance of 5,000 ft. from the nearest point of the nearest landing and takeoff area of each heliport described in 14 CFR 77.9(d);
- OR any highway, railroad, waterway or other traverse way for mobile objects, of a height which, if adjusted upward as defined in 14 CFR 77.9(c) would exceed a standard of 14 CFR 77.9 (a) or (b);
- OR your structure will emit frequencies, and does not meet the conditions of the FAA Co-location Policy;
- OR your proposed structure will be in proximity to a navigation facility and may impact the assurance of navigation signal

reception;

- OR any construction or alteration exceeding 200 feet above ground level, regardless of location;
- OR any construction or alteration located on an airport described in 14 CFR 77.9(d);
- OR filing has been requested by the FAA.

Thank you!

Nels Lund
Airport Planner
North Dakota Aeronautics Commission
PO Box 5020
Bismarck, ND 58502-5020
701-328-9655 (Office)
701-955-8280 (Cell)
https://aero.nd.gov

C4. North Dakota Department of Environmental Quality

NORTH Dakota | Environmental Quality

Be Legendary.

September 4, 2019

Lindsey Churchill, PhD
Environmental Project Manager
AECOM
100 East Calgary Avenue, Suite 1
Bismarck, ND 58503

Re: Northern Divide Wind Energy Center 345 kV Transmission Line in Burke, Mountrail Counties

Dear Ms. Churchill:

The North Dakota Department of Environmental Quality has reviewed the information concerning the above-referenced project received at the department on August 19, 2019, 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 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.

4. The proposed construction project may include individual projects located within Burke and Mountrail counties. It is possible the project or projects may be located over defined glacial drift aquifers, defined sensitive glacial drift aquifers, or within wellhead or source water protection areas. Care should be taken to avoid spills of any materials that may have an adverse effect on groundwater quality. All spills must be immediately reported to this department and appropriate remedial actions performed.

5. 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.

6. All solid waste materials must be managed and transported in accordance with the state's solid and hazardous waste rules. Appropriate efforts to reduce, reuse and/or recycle waste materials are strongly encouraged. As appropriate, segregation of inert waste from non-inert waste can generally reduce the cost of waste management. Further information on waste management and recycling is available from the department's Division of Waste Management at (701) 328-5166.

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., Director
North Dakota Department of Environmental Quality

LDG:dlp
Attach.

Construction and Environmental Disturbance Requirements

The following are the minimum requirements of the North Dakota Department of Environmental Quality for projects that involve construction or environmental disturbance in or near waters of the State of North Dakota. They ensure that minimal environmental degradation occurs as a result of construction or related work which has the potential to affect waters of the state. All projects must be constructed to minimize the loss of soil, vegetative cover, and pollutants (chemical or biological) from a site.

Soils

Prevent the erosion of soil and sediment loss using erosion and sediment controls. Fragile and sensitive areas such as wetlands, riparian zones, delicate flora, and land resources must be protected against compaction, vegetation loss, and unnecessary damage.

Surface Waters

All construction must be managed to minimize impacts to aquatic systems. Follow safe storage and handling procedures to prevent the contamination of water from fuel spills, lubricants, and chemicals. Stream bank and stream bed disturbances must be controlled to minimize slit movement, nutrient upsurges, plant dislocations, and any physical, chemicals, or biological disruption. The use of pesticides or herbicides in or near surface waters is allowed under the department's pesticide application permit with notification to the department.

Fill Material

Any fill material placed below the ordinary high-water mark must be free of topsoil, decomposable materials, and persistent synthetic organic compounds; including, but not limited to, asphalt, tires, treated lumber, and construction debris. The department may require testing of fill materials. All temporary fill must be removed. Debris and solid wastes must be properly disposed or recycled. Impacted areas must be restored to near original condition.

C5. North Dakota Department of Transportation

NORTH Dakota | Transportation
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September 20, 2019

Lindsey Churchill, PHD, PWS
AECOM
Environmental Project Manager
1000 E. Calgary Avenue, Suite 1
Bismarck, ND 58503

DEVELOP A WHOLLY-OWNED, INDIRECT SUBSIDIARY OF NEXT ERA ENERGY RESOURCES AND APPROXIMATELY 41-MILE, 345KV TRANSMISSION LINE WITH WIND ENERGY CENTER, BURKE AND MOUNTRAIL COUNTIES, NORTH DAKOTA

We have reviewed your August 16, 2019, letter.

This project should have no adverse effect on the North Dakota Department of Transportation highways.

Additionally, if because of this project any work needs to be done on highway right of way, appropriate permits and risk management documents will need to be obtained from the Department of Transportation District Engineer, Joel Wilt at 701-774-2700.

CHAD M. ORN, P.E., DIRECTOR - OFFICE OF PROJECT DEVELOPMENT

57\cmo\js
c: Joel Wilt, Williston District Engineer

C6. North Dakota Game and Fish Department

GOVERNOR, Doug Burgum
DIRECTOR, Terry Steinwand
DEPUTY, Scott A. Peterson

"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

September 12, 2019

Lindsey Churchill, PhD, PWS
Environmental Project Manager
1000 East Calgary Avenue Suite 1
Bismarck, ND 58503

Dear Ms. Churchill:

RE: Northern Divide Wind Energy Center and 345 kV Transmission Line Project Burke and Mountrail Counties, ND

The North Dakota Game and Fish Department has been in discussion with NextEra Energy Inc. regarding wind energy development in Burke County since 2016. The original project proposed was sited within an area with a high degree of undisturbed native habitats, therefore extremely important to wildlife, including several Species of Conservation Priority such as the Northern Pintail, Sprague's Pipit, and Sharp-tailed Grouse. In an effort to create a more responsibility sited project, NextEra has relocated 31 of the original 78 turbines. Though the project footprint has been shifted, greatly reducing impacts, the boundary is still within an area of high sensitivity and many of our initial concerns are the same. In this letter, we will provide official comments as requested in a letter dated 8/16/2019.

Native prairie is the most endangered habitat type in North Dakota and, as a grassland state, the majority of our native wildlife species are linked to prairie. Disturbance, fragmentation, and loss of native prairie have adversely impacted a wide variety of species and these negative impacts will only continue to compound as more development takes place on the landscape. The remaining tracts of unbroken prairie are becoming more and more vital to many declining bird and pollinator species. Though just a modest portion of the new project area is composed of native, unbroken prairie, this habitat type supports 30 or more of the 115 Species of Conservation Priority identified in the North Dakota State Wildlife Action Plan (Dyke et. al 2015). Species of Conservation Priority, such as the Chestnut-collared Longspur, Baird's Sparrow, and Sprague's Pipit (all of which have declined over 80% from 1966-2015), may be further negatively impacted by the loss and fragmentation of native prairie in the project area.

The proposed project area is located within the Missouri Coteau, a landscape that not only has a considerable amount of native prairie, but an extremely high concentration of wetlands, some of the highest in North America. Prairie Pothole wetlands are the most productive wildlife habitat in

North Dakota, and they make up a moderate portion of the project area. These wetlands support 54 Species of Conservation Priority, as well as a considerable number of waterfowl, shorebirds and cranes throughout the year. Wind energy development has been shown to have detrimental impacts to wildlife within both wetland and prairie habitats, and careful micro-siting within these habitats is crucial in order to minimize impacts.

Though the Department believes the best way to protect our Species of Conservation Priority is by taking a habitat focused approach, we would be remiss to not also reiterate the following species-specific concerns.

1. The Whooping Crane's migration corridor enters North Dakota in the northwest corner of the state, angling through Burke County and directly through the proposed project area. The migration corridor then proceeds south to just north of the Van Hook Arm on Lake Sakakawea and follows just east of the Missouri River and its reservoirs until it exits the southern portion of the state. The risk of Whooping Cranes striking a turbine or transmission line will be elevated in this area as compared to the rest of the state. While no fatalities have been documented of Whooping Cranes from collision with wind turbines in the United States, collisions with transmission lines are the leading known cause of death in the wild for whooping cranes. Contact the US Fish and Wildlife Habitat and Population Evaluation Team (HAPET) in Bismarck to request the Whooping Crane model of predicted use of landscapes.

2. The project area is highly important to waterfowl production. HAPET has developed a Local Siting Decision Support Tool (DST) to estimate the number of duck pairs that are displaced based on research conducted in the Dakotas (Loesch et al. 2013, Loesch 2016). The model also produces an approximation of the number of wetlands requiring restoration that offset the displacement of these breeding pairs. We recommend NextEra contact the HAPET office to request the DST.

3. Though Bald and Golden Eagle numbers are low in the winter months, both species are likely to be common in the project area during the rest of year, specifically spring and fall.

4. A large number of Sharp-tailed Grouse were observed in the original project area. Twenty-eight leks were confirmed, averaging 11.6 grouse per lek. That is approximately 325 male birds. This does not include males that went undetected, or females. In fall, based on these estimates, the area could produce upwards of 3,500 huntable birds. And as prairie grouse generally avoid areas with human disturbance and tall structures (Leddy et al. 1999, Hagen et al. 2004, Manville 2004, Pruett et all. 2009), this project could impact the local population.

5. Despite an extremely short survey period, a number of species of conservation concern were observed in the project area, including: Sprague's Pipit, Grasshopper Sparrow, Nelson's Sparrow, Marbled Godwit, Northern Harrier, Upland Sandpiper, Bobolink, and Western Meadowlark. All of these species are sensitive to habitat loss and fragmentation and this project has the potential to further negatively impact these, already declining, species. Of particular concern is the Sprague's Pipit. Pipits were historically found

throughout much of North Dakota but the species range has contracted in the state. The Northern Divide Wind Energy Center, particularly the transmission line, overlaps with one of the few places in the state where a high concentration of pipits still persists (Lipsey et al. 2015). Male pipits conduct a flight display about 50-100 meters above the ground that last from several minutes to several hours. This project could impact the core area for pipits, including the risk of increased mortality to this skylarking (a breeding display) species.

Finally, the Department is uncertain of the protocols for creating and maintaining a transmission line. If a road needs to be created for its construction, a sizeable loss to native prairie and an increase in habitat fragmentation would result. If that road is to be maintained, it is likely that disturbance will have long lasting impacts to species of conservation concern, specifically those sensitive to habitat fragmentation. Further, the Department is concerned about what bringing new transmission to the area might mean for future development. As mentioned before, the mosaic of grasslands and wetlands in this area is extremely valuable to a high number of wildlife species and the cumulative impacts of multiple projects in the area is of tremendous concern.

As we continue to address the challenges of stemming the decline of our state's most sensitive species, we cannot endorse or consent to the disturbance, fragmentation, and loss of the remaining high value habitats essential to Species of Conservation Priority without recommending that suitable replacement or offsets be applied back onto the landscape. Ensuring these habitats remain on the landscape is the only way to stem the decline of these species and prevent listings through the Endangered Species Act, which could impact both the state and its citizens by restricting further construction of infrastructure, energy development, recreational activities, grazing, vegetation control, and land-use changes or conversion on both public and private land. The Department has stressed the importance of following the best available science in determining impacts and voluntary offsets. The best science addressing North Dakota resources are Loesch et al. 2013 and Shaffer and Buhl 2016; these papers should be used to help guide NextEra in developing a voluntary offset package.

As NextEra moves forward with this project, the Department requests to remain informed. To accurately analyze the project and provide valuable feedback to the PSC, it is important that the Department receives all documents, including wildlife surveys, spatial data, and any voluntary offsets being proposed 100 days prior to the hearing date.

Sincerely,

Greg Link
Chief, Conservation and Communications Division

Cc: Scott Larson, US Fish and Wildlife Service
ND Public Service Commission

October 1, 2019

Greg Link
Chief, Conservation and Communication Division
North Dakota Game and Fish Department
100 North Bismarck Expressway
Bismarck, ND 58501-5095

Mr. Link,

Thank you for your letter dated September 12, 2019, regarding our proposed 200-MW Northern Divide Wind Energy Center and Transmission Line (Project) in Burke and Mountrail Counties, North Dakota. In response, Northern Divide Wind, LLC (Northern Divide Wind), an indirect, wholly-owned subsidiary of NextEra Energy Resources, LLC (NextEra Energy Resources), presents this letter, which includes our proposed avoidance, minimization, and voluntarily offset measures that effectively mitigate potential environmental impacts. Since July 8, 2019, we have maintained dialogue with your Department and the U.S. Fish and Wildlife Service ("Service"), collectively the "Wildlife Agencies," throughout Project development, including our most recent meeting on September 17, 2019 and ongoing offset discussions thereafter. This dialogue has been beneficial in designing the Project to have minimal environmental impact.

Responses and Clarifications to Department Letter Dated September 12, 2019

Paragraph 1 — NextEra has relocated 31 of the original 78 turbines

Refer below to our response to Paragraph 6 where we describe relocating 44 of the original 81 turbine locations.

Paragraph 2 — Native Prairie

Per our meeting on September 17, 2019, and Attachment 1, native prairie makes up approximately 7% of the Project area (we understand through our discussions with the Department that native prairie is synonymous with "unbroken grassland"). Much of this habitat consists of small, fragmented patches and woody species encroachment is common across most of the habitat, which often results in reduced grassland bird densities. Northern Divide Wind has avoided siting permanent, above-ground wind facility infrastructure in unbroken grassland and is voluntarily offering grassland bird displacement offsets (see response to Paragraph 6 below). Per the Wildlife Agencies' request, the avoidance, minimization, and offset measures described herein effectively mitigate any potential impacts to unbroken grassland and avian use.

Paragraph 3 — Missouri Coteau

We agree that the larger geographic extent of the Missouri Coteau consists of areas with considerable wetland and grassland habitats, but per our meeting on September 17, 2019, and Attachment 1, the Project area is located in an area dominated by cropland (only 7% of Project area is unbroken or native grassland) and the Project is partially located within the Northern Missouri Coteau (20 of the proposed 78 turbine locations lie outside the boundary as defined by Bryce *et al.* 1996). The avoidance, minimization, and offset measures described herein effectively mitigate any potential impacts.

Paragraph 4.1 — Whooping Crane

Northern Divide Wind used information provided by the Wildlife Agencies in early project stages that included radio telemetry data of Whooping Crane locations from the Service that showed the project location

was in the low-use intensity area. Review of Neimuth *et al.* 2018 and our Whooping Crane Habitat Suitability Analysis indicates the project site is no more attractive than the surrounding area and suggests no reason to believe the site would be an attractant. In addition, no Whooping Crane or Sandhill Crane (a non-federally listed species) has ever been injured or killed by collision with wind turbines in the migratory corridor and Derby *et al.* 2018 shows no mortality of either species during monitoring over multiple years at multiple projects in North and South Dakota. Northern Divide Wind avoids all impacts to potentially suitable stopover roosting habitat and commits to marking the entire Project transmission line with bird flight diverters to reduce the potential for collisions following the Avian Power Line Interaction Committee Suggested Practices. Northern Divide Wind is also preparing a Whooping Crane Habitat Review report and will provide a copy to the Department.

Paragraph 4.2 — Habitat and Population Evaluation Team (HAPET) Decision Support Tool (DST)

Northern Divide Wind developed the offset proposal described in response to Paragraph 6 with respect to the HAPET and Shaffer *et al.* 2019 DSTs, as well as coordination with Department staff.

Paragraph 4.3 — Bald and Golden Eagles

Northern Divide Wind is preparing an Avian Use report and will provide a copy to the Department.

Paragraph 4.4 — Sharp-tailed Grouse

By moving the Project area and associated turbines into a crop-dominated landscape, the impact to upland birds, including huntable upland birds, is expected to be minimal.

Paragraph 4.5 — North Dakota Species of Conservation Concern

As stated below in response to Paragraph 6 and described in Attachments 1 through 3, Northern Divide Wind has avoided siting permanent, above-ground wind facility infrastructure in unbroken grassland and is voluntarily offering grassland bird and waterfowl displacement offsets. It is recognized that these avoidance, minimization, and offsetting measures were implemented largely in response to Wildlife Agency concerns related to many of the Species of Conservation Concern.

In regards to Sprague's pipit, the Project is currently sited in an area dominated by tilled cropland and no permanent, above-ground wind facility infrastructure is sited in unbroken grasslands, avoiding further fragmentation that may negatively impact the species. The Project transmission line is also sited mostly in tilled cropland, but it is also co-located to existing roads where possible, located in areas fragmented by private roads and petrochemical infrastructure, or in grasslands with high tree and shrub densities, all of which are unsuitable habitat for the species (Jones 2010).

Paragraph 5 — Transmission Line

To construct a transmission line, Northern Divide Wind uses existing access, including public and private access to the maximum extent possible. Where existing access is unavailable, temporary access is used, but no permanent, maintained access is proposed. Temporary access is only as wide as needed and construction predominately takes place when the ground is dry and hard enough to support construction equipment with no improvements, but occasionally timber mats may be required.

Per our meeting on September 17, 2019, the Project transmission line is a private generation tie line and no other user is permitted. As Northern Divide Wind has committed below in response to Paragraph 6, we propose no further development in the Northern Missouri Coteau.

Paragraph 6 — Offsets

At the recommendation of the Wildlife Agencies on July 8, 2019, Northern Divide Wind committed to additional avoidance, minimization, and offsets. The Wildlife Agencies suggested locating turbines outside of high (>20 pairs per square mile) pintail duck density areas as this species is a key indicator for general waterfowl use in the region. The Wildlife Agencies advised Northern Divide Wind that the 11 eastern-most turbines from the previous 200-MW design previously submitted to the Public Service Commission (PSC) were the most critical to relocate, followed by any other turbines located in high pintail duck density areas. Of the 81 original turbine locations, Northern Divide Wind dropped two and relocated 44 (including the 11 eastern-most turbines, as recommended by the Wildlife Agencies). Thirty-five (35) of the original locations remain the same. The Project now has a total of 79 turbine locations. Additionally, the Project area has been reduced by approximately 52% and now lies in a mostly fragmented agricultural landscape. The result of these avoidance and minimization activities is that all permanent, above-ground wind facility infrastructure are in areas of pintail duck density less than 20 pairs per square mile and all are in tilled cropland, which has resulted in additional avoidance of grassland impacts (*i.e.*, there are no direct, permanent grassland and wetland impacts associated with the Project wind facility). The table in Attachment 1 highlights the decrease in environmental impacts from our avoidance and minimization actions, the figure in Attachment 2 compares the Project and original turbine locations in relation to pintail duck density, and Attachment 3 summarizes Project mitigation measures.

In addition to the design changes, NextEra Energy Resources commits to avoid further development in the Northern Missouri Coteau as defined by Bryce *et al.* 1996 should this Project be approved. This includes abandoning any additional Project phases and any development prospects of our Hartland project area located in the Northern Missouri Coteau near Hartland, ND.

Finally, while careful siting and coordination with the Wildlife Agencies has resulted in avoidance of direct, permanent grassland and wetland impacts associated with the Project wind facility, Northern Divide Wind commits to voluntarily offer indirect avian displacement offsets with respect to methods described in Shaffer *et al.* 2019 (a synthesis of Loesch *et al.* 2013 and Shaffer and Buhl 2016) and recommendations by the Wildlife Agencies. Per the avian displacement estimates in Attachment 1, proposed habitat offsets for waterfowl and grassland bird displacement are approximately 130 wetland-acres (65 2-acre basins) and 100 grassland-acres.

Offset providers are currently limited in North Dakota, but Northern Divide Wind has identified two "turn-key" providers to meet the offset objectives: Magnolia and Ducks Unlimited (DU). DU will provide 65 wetland-acre offsets and Magnolia will provide the remaining offsets. All offsets will take place on private lands within the Missouri Coteau with willing landowners under voluntary, non-perpetual 30-year term conservation agreements with financial incentives to landowners. Northern Divide Wind will allocate offset funds to the respective providers, not to the Wildlife Agencies, to implement the "on-the-ground" conservation, and the providers will coordinate with the Department on monitoring and success criteria. Northern Divide Wind will enter into a Memorandum of Understanding with the Department that outlines our offset commitment, assuming receipt of all certifications and permits.

Paragraph 7 — Documents

At this time, a PSC hearing date is speculative at best, but Northern Divide Wind will attempt to provide the Department sufficient time to analyze all relevant documents.

Northern Divide Wind thanks you for the consideration of this letter, including our avoidance, minimization, and offset measures.

Sincerely,

Mike Sole
Vice President of Environmental Services

CC:

Scott Larson, U.S. Fish and Wildlife Service

Attachments:

1. Table highlighting the decrease in environmental effects from avoidance and minimization measures for the Northern Divide Wind Energy Center.
2. Figure comparing the Project and original turbine locations in relation to pintail duck density.
3. Northern Divide Wind Mitigation Measures.

Literature Cited:

Bryce, S.A., Omernik, J.M., Pater, D.A., Ulmer, M., Schaar, J., Freeouf, J., Johnson, R., Kuck, P., and Azevedo, S.H. 1996. Ecoregions of North Dakota and South Dakota, (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).

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George, T. L., A. C. Fowler, R. L. Knight, and L. C. McEwen. 1992. Impacts of a severe drought on grassland birds in western North Dakota. Ecological Applications 2(3): 275 – 284.

Jones, S. L. 2010. Sprague's Pipit (*Anthus spragueii*) conservation plan. U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C.

Loesch, C. R., J. A. Walker, R. E. Reynolds, J. S. Gleason, N. D. Niemuth, S. E. Stephens, and M. A. Erickson. 2013. Effect of wind energy development on breeding duck densities in the Prairie Pothole Region. Journal of Wildlife Management 77:587–598.

Shaffer, J. A., C. R. Loesch, and D. A. Buhl. 2019. Estimating offsets for avian displacement effects of anthropogenic impacts. Ecological Applications 00(00):e01983. 10.1002/eap.1983.

Shaffer, J. A., and D. A. Buhl. 2016. Effects of wind-energy facilities on grassland bird distributions. Conservation Biology 30:59–71.

Shaffer, J.A. and D.A. Buhl. 2015. Effects of wind-energy facilities on breeding grassland bird distributions. Conservation Biology 30(1):59-71.

ATTACHMENT 1

TABLE HIGHLIGHTING THE DECREASE IN ENVIRONMENTAL EFFECTS FROM AVOIDANCE AND MINIMIZATION MEASURES FOR THE NORTHERN DIVIDE WIND ENERGY CENTER

Table highlighting the decrease in environmental effects from avoidance and minimization measures for the Northern Divide Wind Energy Center.

Metric	Current Project Design	Original Project Design	Decrease (%)
Project Area (ac)	11,050	22,929	52
Wetland features (NWI) in Project Area (ac)	1,067	3,016	65
Wetland features (NWI) in Project Area (count)	950	2,470	62
Wetland features (NWI) percent of Project Area (%)	10	13	23
Wetland impacts: permanent or temporary (ac)	0	0	0
Wetland features (NWI) within 0.5 mile of turbines (ac)	1,261	3,664	66
Breeding duck pair estimated displacement (count)[1]	486	981	51
Breeding duck pair estimated habitat offset (ac)[1]	130	266	51
Unbroken grassland in Project Area (ac)	743	4,785	84
Unbroken grassland percent of Project Area (%)	7	21	67
Unbroken grassland impacts: permanent (ac)	0	6	100
Unbroken grassland impacts: temporary (ac)[2]	8	112	93
Unbroken grassland within 300 m of turbines (ac)	188	751	75
Grassland bird pair estimated displacement (count)[1,3]	39-116	159-478	75
Grassland bird pair estimated habitat offset (ac)[1,4]	100	398	75

[1] With respect to methods described in Shaffer *et al.* 2019 and recommendations by the North Dakota Game and Fish Department.

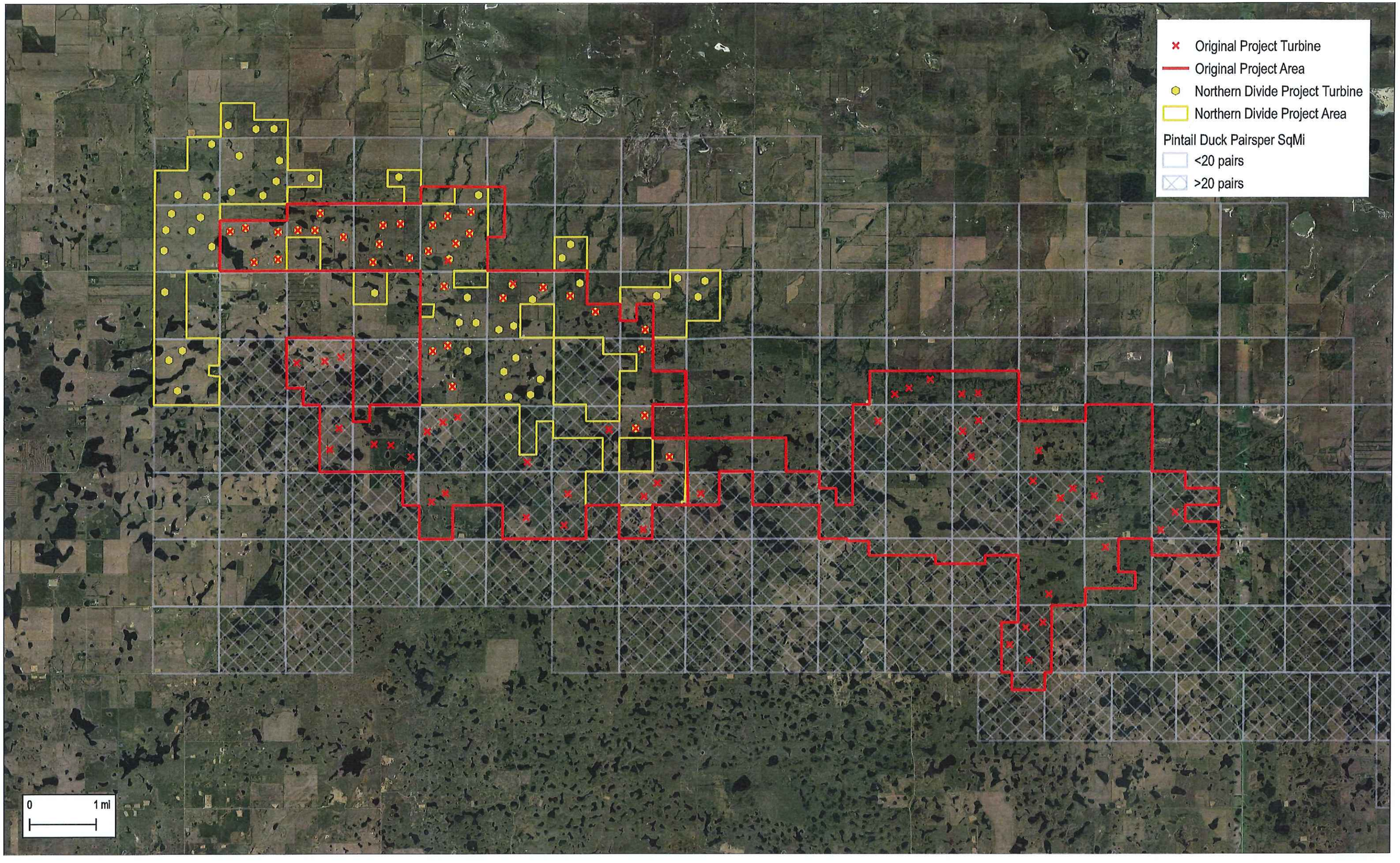
[2] Current Project impacts based off preliminary design and desktop grassland review. Project is currently being surveyed and attempts will be made to avoid or further minimize all direct impacts.

[3] Range based on 0.4 to 1.2 grassland bird pairs per acre (George et al. 1992, Shaffer and Buhl 2015) and a 53% displacement rate per Shaffer *et al.* 2019.

[4] Grassland habitat offset assumes an equivalent pre-impact and offset grassland bird density.

ATTACHMENT 2

FIGURE COMPARING THE PROJECT AND ORIGINAL TURBINE LOCATIONS IN RELATION TO PINTAIL DUCK DENSITY


Original Project Turbine
Original Project Area
Northern Divide Project Turbine
Northern Divide Project Area
Pintail Duck Pairsper SqMi
<20 pairs
>20 pairs
0
1 mi

ATTACHMENT 3

NORTHERN DIVIDE WIND MITIGATION MEASURES

Northern Divide Wind Mitigation Measures

General Environmental

1. Site turbines, access roads, and associated facilities off public recreational lands.
2. Light turbines in accordance with FAA and PSC requirements.
3. Provide contractors with static constraint maps and ensure compliance through onsite environmental construction monitoring.

Wetlands

4. Avoid all direct impacts, including temporary impacts from underground collection by boring.
5. Maintain appropriate water and soil conservation practices during construction through the implementation of best management practices (BMP). These practices include silt fencing, temporary reseeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways and sod stabilization.

Native Prairie/Unbroken Grassland

6. Avoid all direct, permanent impacts from turbines, roads, meteorological towers, and substations.
7. Coordinate with local Natural Resource Conservation Services staff to revegetate non-cropland and pasture areas temporarily disturbed during construction or operation of the wind facility with locally sourced native seed mixes appropriate to the region.
8. Coordinate with the North Dakota Department of Trust Lands on a locally sourced native seed mix for any Project impacts on their lands.
9. Reseed temporarily disturbed areas or restore to crop, based on the conditions of the area prior to construction and based on landowner preference.
10. Develop and implement a noxious weed prevention plan.

Woodlands

11. Avoid placement of turbines in previously undisturbed shrub/scrub vegetation types that may provide additional habitat for breeding birds.
12. Protect existing trees and shrubs by avoiding tree removal for turbines, access roads, and underground collector lines or if removal is necessary, replace following the PSC Tree and Shrub Mitigation Criteria.

General Wildlife

13. Conduct one (1) year of Tier 4 post-construction monitoring to better understand bird and bat impacts that are attributable to operations with reporting to be shared with both NDGFD and the USFWS.
14. Once turbine construction is completed, implement a Wildlife Response and Reporting System (WRRS). The WRRS will include reporting protocols to report and document bird and bat mortality during routine maintenance activities. If any dead or injured birds or bats are found, its location will be marked and reported to the Plant Lead/Site Supervisor. The dead or injured bird or bat will not be removed from the location it was found.
15. Prepare a voluntary Wildlife Conservation Strategy (WCS), which includes an adaptive management approach, so that information gathered during post-construction monitoring can be used to inform future management decisions at the Project.
16. Implement a 25 mph speed limit on Project roads to minimize wildlife collisions.

Avian

17. Provide voluntary offsets for indirect waterfowl and grassland bird displacement.
18. Bury collection lines from the turbines to the collection substation to avoid collision risk in accordance with the Avian Power Line Interaction Committee (APLIC) suggested practices.
19. Design utility lines according to APLIC guidelines to prevent bird collision, as practicable.

20. Implement pad-mounted transformers to reduce risk of bird electrocution.
21. Site turbines at least 0.25 mile from active raptor nests and 0.5 mile from leks.
22. Avoid construction to the extent practicable within 0.5 mile of known sharp-tailed grouse lek locations during the lekking and breeding season (April to July).
23. Avoid construction to the extent practicable with 0.25 mile of active raptor nest locations during the nesting season (March to July).
24. Construct wind turbines using tubular, monopole towers as opposed to a lattice structure, to minimize perching opportunities for raptors and other birds.
25. If any raptor nest is discovered during construction, the nest will be monitored to determine if there is a change in the nest activity status in order to avoid impacts that might have the potential to precipitate nest abandonment.

Threatened and Endangered Species (Whooping Cranes and Dakota Skipper)

26. Given the Project's location within the USFWS North American whooping crane corridor, implement NextEra Energy Resources' internal guidance document determining whooping crane curtailment triggers during migratory periods as part of the WCS. These curtailment steps include shutting down all operational turbines when a whooping crane is identified within one (1) mile of the Project Area, with the turbines remaining shut down for 15 minutes following the departure of the whooping crane or until the whooping crane is observed moving away.
27. Provide the appropriate whooping crane identification guide materials to be in all Project maintenance and operations vehicles for reference.
28. Field-verified suitable Dakota skipper habitat has been and will continue to be avoided. High visibility fencing (*e.g.*, snow fence) will be placed around field-verified suitable Dakota skipper habitat areas in close proximity to construction that are to be avoided to restrict construction equipment from disturbing these areas.
29. No construction will occur during the Dakota skipper adult flight period (between June 15 and July 18) in areas proximal to field-verified Dakota skipper dispersal or foraging habitat.
30. Provide contractors with training, spatial data and static constraints maps that identity where field-verified suitable Dakota skipper habitat is located and where construction equipment is restricted.
31. Educate construction contractors about threatened and endangered species and associated mitigative measures being implemented for each respective species.
32. Mark overhead transmission lines with bird flight diverters in keeping with the Avian Power Line Interaction Committee guidelines (APLIC 2012).

October 23, 2019

Greg Link
Chief, Conservation and Communication Division
North Dakota Game and Fish Department
100 North Bismarck Expressway
Bismarck, ND 58501-5095

Mr. Link,

On October 4, 2019, the U.S. Fish and Wildlife Service Habitat and Population Evaluation Team (HAPET) released an updated Avian Impact Offset Method Decision Support Tool (DST) to address errors identified in the previous DST (released on September 13, 2019). Upon review of the updated DST, we are revising the voluntary indirect waterfowl displacement offset offered in our response letter dated October 1, 2019. The revision increases the wetland-acre offset from approximately 130 acres (65 2-acre basins) to approximately 196 acres (98 2-acre basins). The table provided in Attachment 1 of our response letter also changes for the following metric:

Metric	Current Project Design	Original Project Design	Decrease (%)
Breeding duck pair estimated habitat offset (ac)	196	398	51

Sincerely,

Mike Sole
Vice President of Environmental Services

CC:

Scott Larson, U.S. Fish and Wildlife Service

GOVERNOR, Doug Burgum
DIRECTOR, Terry Steinwand
DEPUTY, Scott A. Peterson

"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

November 19, 2019

Michael Sole
Vice President of Environmental Services
Northern Divide Wind, LLC
700 Universe Boulevard
Juno Beach, FL 33408

SUBJECT: Northern Divide Wind Energy Center and 345 kV Transmission Line Project
Burke and Mountrail Counties, ND

Mr. Sole,

As you know, the North Dakota Game and Fish Department (Department) has been in continued discussion with NextEra Energy Resource, LLC (NextEra) since 2016, regarding wind energy development in Burke County. The original project proposed, known as Burke County Wind Energy Center (BCWEC), was sited within the Missouri Coteau, a landscape consisting of substantial amounts of intact native prairie and a tremendously high concentration of wetlands. This unique blend of native habitats makes the area extremely important to wildlife, including several of North Dakota's Species of Conservation Priority such as the Northern Pintail, Sprague's Pipit, and Sharp-tailed Grouse. Due to this area's unique nature and significance, the Department, from the onset of project consultation, expressed substantial concern regarding the BCWEC's location selection. Subsequently, the ND Public Service Commission denied BCWEC's permit application in June 2019 for these very reasons.

As a result of this denial, you and your company, initiated heightened coordination and collaboration with the Department on July 8, 2019. To develop a more responsibly sited project, Northern Divide Wind Energy Center (NDWEC) was created. During routine meetings and dialog since that time, including our meeting of September 17, 2019, we've witnessed NextEra's increased attention to our recommendations and a renewed desire, through its subsidiary Northern Divide Wind, LLC (Northern Divide Wind), to avoid, minimize, and offset measures for key native habitats. As documented in your October 1, 2019 and October 23, 2019 letters, Northern Divide Wind has taken several positive steps to reduce and defray the impact of the NDWEC project, such as shifting the project boundary; thereby, decreasing the project area by approximately 50%. As recommended, Northern Divide Wind has relocated 44 and removed 3 of the original 81 turbines. All turbines have been moved away from key Northern Pintail breeding

habitat, and most importantly, all have been relocated off and away from unbroken grassland sites. Through these efforts, the potential impacts to important wildlife resources, resulting from the new NDWEC lay-out, are considerably reduced as compared to the original BCWEC.

Although greatly improved, not all the project's potential impacts could be avoided. Similar to the originally proposed BCWEC location, the majority of the proposed NDWEC project area remains within the Northern Missouri Coteau, the same native grassland-wetland rich landscape which contains some of the highest wetland densities in North America. As presented in all our prior letters regarding the BCWEC, the unique grassland and wetland mosaic of the Missouri Coteau not only provides essential resources for many resident species, but functions as important stopover habitat to numerous migratory water birds, as well. Because of this, there is a higher degree of displacement risk associated with development in this landscape area, as compared to other areas within the state.

In our review and analysis of potential impacts to wildlife, the Department quantifies both direct habitat loss and indirect wildlife displacement associated with wind energy development. To do this, we look to the best available science, specifically research conducted in North Dakota, on avoidance and displacement of prairie avian species due to wind development: Loesch et al 2013, Shaffer et al. 2015, and follow-up Schaffer et al. 2019. In its most recently updated and published work, Schaffer et al. 2019 predicts an average rate of 18% displacement by five waterfowl species within a half mile of turbines, and an avoidance and 53% displacement rate by seven grassland bird species within 300 meters from turbines by the 5th year post-construction.

By using the parameters within these studies, the predicted indirect impacts can be estimated for both grassland birds and breeding ducks, indicator species that reflect the use of habitats for a variety of other species. As initially provided in your October 1, 2019 letter and later modified in an ensuing letter of October 23, 2019, Northern Divide Wind has taken this information, quantified predicted impacts, and committed to a voluntary offset package for restoration of the following habitat features:

- 100 native grassland-acres
- 196 wetland-acres or 98 2-acre basins.

As stated above, we acknowledge Northern Divide Wind has taken the Department's recommendations seriously, resulting in significant impact avoidance and minimization. Despite these positive efforts to alter boundary and relocate turbines for the modified NDWEC project, it was not possible to completely avoid all indirect impacts. Northern Divide Wind has, however, voluntarily committed to address these unavoidable wildlife impacts by facilitating native grassland and wetland restoration activities on private land in the Missouri Coteau. With new insight and understanding of the importance of this area to wildlife, Northern Divide Wind has also committed to avoid future wind development in the Northern Missouri Coteau.

We appreciate Northern Divide Wind's efforts to listen and address the Department's concerns. These efforts demonstrate your commitment to pursue more responsibly sited development, on

this project and in the future.

Sincerely,

Greg Link
Chief, Conservation and Communications Division

Cc: Dustin Jones, NextEra
Scott Larson, U.S. Fish and Wildlife Service

C7. North Dakota Geological Survey

North Dakota Geological Survey

Edward C. Murphy - State Geologist

Department of Mineral Resources

Lynn D. Helms - Director

North Dakota Industrial Commission

www.state.nd.us/ndgs

August 30, 2019

Lindsey Churchill, PhD
AECOM
1000 East Calgary Ave, Suite 1
Bismarck, ND 58503

Re: Northern Divide Wind Energy Center and 345 kV Transmission Line Project: Burke & Mountrail Counties, ND

The North Dakota Geological Survey appreciates the notification and opportunity to review and provide comment on the proposed wind energy development project. Your comment solicitation letter of August 22, 2019 was reviewed by our office on August 30, 2019.

Based on the extent of the proposed project areas, it appears that there are some locations in the southern portion of the transmission line corridor boundaries that contain areas mapped as landslides or features that suggest slope instability. These areas can be found depicted on our 1:24,000 scale landslide maps that have been completed for the White and Ross NW quadrangles and should be included in your project area evaluations.

Also, there appears to be several areas within the proposed Northern Divide project area boundaries that contain mineable coal resources as depicted on our detailed coal maps for this area. A review of the PSC's Abandoned Mine Land (AML) locations data also shows seven AML locations just north of White Earth, N.D. that should also be noted.

Our current Areas of Landslides maps, LiDAR elevation mapping and data products, and coal maps for the 1:24,000 and 1:100,000 scale quadrangles that encompass the proposed project area can be found on our website at:

https://www.dmr.nd.gov/ndgs/landslides/

You may also contact our offices directly, with any additional questions or comments, at (701) 328-8000.

Sincerely,

North Dakota Geological Survey:

Fred Anderson
Geologist
fjanderson@nd.gov

FJA\

C8. North Dakota State Water Commission

NORTH Dakota | Water Commission

Be Legendary.™

September 9, 2019

Lindsey Churchill
AECOM
1000 East Calgary Avenue
Bismarck, ND 58503

Dear Ms. Churchill:

This is in response to your request for a review of the environmental impacts associated with the Northern Divide Wind Energy Center and 345 kV Transmission Line Project located in Burke and Mountrail Counties, ND.

The proposed project has been reviewed by State Water Commission staff, and the following comments are provided:

- Initial review indicates the project does not require a conditional or temporary permit for water appropriation. However, if surface water or groundwater will be diverted for construction of the project, a water permit will be required per North Dakota Century Code § 61-04-02. Please consult with the Water Appropriations Division of the Office of the State Engineer if you have any questions at (701) 328-2754 or waterpermits@nd.gov.

- The State Water Commission maintains a network of observation wells across the state for monitoring the water levels and quality in glacial and bedrock aquifers. These wells are often installed in road and highway rights-of-way to limit inconvenience to the adjacent landowners. State Water Commission observation wells have a yellow protective casing extending between 1 and 3 feet above ground surface, and their locations are marked with a stake. If an observation well is encountered during project activities and must be removed, please contact the Water Appropriations Division. The State Water Commission hopes to keep all observation wells, but otherwise will ensure the well is properly abandoned.

- There are no floodplains identified and/or mapped where this proposed project is to take place. No permits relative to the NFIP are required based on the current effective FIRM and State minimum standards.

Thank you for the opportunity to provide review comments. Should you have further questions, please contact me at 701-328-4970 or stevebest@nd.gov.

Sincerely,

Steven Best
Planner III

SB:dm/1570

C9. North Dakota Department of Trust Lands

1707 North 9th Street
PO Box 5523
Bismarck, ND 58506-5523
Phone: (701) 328 – 2800
Fax: (701) 328 – 3650

https://land.nd.gov

DEPARTMENT OF
ND TRUST LANDS
INVESTING FOR EDUCATION

Jodi A. Smith, Commissioner

August 28, 2019

LINDSEY CHURCHILL
ENVIRONMENTAL PROJECT MANAGER
AECOM
1000 EAST CALGARY AVE, SUITE 1
BISMARCK ND 58503

RE: North Divide Wind Energy Center and 345 kV Transmission Line Project Burke and Mountrail Counties, ND

Dear Ms. Churchill:

We received your letter dated August 16, 2019, regarding a request for information on the proposed Northern Divide Wind Energy Center and 345 kV Transmission Line Project in Burke and Mountrail Counties.

To obtain an easement across trust Lands, an on-line application form must be completed. This application can be found at: https://www.land.nd.gov/SurfaceROW/RowApplicationForm . Any proposed towers or lines would be subject to review by the surface division staff and approval by the Land Commissioner on behalf of the Board of University and School Lands.

The following items may be considered in the review of an easement application:

1. Financial benefit to the trusts;
2. Availability of alternate encumbrance site or route;
3. The least environmentally damaging site or route regardless of property ownership;
4. Physical stability of the landscape;
5. Other potential future uses for the trust lands, including urban development;
6. Potential mineral and other material development including oil, gas, coal, cement materials, sodium sulfate, sand and gravel, road material, building stone, chemical substances, metallic ores, uranium ores, or colloidal or other clays;
7. Feasibility for reclamation;
8. Maintenance of existing wetlands and water flows;
9. Any cultural, historical, archeological, and paleontological resources;
10. Federally listed threatened and endangered species;
11. Location of the proposed route or site in relation to section lines, quarter section lines and corridors;
12. Potential liability to the trusts;
13. Applicant's past encumbrances on trust lands;
14. Applicant's financial stability; and
15. Any other information relevant to the application which would assist in the determination.

There are school trust surface interests that are managed by the North Dakota Department of Trust Lands on behalf of the Board of University and School Lands which are located within or near the proposed project area. These surface interests are as follows:

County	Township	Range	Section	Subdivision
Burke	159	93	16	NW4, SE4, SW4
Burke	160	93	16	ALL
Burke	160	93	36	ALL
Burke	161	93	16	NW4, SW4
Burke	161	93	36	NW4, SW4
Burke	161	94	16	NW4, SW4
Burke	162	94	16	NE4
Burke	162	94	36	ALL
Mountrail	157	93	16	ALL
Mountrail	157	94	16	NE4, SE4, SW4
Mountrail	158	93	29	SW4

There are no active Coal Leases on school trust lands within the project area. Attached for your information is a spreadsheet of state mineral interests within the project area.

Please be advised the Board of University and School Lands will not move forward on Wind Projects until site inspection and review have been completed and all local and state approvals have been obtained.

If you have any questions, feel free to contact our office at 701-328-2800.

Sincerely,

Michael Humann

Michael Humann
Surface Division Manager

Attachment: State Mineral Interest spreadsheet

No.	County	Oil Lease	Legal	Subdv	Mineral Interest	Net Acres	Trust	Status	Acquisition
700480	BRK	OG0500023	159-93-7-NW	E2NW4, LOTS 1,2	0.5	76.02	L	A	L
700490	BRK	OG0500024	159-93-7-SW	E2SW4, LOTS 3,4	0.5	76.22	L	A	L
700500	BRK	OG1600068	159-93-8-NE	NE4	0.5	80	L	A	L
700510	BRK	OG1600070	159-93-11-SE	SE4	0.5	80	I	A	A
700520	BRK	OG1600071	159-93-11-SW	SW4SW4, LOT 4	0.5	39.6	L	A	L
706400	BRK	OG1600069	159-93-11-NW	ACCRETION ATTRIBUTABLE TO LOT4 IN SW4	0.5	0.35	L	A	L
706410	BRK	OG1600071	159-93-11-SW	ACCRETION ATTRIBUTABLE TO LOT 4 IN NW4	0.5	0.4	L	A	L
700550	BRK	OG1600073	159-93-16-NE	NE4	1	160	A	A	G
700560	BRK	OG1600074	159-93-16-NW	NW4	1	160	A	A	G
700570	BRK	OG1600075	159-93-16-SE	SE4	1	160	A	A	G
700580	BRK	OG1600076	159-93-16-SW	SW4	1	160	A	A	G
700610	BRK	OG1600078	159-93-28-NW	S2NW4	0.5	40	L	A	L
700620	BRK	OG1600314	159-93-29-NE	E2NE4	0.5	40	L	A	L
700630	BRK	OG1600336	159-93-33-SW	SW4	0.05	8	L	A	L
706480	BRK	OG1600522	159-93-35-NE	ACCRECTIONS ATTRIBUTABLE TO LOT 2 OF SECTION 36	0.5	4.43	A	A	A
701360	BRK	OG1000580	160-93-9-SE	SE4	0.5	80	L	A	L
701370	BRK	OG1000581	160-93-10-SW	S2SW4	0.5	40	L	A	L
701380	BRK	OG1000582	160-93-11-NW	S2NW4	0.5	40	L	A	L
705440	BRK	OG1000583	160-93-11-SW	N2SW4	0.5	40	L	A	L
701400	BRK	OG1000585	160-93-15-NW	N2NW4	0.5	40	L	A	L
701410	BRK	OG1000586	160-93-16-NE	NE4	1	160	A	A	G
701420	BRK	OG1000587	160-93-16-NW	NW4	1	160	A	A	G
701430	BRK	OG1000588	160-93-16-SE	SE4	1	160	A	A	G
701440	BRK	OG1000589	160-93-16-SW	SW4	1	160	A	A	G
701460	BRK	OG1000591	160-93-35-NE	NE4	0.5	80	L	A	L
701470	BRK	OG1000592	160-93-35-NW	S2NW4	0.5	40	L	A	L
701480	BRK	OG1000593	160-93-36-NE	NE4	1	160	A	A	G
701490	BRK	OG1000594	160-93-36-NW	NW4	1	160	A	A	G
701500	BRK	OG1000595	160-93-36-SE	SE4	1	160	A	A	G

701510	BRK	OG1000596	160-93-36-SW	N2SW4, SE4SW4, LOT 1	1	154.6	A	A	G
702300	BRK	OG1500727	161-93-10-NE	NE4	0.5	80	L	A	L
702310	BRK	OG1500728	161-93-10-NW	NW4	0.5	80	L	A	L
702320	BRK	OG1500729	161-93-10-SE	SE4	0.5	80	L	A	L
702330	BRK	OG1500730	161-93-16-NE	NE4	0.5	80	A	A	G
702340	BRK	OG1500731	161-93-16-NW	NW4	1	160	A	A	G
702350	BRK	OG1500732	161-93-16-SE	SE4	0.5	80	A	A	G
702360	BRK	OG1500733	161-93-16-SW	SW4	1	160	A	A	G
702370	BRK	OG1500734	161-93-19-NE	NE4	0.5	80	L	A	L
702380	BRK	OG1500735	161-93-19-SE	SE4	0.5	80	L	A	L
702390	BRK	OG1500736	161-93-19-SW	E2SW4, LOTS 3,4	0.5	79.02	L	A	L
702400	BRK	OG1500737	161-93-28-SE	SE4	1	160	L	A	L
702410	BRK	OG0500164	161-93-36-NE	NE4	1	160	A	A	G
702420	BRK	OG0500165	161-93-36-NW	NW4	1	160	A	A	G
702430	BRK	OG0500166	161-93-36-SE	SE4	1	160	A	A	G
702440	BRK	OG0500167	161-93-36-SW	SW4	1	160	A	A	G
702450	BRK	OG1100564	161-94-5-NE	S2NE4, LOTS 1,2	0.5	80.21	L	A	L
702460	BRK	OG1100565	161-94-5-NW	S2NW4, LOTS 3,4	0.5	80.31	L	A	L
702470	BRK	OG0400027	161-94-6-NE	S2NE4, LOTS 1,2	0.05	8.03	L	A	L
702480	BRK	OG0900027	161-94-8-SW	W2SW4	0.5	40	L	A	L
702490	BRK	OG0600035	161-94-16-NE	NE4	0.5	80	A	A	G
702500	BRK	OG0600036	161-94-16-NW	NW4	1	160	A	A	G
702510	BRK	OG0600037	161-94-16-SE	SE4	0.5	80	A	A	G
702520	BRK	OG0600038	161-94-16-SW	SW4	1	160	A	A	G
702530	BRK	OG1600433	161-94-24-SE	E2SE4	0.5	40	L	A	L
705260	BRK	OG1003288	161-94-28-NE	NE4	0.5	80	L	A	L
705290	BRK	OG1003289	161-94-28-NW	N2NW4	0.5	40	L	A	L
705510	BRK	OG1003290	161-94-28-SE	N2SE4	0.5	40	L	A	L
703660	BRK	OG1800020	162-94-16-NE	NE4	1	160	A	A	G
703670	BRK	OG1800021	162-94-16-NW	NW4	0.5	80	A	A	G
703680	BRK	OG1800022	162-94-16-SE	SE4	0.5	80	A	A	G
703690	BRK	OG1800023	162-94-16-SW	SW4	0.5	80	A	A	G
703700	BRK	OG1002806	162-94-23-SW	SW4	0.5	80	Y	A	A
703710	BRK	OG1600102	162-94-27-SE	SW4SE4	0.5	20	L	A	L

703720	BRK	OG1800024	162-94-27-SW	SW4	0.5	80	L	A	L
703730	BRK	OG1600439	162-94-30-NE	NE4	0.5	80	L	A	L
703740	BRK	OG1600440	162-94-36-NE	NE4	1	160	A	A	G
703750	BRK	OG1600441	162-94-36-NW	NW4	1	160	A	A	G
703760	BRK	OG1600442	162-94-36-SE	SE4	1	160	A	A	G
703770	BRK	OG1600443	162-94-36-SW	SW4	1	160	A	A	G
3109850	MOU	OG0401347	157-93-4-SE	W2SE4	0.5	40	D	A	A
3109860	MOU	OG0401348	157-93-4-SW	S2SW4	0.5	40	L	A	L
3112840	MOU	OG0401349	157-93-4-SW	N2SW4	0.5	40	D	A	A
3109870	MOU	OG1500153	157-93-9-NW	N2NW4	0.5	40	L	A	L
3109880	MOU	OG0401351	157-93-15-NE	SW4NE4	0.5	20	L	A	L
3111810	MOU	OG0401352	157-93-15-NW	SE4NW4	0.5	20	L	A	L
3111820	MOU	OG0401353	157-93-15-SE	NW4SE4	0.5	20	L	A	L
3111830	MOU	OG0401354	157-93-15-SW	NE4SW4	0.5	20	L	A	L
3109890	MOU	OG0901025	157-93-16-NE	NE4	1	160	A	A	G
3109900	MOU	OG0901026	157-93-16-NW	NW4	1	160	A	A	G
3109910	MOU	OG0901027	157-93-16-SE	SE4	1	160	A	A	G
3109920	MOU	OG0901028	157-93-16-SW	SW4	1	160	A	A	G
3110110	MOU	OG0901617	157-94-16-NE	NE4	1	160	A	A	G
3110120	MOU	OG0901618	157-94-16-NW	NW4	0.5	80	A	A	G
3110130	MOU	OG0901619	157-94-16-SE	SE4	1	160	A	A	G
3110140	MOU	OG0901620	157-94-16-SW	SW4	1	160	A	A	G
3110150	MOU	OG4900013	157-94-30-SE	N2SE4, SW4SE4	0.5	60	L	A	L
3110160	MOU	OG4900013	157-94-30-SW	SE4SW4, LOTS 3,4	0.5	58.67	L	A	L
3111130	MOU	OG0402282	158-93-3-SW	W2SW4	0.5	40	A	A	A
3111140	MOU	OG0402283	158-93-4-SE	SE4	0.5	80	A	A	A
3111160	MOU	OG1800052	158-93-11-SE	SE4	0.5	80	L	A	L
3111170	MOU	OG1500406	158-93-16-NE	NE4	0.5	80	A	A	G
3111180	MOU	OG1500407	158-93-16-NW	NW4	0.5	80	A	A	G
3111190	MOU	OG1500408	158-93-16-SE	SE4	0.5	80	A	A	G
3111200	MOU	OG1500409	158-93-16-SW	SW4	0.5	80	A	A	G
3111210	MOU	OG0402291	158-93-20-NE	E2NE4	0.5	40	D	A	A
3111220	MOU	OG1500410	158-93-21-NW	W2NW4	0.5	40	D	A	A
3111530	MOU	OG1000903	158-93-26-SW	SW4	0.5	80	L	A	L

3111230	MOU	OG1500411	158-93-29-SW	SW4	1	160	A	A	A
3111540	MOU	OG1500412	158-93-34-NE	NE4	0.5	80	L	A	L
3111550	MOU	OG1500413	158-93-34-SE	W2SE4, SE4SE4	0.5	60	L	A	L
3111560	MOU	OG1500414	158-93-34-SW	SW4	0.5	80	L	A	L

Legend: Coal Ownership

%	Trust	Acq Code	Ownership
5 & 50	L	L	Coal ownership unknown
50	A	A	Coal ownership unknown
50	A	G	Coal ownership dependent on year sold
100	A	G	State owns all coal
50	B	A	Coal ownership unknown
100	D	A	Coal ownership unknown
50	N	A	Coal ownership unknown
50	U	A	Coal ownership unknown

C10. U.S. Department of Defense

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3500 DEFENSE PENTAGON
WASHINGTON, DC 20301-3500

SUSTAINMENT

November 21, 2019

Lindsey Churchill
Environmental Project Manager, Environment
AECOM

Dear Dr. Churchill,

As requested, the Military Aviation and Installation Assurance Siting Clearinghouse coordinated within DoD an informal review of the Northern Divide Wind Energy Center and Transmission Line Project. The results of our review indicated that the dual wind and transmission project, located in Burke County, North Dakota, as proposed, will have minimal impact on military operations conducted in the area.

Please note that this informal review by the DoD Military Aviation and Installation Assurance Siting Clearinghouse does not constitute an action under 49 United States Code Section 44718 and that the DoD is not bound by the conclusion arrived at under this informal review. To expedite our review in the Obstruction Evaluation Airport Airspace Analysis (OE/AAA) process, please add the project number 2019-09-D-DEV-10 in the comments section of the filing. If you have any questions, please contact me at steven.j.sample4.civ@mail.mil or at 703-571-0076.

Sincerely,

Steven J. Sample
Deputy Director
Military Aviation and Installation
Assurance Siting Clearinghouse

C11. State Historical Society of North Dakota

August 29, 2019

Ms. Lindsey Churchill, Ph.D.
Environmental Project Manager
AECOM
1000 East Calgary Avenue Suite 1
Bismarck, ND 58503

ND SHPO Ref: 19-0574 PSC Northern Divide Wind Energy Center and 345 kV Transmission Line Project in Burke and Mountrail Counties, North Dakota

Dear Ms. Churchill,

We reviewed your preliminary information on ND SHPO Ref: 19-0574 PSC Northern Divide Wind Energy Center and 345 kV Transmission Line Project in Burke and Mountrail Counties, North Dakota. We recommend survey for cultural resources as follows:

- A current Class I (file search) to determine any additional recorded cultural resources in the project area.

- A Class II (reconnaissance) and Class III (pedestrian) 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 two-mile radius of individual turbine locations. The purpose is to evaluate any architectural or structural features that may be eligible for nomination to the National Register of Historic Places. At least three out of the seven aspects of integrity used to evaluate historic properties could be impacted by the proposed project: the setting, feeling, and association of historic sites.

- A Class III archaeological survey of all areas of direct impact including crane paths, met towers, access roads, turbine locations and staging areas, unless the footprint has been recently surveyed for cultural resources.

Thank you for the opportunity to review this project to date. We look forward to review of the Class II/Class III surveys. Please include the ND SHPO reference number listed above in any further correspondence for this specific project. If you have any questions, please contact Lorna Meidinger at (701) 328-2089 or lbmeidinger@nd.gov.

Sincerely,

Claudia J. Berg
Director, State Historical Society of North Dakota

C12. U.S. Army Corps of Engineers

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
NORTH DAKOTA REGULATORY OFFICE
3319 UNIVERSITY DRIVE
BISMARCK, NORTH DAKOTA 58504-7565

August 26, 2019

NWO-2016-02466-BIS

AECOM
Attn: Ms. Lindsey Churchill
1000 East Calgary Avenue, Suite 1
Bismarck, North Dakota 58503

Dear Ms. Churchill:

This is in response to your letter dated August 16, 2019, requesting comments on the proposed Northern Divide LLC; Northern Divide Wind Energy Center and 345 kV Transmission Line project. The project is located throughout Burke and Mountrail 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.

Based on the information contained in your letter, the Corps has determined that your proposed project may need a Clean Water Act Section 404 permit. The permit application and instructions for completing the application may be found at: http://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Obtain-a-Permit. Be sure to accurately describe all proposed work and construction methodology. Once the application is complete, mail it to the letterhead address or to the email address below.

The North Dakota Regulatory office can accept (and prefers) electronic submissions to the following email: CENWO-OD-RND@usace.army.mil.

Printed on Recycled Paper

Please refer to identification number NWO-2016-02466-BIS in any correspondence concerning this project. If you have any questions, please contact Jeremy Nygard at U.S. Army Corps of Engineers, North Dakota Regulatory Office, 3319 University Drive, Bismarck, North Dakota 58504-7565, by email at *Jeremy.S.Nygard@usace.army.mil*, or telephone at (701) 255-0015 X 2006. For more information regarding our program, please visit our website at *http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/NorthDakota.aspx*.

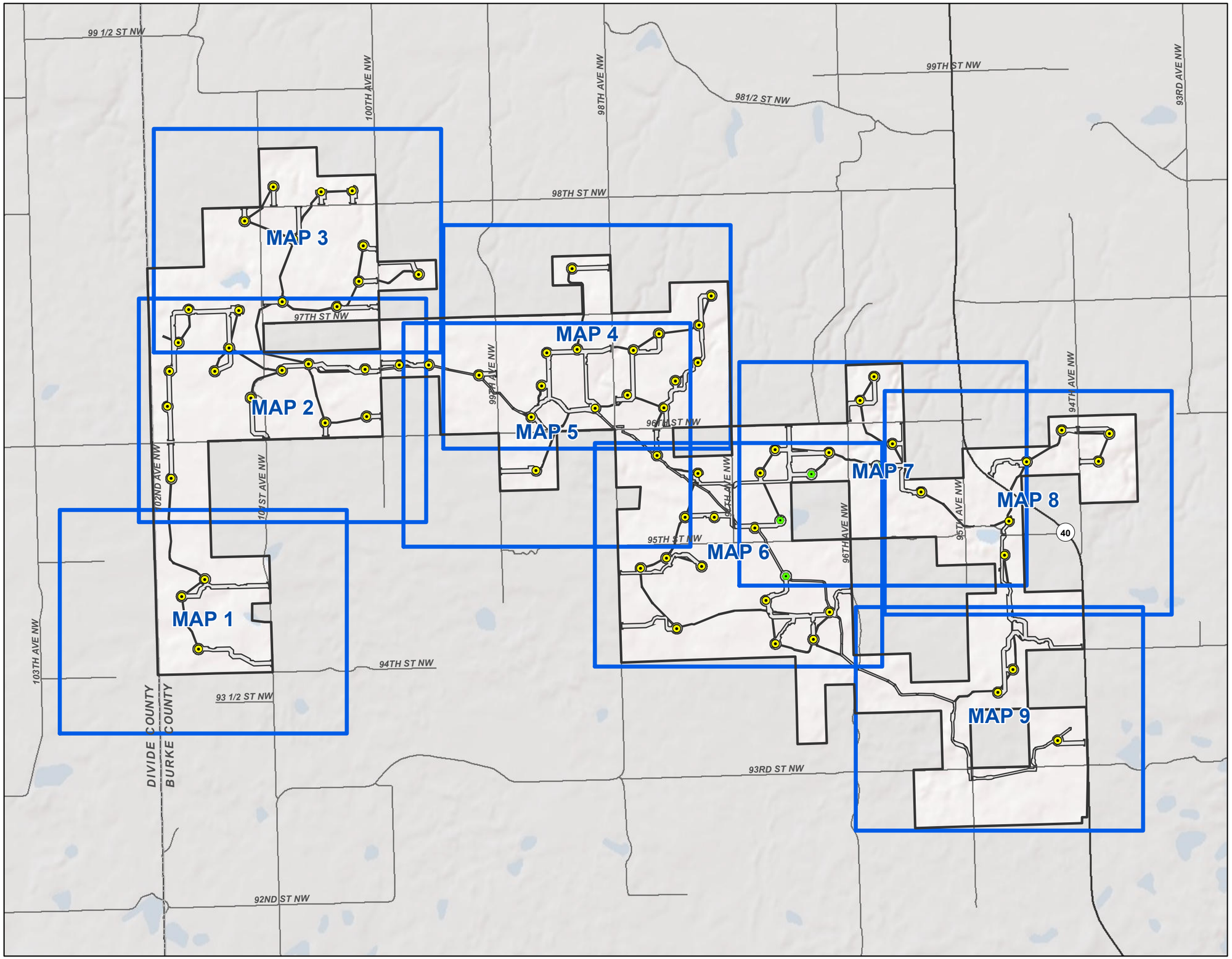
Sincerely,

MCQUEARY.PATRICIA.L.1369971936 Digitally signed by MCQUEARY.PATRICIA.L.1369971936 Date: 2019.08.23 15:55:52 -05'00'

Patricia L. McQueary
State Program Manager
North Dakota

Appendix D

Project Mapbook





Legend

- County Road
- State/Federal Highway
- County Boundary

Site Plan

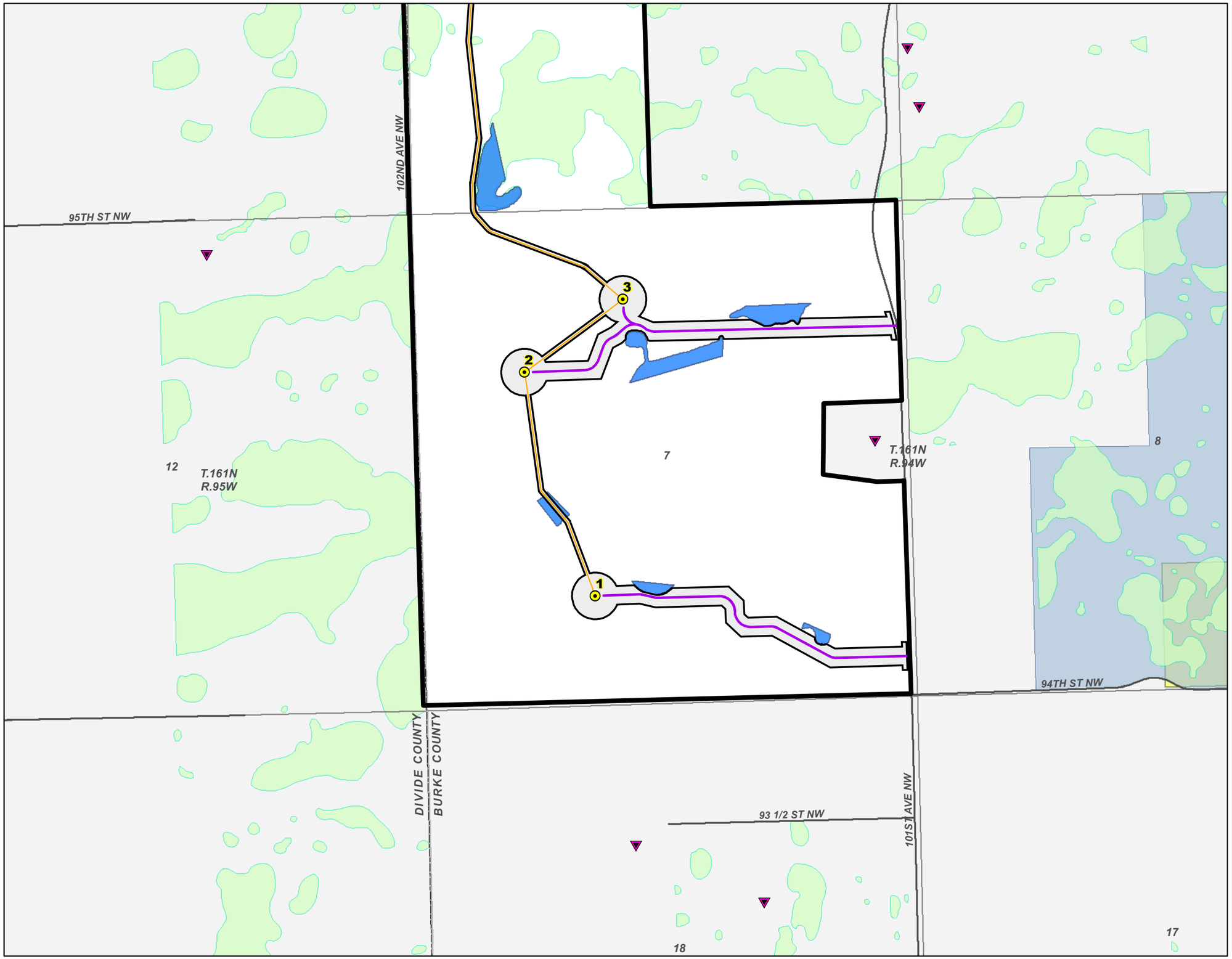
- Primary Turbine
- Alternative Turbine
- Construction Easement
- Northern Divide Wind Energy Center Project Area

Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.

0 0.5 1 Miles

Appendix D
Site Plan Detail
Index Map
Northern Divide Wind Energy Center
Burke County, ND

AECOM





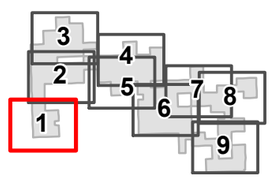
Legend

- County Road
- County Boundary
- Township/Range Boundary
- Section Boundary
- Receptor
- Delineated Wetland
- USFWS Wetland Easement
- USFWS Grassland Easement
- Private Land Open to Sportsmen Agreement

Site Plan

- Primary Turbine
- Access Road
- Collection Line
- Construction Easement
- Northern Divide Wind Energy Center Project Area

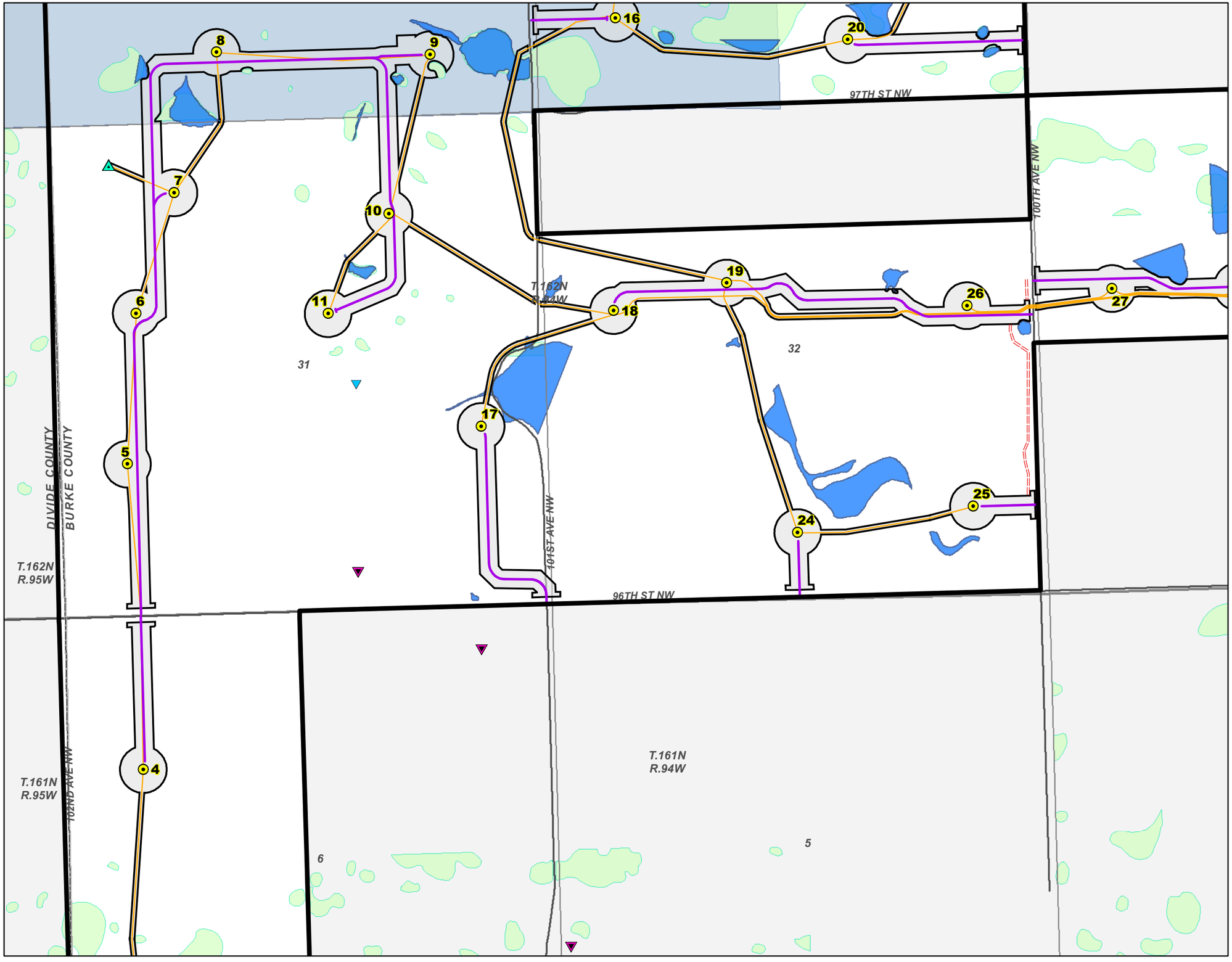
Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.



0 1,000 2,000 Feet

Appendix D
Site Plan Detail
Map 1 of 9
Northern Divide Wind Energy Center
Burke County, ND

AECOM





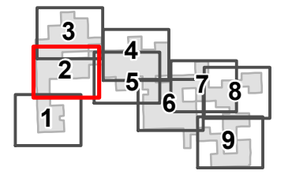
Legend

- County Road
- County Boundary
- Township/Range Boundary
- Section Boundary
- Receptor
- Delineated Wetland
- USFWS Wetland Easement
- Private Land Open to Sportsmen Agreement

Site Plan

- Primary Turbine
- Permanent MET Tower
- Temporary MET Tower
- Construction Easement
- Northern Divide Wind Energy Center Project Area
- Access Road
- Collection Line
- Crane Path

Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.

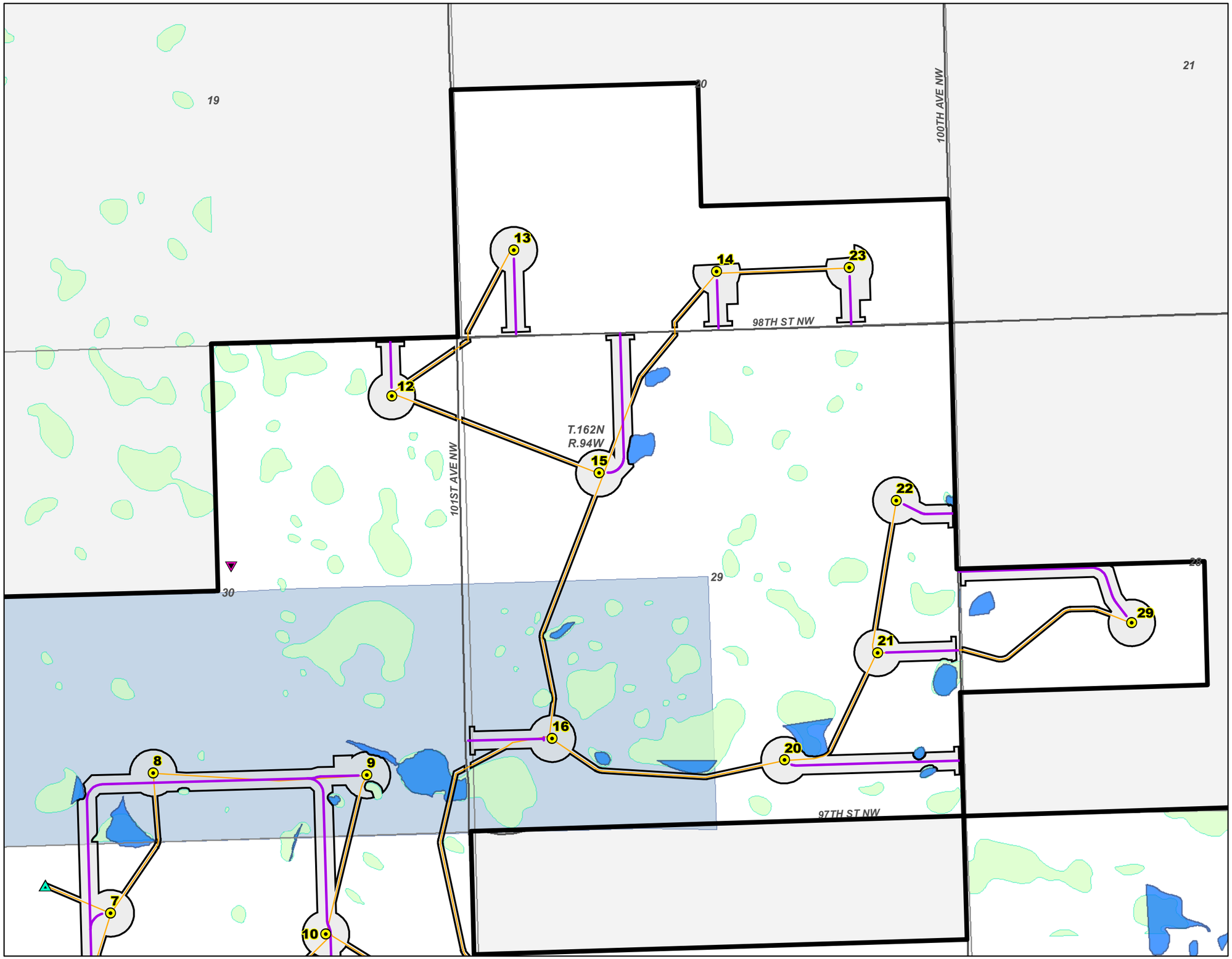


0 1,000 2,000 Feet

Appendix D
Site Plan Detail
Map 2 of 9
Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM





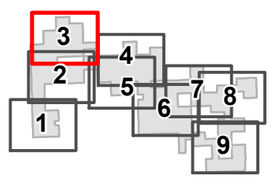
Legend

- County Road
- County Boundary
- Township/Range Boundary
- Section Boundary
- Receptor
- Delineated Wetland
- USFWS Wetland Easement
- Private Land Open to Sportsmen Agreement

Site Plan

- Primary Turbine
- Permanent MET Tower
- Access Road
- Collection Line
- Construction Easement
- Northern Divide Wind Energy Center Project Area

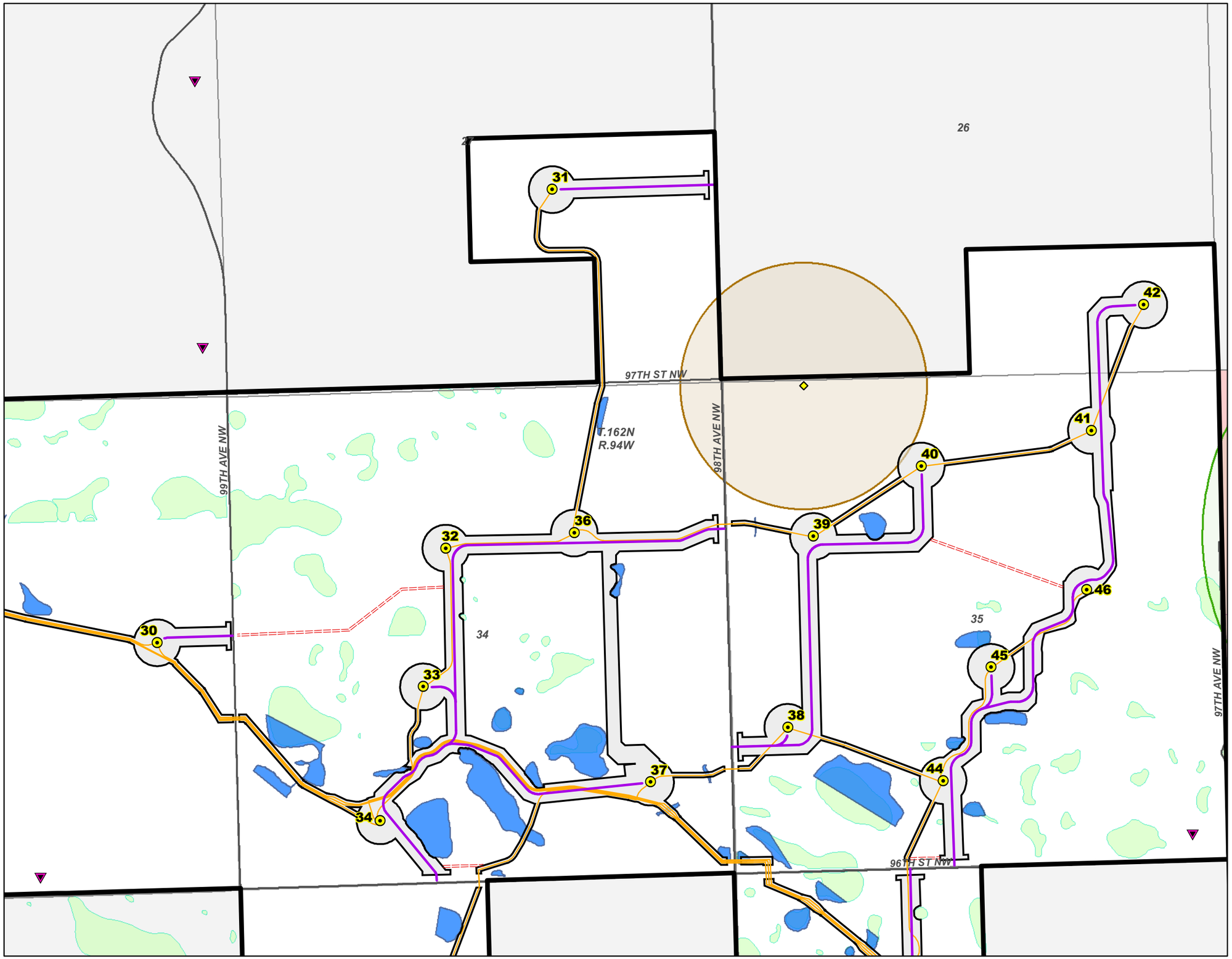
Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.



0 1,000 2,000 Feet

Appendix D
Site Plan Detail
Map 3 of 9
Northern Divide Wind Energy Center
Burke County, ND

AECOM





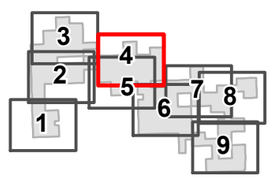
Legend

- County Road
- County Boundary
- Township/Range Boundary
- Section Boundary
- Receptor
- Raptor Nest
- Raptor Nest 1/4 Mile Buffer
- Sharp-tailed Grouse Lek 1/2 Mile Buffer
- Delineated Wetland
- USFWS Wetland Easement
- State Trust Land

Site Plan

- Primary Turbine
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Northern Divide Wind Energy Center Project Area

Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.



0 1,000 2,000 Feet

Appendix D
Site Plan Detail
Map 4 of 9
Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM



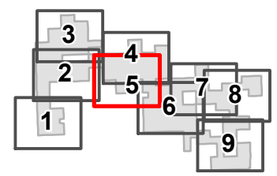
Legend

- County Road
- County Boundary
- Township/Range Boundary
- Section Boundary
- Receptor
- Raptor Nest 1/4 Mile Buffer
- Delineated Wetland
- USFWS Wetland Easement

Site Plan

- Primary Turbine
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Northern Divide Wind Energy Center Project Area

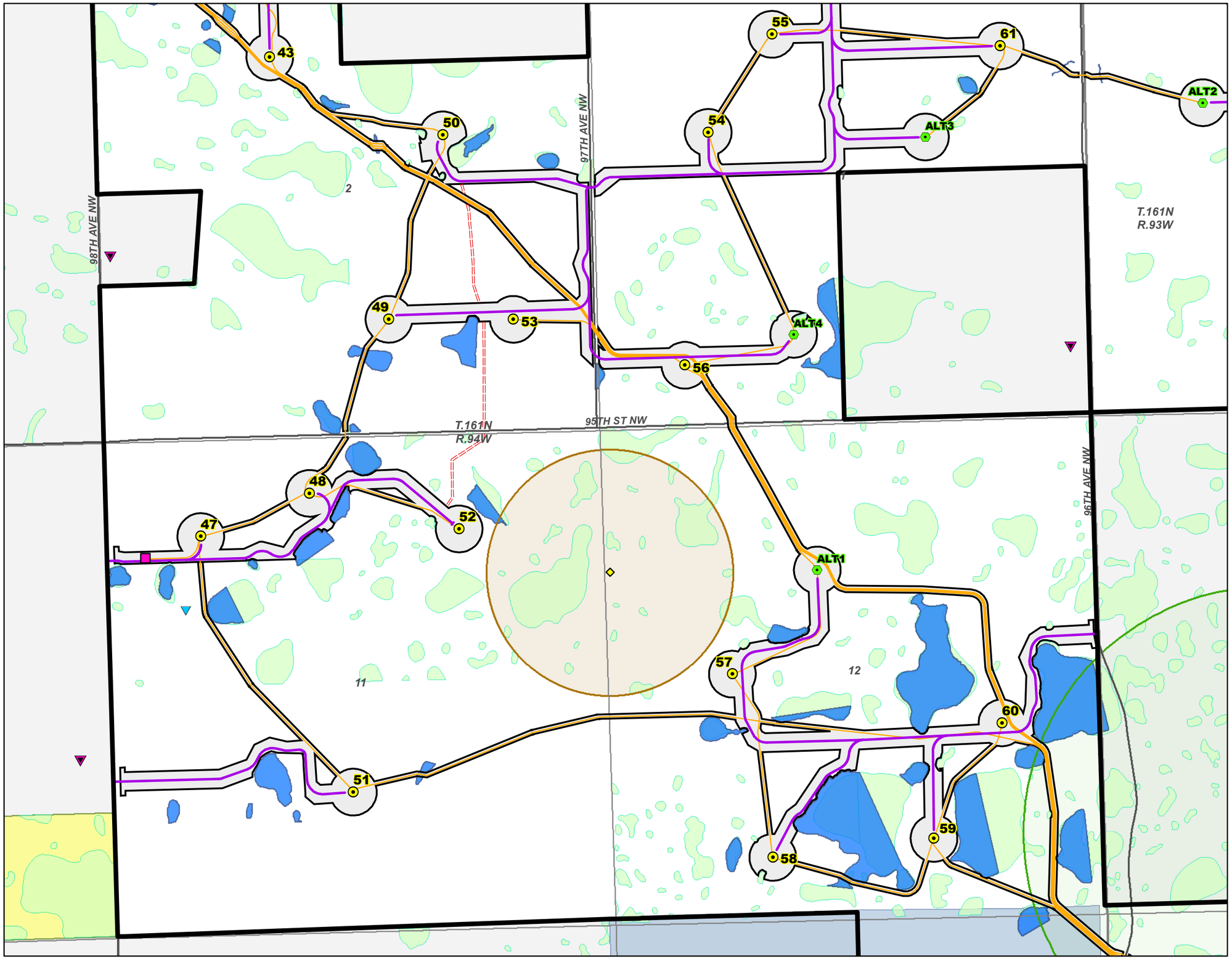
Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.



0 1,000 2,000 Feet

Appendix D
Site Plan Detail
Map 5 of 9
Northern Divide Wind Energy Center
Burke County, ND

AECOM





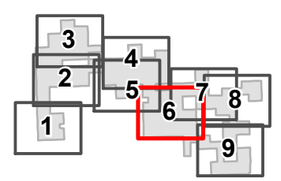
Legend

- County Road
- County Boundary
- Township/Range Boundary
- Section Boundary
- Receptor
- Raptor Nest
- Raptor Nest 1/4 Mile Buffer
- Sharp-tailed Grouse Lek 1/2 Mile Buffer
- Delineated Wetland
- USFWS Wetland Easement
- USFWS Grassland Easement
- Private Land Open to Sportsmen Agreement

Site Plan

- Primary Turbine
- Alternative Turbine
- Temporary MET Tower
- ALDS Radar Tower
- Access Road
- Collection Line
- Crane Path
- Construction Easement
- Northern Divide Wind Energy Center Project Area

Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.

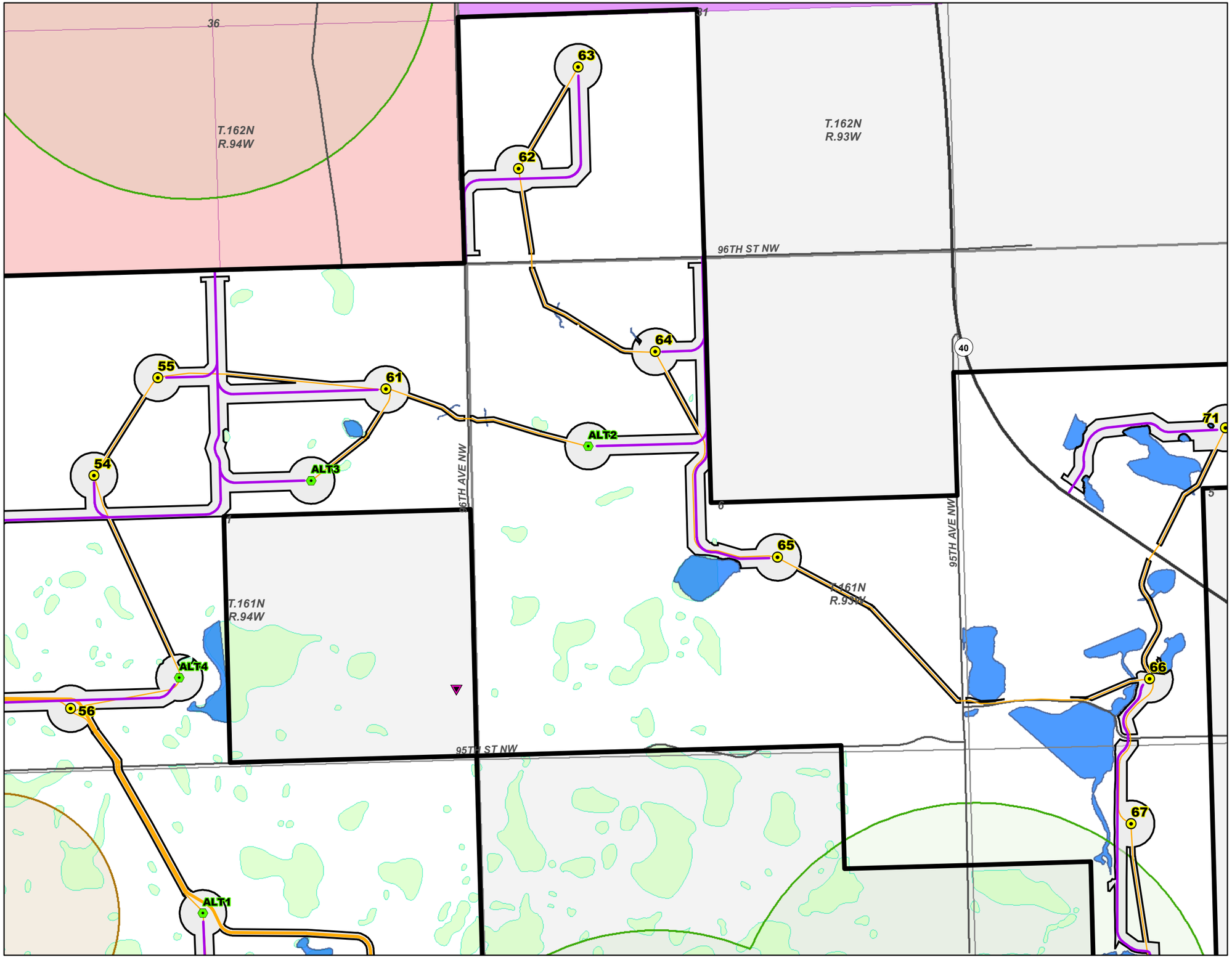


0 1,000 2,000 Feet

Appendix D
Site Plan Detail
Map 6 of 9
Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM





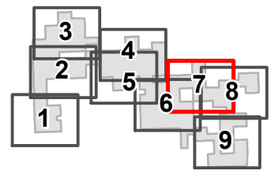
Legend

- County Road
- State/Federal Highway
- County Boundary
- Township/Range Boundary
- Section Boundary
- Receptor
- Raptor Nest 1/4 Mile Buffer
- Sharp-tailed Grouse Lek 1/2 Mile Buffer
- Delineated Wetland
- USFWS Wetland Easement
- State Trust Land
- Columbus Park District - WildWood Park

Site Plan

- Primary Turbine
- Alternative Turbine
- Access Road
- Collection Line
- Construction Easement
- Northern Divide Wind Energy Center Project Area

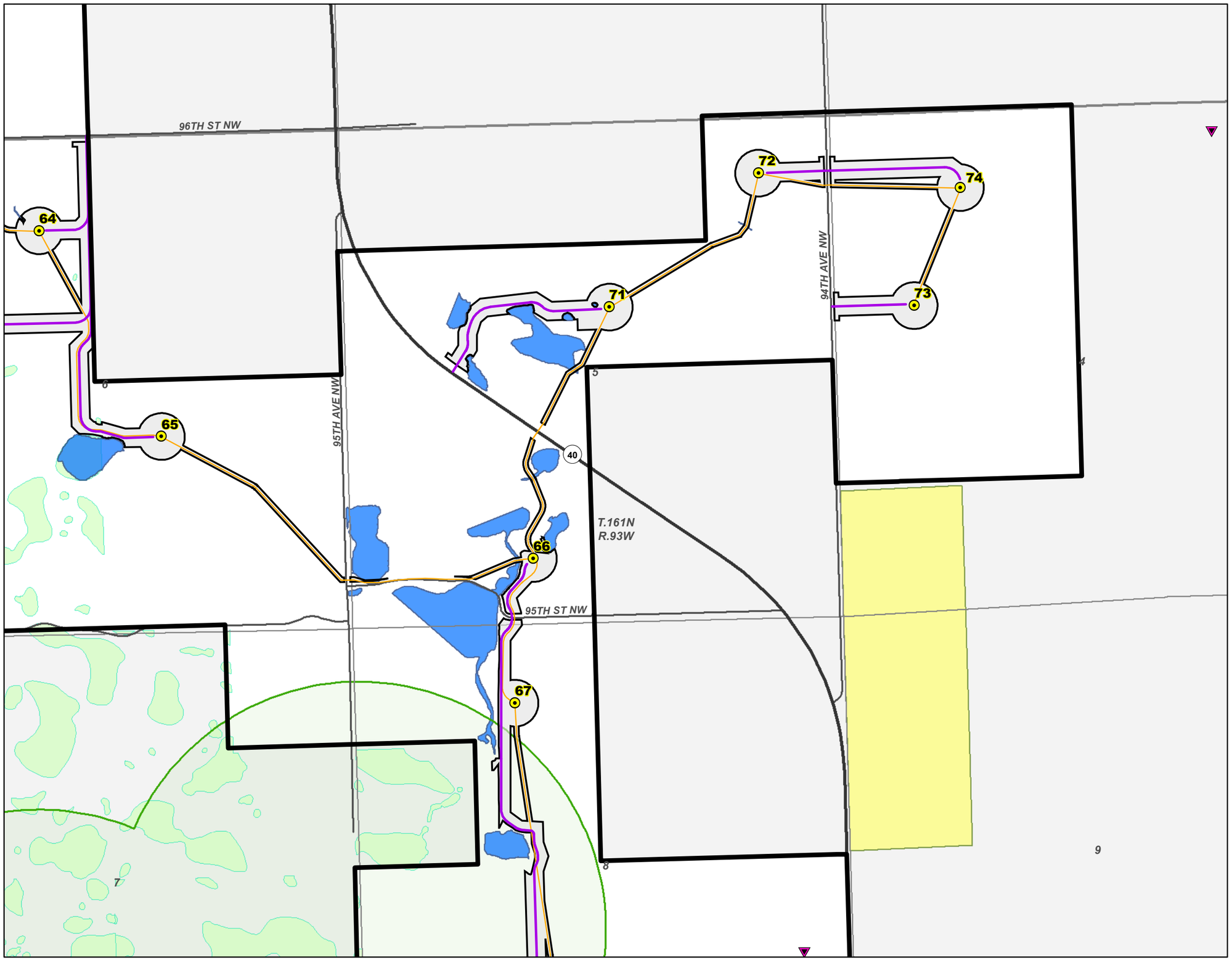
Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.



0 1,000 2,000 Feet

Appendix D
Site Plan Detail
Map 7 of 9
Northern Divide Wind Energy Center
Burke County, ND

AECOM





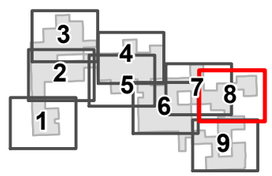
Legend

- County Road
- State/Federal Highway
- County Boundary
- Township/Range Boundary
- Section Boundary
- Receptor
- Sharp-tailed Grouse Lek 1/2 Mile Buffer
- Delineated Wetland
- USFWS Wetland Easement
- USFWS Grassland Easement

Site Plan

- Primary Turbine
- Access Road
- Collection Line
- Construction Easement
- Northern Divide Wind Energy Center Project Area

Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.

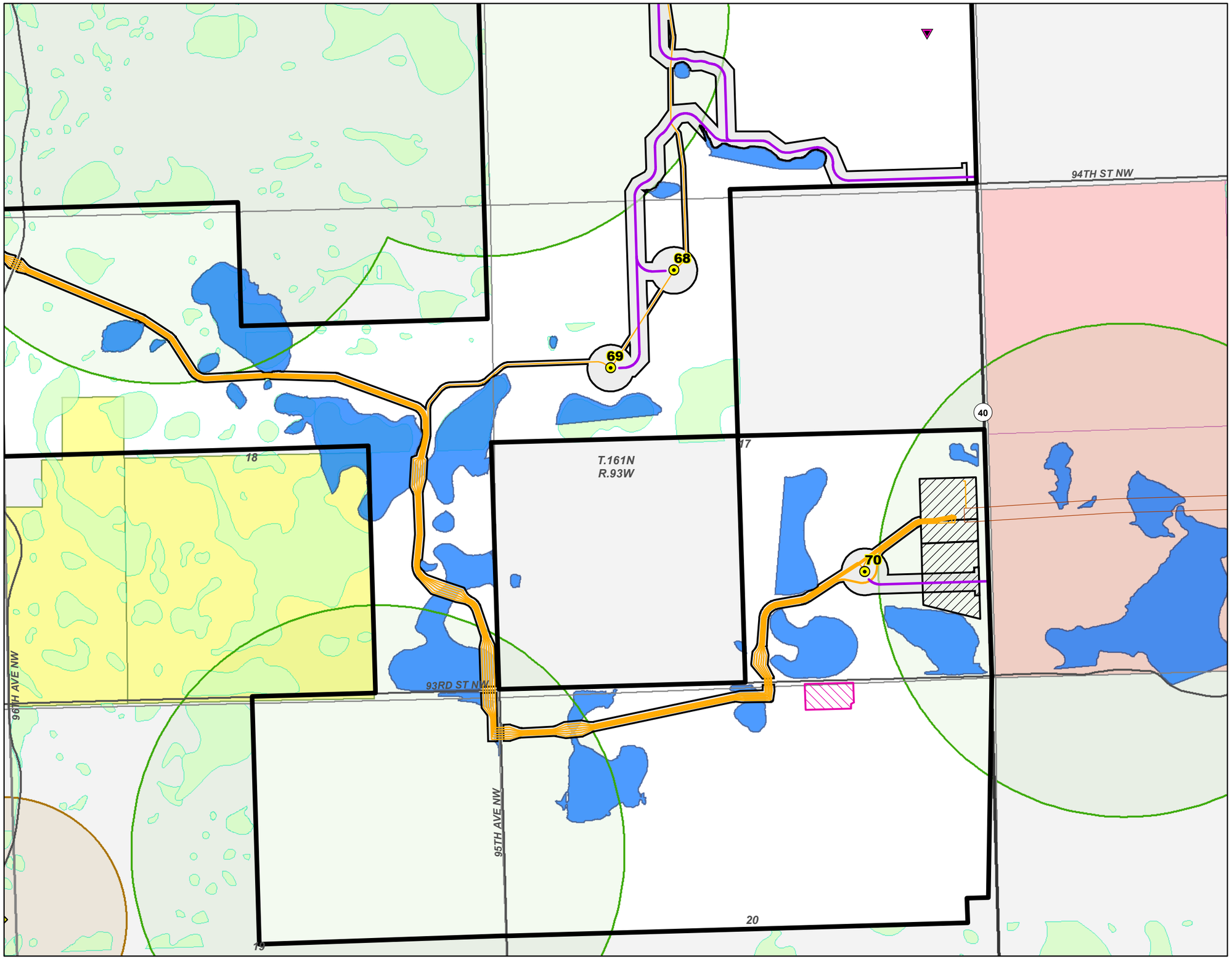


0 1,000 2,000 Feet

Appendix D

Site Plan Detail
Map 8 of 9
Northern Divide Wind Energy Center
Burke County, ND

AECOM





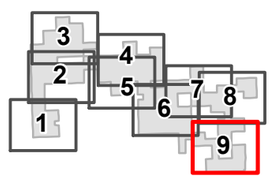
Legend

- County Road
- State/Federal Highway
- County Boundary
- Township/Range Boundary
- Section Boundary
- Receptor
- Raptor Nest
- Raptor Nest 1/4 Mile Buffer
- Sharp-tailed Grouse Lek 1/2 Mile Buffer
- Delineated Wetland
- USFWS Wetland Easement
- USFWS Grassland Easement
- State Trust Land

Site Plan

- Primary Turbine
- Access Road
- Collection Line
- Batch Plant
- Laydown Yard, O&M Building & Substation
- Construction Easement
- Northern Divide Wind Energy Center Project Area
- Northern Divide 345-kV Transmission Line Right-of-Way

Contractor will bore all wetlands and roads. Known archaeological sites are not depicted due to confidentiality.



0 1,000 2,000 Feet

Appendix D

Site Plan Detail
Map 9 of 9
Northern Divide Wind Energy Center
Burke County, ND

N W E S

AECOM