

March 6, 2023

VIA E-MAIL AND FEDERAL EXPRESS

Mr. Steven Kahl
Executive Secretary
North Dakota Public Service Commission
600 E. Boulevard, Dept. 408
Bismarck, ND 58505-0480

**Re: Otter Tail Power Company
Langdon Wind Energy Center Upgrade Project
Siting Application – Cavalier County
Case No. PU-23-_____**

Dear Mr. Kahl:

Otter Tail Power Company (“Otter Tail”) plans to upgrade the Langdon Wind Energy Center (“Upgrade Project”) located in Cavalier County, North Dakota. In support of the Upgrade Project, enclosed for filing in the above-referenced case are an original and six (6) copies of the following documents:

1. Certification of Bradley E. Tollerson with accompanying:
 - a. Exhibit A – Environmental and Regulatory Compliance Memorandum, with associated Figures and the following appendices:
 - i. Appendix A – Acoustic Assessment Results and Sound Waivers;
 - ii. Appendix B – Shadow Flicker Assessment Results;
 - iii. Appendix C – Determinations of No Hazard;
 - iv. Appendix D – Microwave Beam Path Analysis;
 - v. Appendix E – Cultural Resource Report (PUBLIC VERSION);
 - vi. Appendix F – Unanticipated Discoveries Plan;
 - vii. Appendix G – IPaC Resource List; and
 - viii. Appendix H – Agency Correspondence.

A check in the amount of \$25,000.00 for the administrative fee required pursuant to NDCC § 49-22-22 is also enclosed.

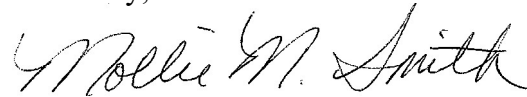
An unredacted, non-public version of the *Class I Literature Review: Langdon Re-Power Wind Farm Project* (the above-referenced Appendix E) and associated GIS data will be provided under separate cover with an Application for Protection of Information.

Mr. Steven Kahl
March 6, 2023
Page 2

Fredrikson

Electronic copies of the enclosed documents and this letter were filed with the Commission today via e-mail. If you have any questions, please let me know.

Sincerely,

A handwritten signature in cursive script that reads "Mollie M. Smith".

MOLLIE M. SMITH

MMS/78514816
Enclosures

cc: Lisa McFarland (w/ enclosures, via e-mail)
Bryce Haugen (w/ enclosures, via e-mail)

layout, which will remain as depicted in the as-built maps Otter Tail is filing with the Commission concurrently with this Certification.¹

5. Due to the increased blade length, the overall turbine height will increase from 118.5 meters (388.8 feet) to 128.5 meters (421.6 feet).

6. Otter Tail plans to use the existing turbine foundations (with reinforcement, if needed), collection and communications systems, permanent access roads, and Facility substation. Other associated facilities will remain unchanged.

7. During installation of the upgraded equipment, existing access roads will be temporarily widened to accommodate delivery and staging of components and equipment. Temporary crane paths may also be needed to facilitate equipment removal and installation. A temporary laydown yard will also be used during installation. All activities are expected to occur within areas previously disturbed by initial construction.

8. The Upgrade Project activities are wholly within the site designated by the Commission for the Facility in its May 31, 2007 Findings of Fact, Conclusions of Law and Order (Case No. PU-07-26) (May 2007 Order), and are to improve the same type of facility for which a Certificate of Site Compatibility was issued. *See* N.D.C.C. §§ 49-22-03(3)(a)(1), (3) and (4)(b).

9. Otter Tail has conducted an environmental and regulatory compliance analysis for the Upgrade Project, and an associated report prepared by its environmental consultant, Atwell, LLC (Atwell), is provided as **Exhibit A**. As set forth in **Exhibit A**:

a. **Cultural Resources.** Otter Tail coordinated with the State Historical Society of North Dakota (SHSND) regarding the Upgrade Project. The Upgrade Project

¹ In preparing this Certification, it was determined that as-builts covering the entirety of the Facility had not previously been filed with the Commission. Therefore, a set of Facility as-builts is being filed in this docket, as well as in Case No. PU-08-159.

activities will occur primarily within areas previously surveyed for cultural resources, and all activities will occur within areas previously disturbed by initial construction. As a result, the SHSND has determined that additional cultural resource surveys are not necessary, except to the extent crane paths are located in previously unsurveyed areas. If any crane paths are located outside of areas previously surveyed for cultural resources, Otter Tail will complete cultural resource field surveys and will avoid any resources identified that are eligible or unevaluated for listing on the National Register of Historic Places (NRHP). Therefore, no cultural resources will be affected by the Upgrade Project.

b. **Architectural Resources.** Although not recommended at the time the Facility was originally permitted and constructed, the SHSND's current practice is to recommend completion of an architectural history survey within the vicinity of wind energy generation facilities to identify architectural resources potentially eligible for NRHP-listing and to evaluate potential impact to those resources. As a result, Otter Tail is in the process of completing an architectural history survey. Since the Upgrade Project involves technology upgrades to existing turbines, it is not anticipated that the limited modifications will adversely affect architectural history resources. However, in the event of an adverse impact, Otter Tail will coordinate with SHSND to identify appropriate mitigation.

c. **Wetlands.** Wetlands and waterbodies have been identified within the Upgrade Project area. No permanent wetland impacts will occur as a result of upgrade activities.

d. **Sound.** At Atwell's direction, Epsilon Associates, Inc. (Epsilon) completed a sound analysis for the Facility with the proposed upgraded technology. At

the time the Facility was permitted, the Commission did not have a sound standard for wind energy facilities. Finding of Fact No. 31 in the Commission's May 2007 Order states that "average noise levels at such [occupied] residences will not exceed the generally accepted 50 dB standard." The Commission's current sound level requirement is 45 dBA or less within 100 feet of occupied residences and community buildings. With the upgraded equipment, sound levels were modeled at between 46 and 49 dBA within 100 feet of six occupied residences, while sound levels were at or below 45 dBA within 100 feet of the remaining residences (no community buildings are present). With respect to the six residences with modeled sound levels above the Commission's current sound standard, Otter Tail will either obtain a waiver from the owner(s) of each residence or install noise-reduction technology to comply with the Commission's current sound requirement.

e. **Shadow Flicker.** Epsilon completed a shadow flicker assessment for the Facility with the proposed upgraded technology. The Commission does not have a shadow flicker standard, and shadow flicker was not addressed in the Commission's May 2007 Order. The shadow flicker assessment demonstrates that shadow flicker levels are not anticipated to exceed 30 hours per year at any occupied residence.

f. **Exclusion and Avoidance Areas.** Otter Tail has analyzed the Upgrade Project's compliance with the Commission's current exclusion area and avoidance area criteria. The Facility will comply with all current exclusion area and avoidance area criteria, and construction activities associated with the Upgrade Project will not affect any known exclusion or avoidance areas within the designated site. *See* N.D.C.C. §§ 49-22-03(3)(a)(2) and (4)(a).

10. The Facility will continue to comply with all requirements set forth in the Commission's Orders regarding the Facility, including applicable laws and rules designating the site. See N.D.C.C. §§ 49-22-03(3)(a)(1) and (4)(c).

FURTHER AFFIANT SAYETH NOT.


Bradley E. Tollerson

Subscribed and sworn to before me
this 3rd day of March 2023.


Notary Public



78395466 v4

Exhibit A

Environmental and Regulatory Compliance Memorandum Langdon Wind Energy Center Upgrade Project Case No. PU-23-_____

Introduction

Otter Tail Power Company (Otter Tail) has retained Atwell, LLC (Atwell) to prepare this memorandum to support Otter Tail's certification of compliance with N.D.C.C. § 49-22-03(a) in connection with equipment upgrading activities for its 40.5-megawatt (MW) Langdon Wind Energy Center (Upgrade Project or Project). Otter Tail, with assistance from Atwell, analyzed the Upgrade Project with respect to environmental, cultural, and natural resources, as well as sound and shadow flicker. The following sections and referenced figures and appendices summarize the results of the analysis.

Description of the Upgrade Project

The Upgrade Project involves replacing the current General Electric (GE) 1.5 MW turbine technology with updated technology. More specifically, the Project will consist of removing and replacing the existing GE 77-meter (252.6 feet) rotor diameter (RD) blades, hub, and gearbox with a new equipment upgrade package of GE 97-meter (318.2 feet) RD blades, hub, and gearbox. In addition, the generator technology will be upgraded to accommodate the new equipment. All 27 existing 80 meter (262.5 feet) structural steel towers will be used as well as existing nacelles and, as a result, turbine locations will not change. Otter Tail plans to use the existing turbine foundations (with reinforcement, if needed), collection/communications systems, and permanent access roads. Other associated facilities will remain unchanged.

Once removed, the existing 77-meter RD blades will be cut on-site to fit into legal load transportation-size pieces. Loads will be secured and/or covered or other steps will be taken to ensure materials do not escape during transport. Otter Tail's contractor will transport the loads to an out-of-state facility that will grind the blade materials for repurposing, and no blades will be deposited in a landfill.

During installation of the equipment upgrade technology, existing access roads will be temporarily widened to accommodate delivery of components and equipment. Temporary crane paths may also be needed to facilitate equipment removal and installation. A temporary laydown yard located adjacent to the existing substation, south of the Project, will also be used during installation. Otter Tail currently plans to upgrade roads in the summer of 2023 and install the equipment upgrade technology in the summer of 2024.

Figure 1 depicts the Project Area and layout. Figure 2 depicts the proposed turbine technology.

Compliance with Exclusion and Avoidance Areas

Exclusion Areas

Per N.D.A.C. §§ 69-06-08-01(1) and (2), the geographical areas listed in Table 1 shall be excluded in the consideration of a site for an energy conversion facility. Based on the Commission’s approach in prior equipment upgrade dockets, Otter Tail confirmed the Project’s compliance with the Commission’s current exclusion area criteria. With the exception of three turbines that are within the non-participating property line exclusion area, the Project complies with all exclusion areas. Otter Tail identified the owners of the properties at issue and is pursuing waivers. Otter Tail requests that the Commission grant a variance conditioned upon submission of the waivers. If any landowner is not willing to grant a waiver, Otter Tail will not upgrade equipment at the affected turbine. Exclusion areas are mapped for the Project Area on Figure 3.

Table 1: Summary of Exclusion Areas		
General Exclusion Area	Present Within Upgrade Project Area?	Description
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.	None	United States Fish and Wildlife Service (USFWS) administered Waterfowl Production Areas (WPA) are located in the vicinity of the Project Area. A minimum 0.25-mile buffer was and continues to be maintained from each WPA.
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.	None	N/A
County parks and recreational areas; municipal parks; parks owned or administered by other governmental subdivisions; hardwood draws; and enrolled woodlands.	None	N/A
Areas critical to the life stages of threatened or endangered animal or plant species.	None	N/A
Areas where animal or plant species that are unique or rare to this state would be irreversibly damaged.	None	N/A

Table 1: Summary of Exclusion Areas

General Exclusion Area	Present Within Upgrade Project Area?	Description
Areas within 1,200 feet of the geographic center of an intercontinental ballistic missile (ICBM) launch or launch control facility.	None	N/A
Areas within thirty feet [9.14 meters] on either side of a direct line between an intercontinental ballistic missile (ICBM) launch facility and a missile alert or launch control facilities to avoid microwave interference. This restriction only applies to aboveground structures, not to surface features, such as roads, or belowground infrastructure.	None	N/A
Additional Exclusion Areas for Wind Energy Conversion Facilities – Areas within:		
1.1x the turbine height from the nearest edge of an interstate or state roadway right-of-way (ROW).	Present	No turbines will be located within these exclusion areas.
1.1x the turbine height plus 75 feet from the centerline of any county or maintained township roadway.	Present	No turbines will be located within these exclusion areas.
1.1x the turbine height from the nearest edge of railroad ROW.	Present	No turbines will be located within these exclusion areas. Note that only abandoned railroad ROW is present in Project Area.
1.1x the turbine height from the neared edge of a 115 kV or higher transmission line ROW.	None	N/A

Table 1: Summary of Exclusion Areas		
General Exclusion Area	Present Within Upgrade Project Area?	Description
1.1x the turbine height from the property line of a non-participating landowner and 3x the height of the turbine from an inhabited rural residence of a non-participating landowner, unless a variance is granted. A variance may be granted if an authorized representative or agent of the permittee, the nonparticipating landowner, 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 nonparticipating landowner is a landowner that has not signed a wind option or an easement agreement with the permittee of the wind energy conversion facility as defined in NDCC Chapter 17-04.	Present	Three turbines would be located within the non-participating property line exclusion area with the equipment upgrade technology. Otter Tail is in the process of obtaining waivers from the landowners to support issuance of variances. No turbines will be located within 3x the height of the upgraded turbines from a non-participating inhabited residence.

Avoidance Areas

Per N.D.A.C. §§ 69-06-08-01(3) and (4), the geographical areas listed in Table 2 may not be approved as a site for an energy conversion facility unless the applicant shows that under the circumstances there is no reasonable alternative or (in the case of the sound limit) a waiver has been obtained. Based on the Commission's approach in prior equipment upgrade dockets, Otter Tail confirmed the Project's compliance with the Commission's current avoidance area criteria.

Table 2: Summary of Avoidance Areas		
Avoidance Area	Present Within Project Area?	Description
Historical resources which are not designated as exclusion areas.	Present	No impacts to historical resources are anticipated. An Unanticipated Discoveries Plan has been prepared for the Project. A copy of that plan is provided as Appendix F.
Areas within the city limits of a city or the boundaries of a military installation.	None	N/A
Areas within known floodplains as defined by the geographical boundaries of the hundred-year flood.	None	N/A

Avoidance Area	Present Within Project Area?	Description
Areas that are geologically unstable.	None	N/A
Woodlands and wetlands.	Present	No wetlands or woodlands will be impacted by the Project.
Areas of recreational significance which are not designated as exclusion areas.	None	N/A
A geographic area where, due to the operation of the facility, the sound levels within one hundred feet on an inhabited residence or community building will exceed forty-five dBA. The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building.	Present	Six residences have modeled sound levels in excess of the Commission's sound standard. Otter Tail will comply with the sound standard by obtaining sound waivers or installing noise-reduction technology.

Setback Compliance

In addition to compliance with the setbacks set forth above, the Project continues to comply with the setback commitments listed in Table 3, which were made at the time a Certificate of Site Compatibility was issued for the Langdon Wind Project.

Setback Type	Distance
Occupied Residence	1,400 feet
Transmission and Distribution Line	420 feet
USFWS WPA	0.25 miles

Socioeconomics

The Project will have positive impacts on socioeconomics by extending the life of the wind energy facility, which, in turn, extends the time period for which landowners will receive easement payments. In addition, the Project will create temporary construction jobs, with associated opportunities for increased local spending.

Land Use

The Project will be constructed entirely within the previously-designated site, and turbine and other permanent infrastructure locations will remain the same. As a result, land use will also remain unchanged. The Project will result in temporary disturbances, including temporary widening of access roads to accommodate transportation of components and equipment, a temporary laydown yard, and temporary crane paths (as needed). Temporarily impacted areas will be restored in compliance with applicable provisions of the Commission's Findings of Fact, Conclusions of Law and Order, dated May 31, 2007 (Case No. PU-07-26) (May 2007 Order.)

Public Services

The Project will result in a temporary increase in traffic in and near the Project Area, but is not anticipated to interfere with local road use. Otter Tail will coordinate with Cavalier County and the townships, as appropriate, regarding local road use, will obtain all necessary road use permits, and will restore roads impacted by the Project in accordance with the requirements of the Commission's May 2007 Order and as required by Cavalier County and the townships.

Sound, Shadow Flicker, and Human Health and Safety

As noted above, the Project continues to maintain a turbine setback of 1,400 feet from occupied residences. A sound study was completed for the Project using GE 1.5 MW turbines with 97-meter hub height (Appendix A). Based on the initial analysis, sound levels within 100 feet of six occupied residences were modeled between 45 dBA and 49 dBA. The Project will comply with the current sound regulations by either obtaining waivers from the owner(s) of the affected residences, or by installing noise-reduction technology, such as noise-reducing operation modes (NRO) and/or low-noise trailing edge (LNTE) blades at up to 10 turbines (as needed). Copies of noise waivers obtained to-date are provided in Appendix A.

At the time the Langdon Wind Energy Center was permitted, the Commission did not specifically address shadow flicker. However, Otter Tail conducted a shadow flicker assessment for the Project utilizing realistic modeling inputs. Based on the assessment, shadow flicker levels from the Project will not exceed 30 hours per year at any occupied residences (Appendix B).

Otter Tail submitted form 7460-1 to the Federal Aviation Administration (FAA) for each turbine to confirm that the increased tip height will not impact navigable airspace or communications technology used in aviation operation. The FAA issued Determinations of No Hazard to Otter Tail on February 23, 2023 for each turbine submitted. A listing of the FAA's aeronautical study number for each turbine and status is provided in Appendix C.

Comsearch completed a microwave study for the Project. Based on the analysis, Comsearch found that none of the turbines would obstruct microwave beam paths in the area with the upgraded equipment (Appendix D).

The Project will continue to comply with all safety-related and other conditions of the Commission's May 2007 Order.

Cultural and Architectural Resources

In November of 2022, staff from Atwell conducted background research at the State Historical Society of North Dakota (SHSND) for information on previously identified archaeological sites and architectural properties within one mile (1.6 km) of the Project Area and on surveys previously conducted within the Project Area (Appendix E – Class I Literature Review).

Otter Tail coordinated with the SHSND regarding the Project. The Project construction activities will occur primarily within areas previously surveyed for cultural resources, and all construction activities will occur within areas previously disturbed by initial Langdon Wind Energy Center construction. As a result, the SHSND has determined that additional cultural resource surveys are not necessary, except to the extent crane paths are located in previously unsurveyed areas. If any crane paths are located outside of areas previously surveyed for cultural resources, Otter Tail will complete cultural resource field surveys and will avoid any resources identified that are eligible or unevaluated for listing on the National Register of Historic Places (NRHP). Additionally, Otter Tail has prepared an Unanticipated Discoveries Plan, which will be implemented during Project construction (Appendix F).

Although not recommended at the time the Langdon Wind Energy Center was originally permitted and constructed, the SHSND's current practice is to recommend completion of an architectural history survey in the vicinity of wind energy generation facilities to identify architectural resources potentially eligible for NRHP-listing and to evaluate potential impact to those resources. Otter Tail is in the process of completing the architectural history survey. Since the Upgrade Project involves technology upgrades to existing turbines, it is not anticipated that the limited modifications will adversely affect architectural history resources. However, in the event of an adverse impact, Otter Tail will coordinate with SHSND to identify appropriate mitigation. Otter Tail will submit SHSND concurrence prior to construction.

Recreational Resources

The Project will not impact any recreational resources. The Project continues to maintain a setback of at least 0.25 miles from nearby WPAs.

Land-Based Economics

The Project will not result in any additional long-term land impact; as a result, the Project will also not result in any long-term impacts to agricultural use or production. Otter Tail will compensate landowners for any temporary impacts to cropland in accordance with the terms of its wind lease agreements, as applicable.

Soils

Project construction may result in minor short-term impacts to soils within the disturbance area. During construction, short-term impacts may include soil compaction, vegetation clearing, and the potential for localized soil erosion and sedimentation. No other impacts are anticipated. Measures to control erosion will be implemented during Project construction to avoid or minimize soil erosion.

Erosion and sedimentation will be reduced by implementation of best management practices (BMPs) such as mulching, hydroseeding, wildlife-friendly erosion control blankets, silt fence installation, matting, and revegetation, as appropriate. Once construction is completed, soils will be revegetated in accordance with Natural Resources Conservation Service requirements (unless otherwise specified by the landowner and approved by the Commission). No adverse impacts to soil resources are expected as a result of the Project.

Geologic and Groundwater Resources

The Upgrade Project is not expected to disturb any geologic or groundwater resources.

Waterbodies, Wetlands, and Floodplain Resources

Previously, a wetland delineation and determination was conducted within the Langdon Wind Energy Center boundary in 2007 (TetraTech EC, INC. 2007). The wetland delineation was performed in accordance with the *1987 U.S. Army Corps of Engineers Wetland Delineation Manual* (USACE 1987). The report did not identify any temporary or permanent impacts to wetlands within the Project Area, and no temporary or permanent impacts are anticipated as a result of the Project.

FEMA floodplains (100-year) are not mapped in Cavalier County. In addition, haul route turning radii design will be based on existing public roads. As such, impacts to floodplains are not anticipated.

Vegetation

No trees or shrubs will be removed in connection with the Project. Otter Tail will comply with the site restoration and reseeding conditions in the Commission's May 2007 Order and all other applicable permitting requirements.

Wildlife

Impacts to wildlife are expected to be minimal as the proposed construction disturbance areas were previously disturbed and are of low-quality habitat. If construction activities are planned during the springtime, ground nesting bird clearance surveys in uncultivated areas will be conducted, as applicable, prior to construction.

With respect to federally-designated threatened, endangered, and candidate species, the northern long-eared bat and the monarch butterfly have the potential to occur in Cavalier County. The existing turbines were built in open terrain outside of forested areas and riparian corridors. Additionally, Project construction activities will be confined to previously disturbed areas, and no tree removal is anticipated. As a result, no impacts to these species are anticipated.

The Project is not anticipated to have any measurable change in impact on migrating birds or bats. Impacts are expected to be similar to other operating wind projects in the area. Otter Tail will develop a Wildlife Conservation Strategy for the facility, which will outline BMPs that are to be

undertaken for the life of the facility to minimize risks to birds, bats, and other wildlife from operation of the wind farm. Coordination with USFWS regarding the Project is under way (Appendix H – Agency Correspondence).

An IPaC Resource List for Cavalier County is provided in Appendix G.

Conclusion

Table 4 below summarizes Otter Tail’s environmental and regulatory analysis of the Upgrade Project. As indicated in Table 4 and the prior sections, the Project complies with the requirements of N.D.C.C. § 49-22-03(3)(a), including the Commission’s current exclusion area and avoidance area criteria. Additionally, the Project will continue to comply with all applicable siting laws, rules, and Commission orders, including the conditions specified in the Commission’s May 2007 Order.

Summary Table

Table 4: Summary of Environmental Resource Impact Analysis and Avoidance/Minimization Measures		
Resource	Potential Impact of Repower Project	Avoidance and/or Minimization Measures
Socioeconomics	Positive economic and social impacts.	None proposed.
Land Use	Temporary disturbances only; will utilize previously disturbed areas.	Will restore temporarily impacted areas in compliance with applicable provisions of the Commission's May 2007 Order.
Public Services	A temporary increase in traffic due to construction will occur.	Will coordinate with Cavalier County and applicable townships regarding local road use, obtain all necessary road use permits, and restore roads impacted by the Upgrade Project in accordance with the requirements of the Commission's May 2007 Order and as required by Cavalier County and the townships.
Human Health and Safety	Turbine lighting will continue to meet FAA and Commission requirements. Shadow flicker is predicted to be 30 hours per year or less at all occupied residences.	None proposed.
Sound	Initial modeling analysis (with standard edge blades) determined that the sound may exceed 45 dBA within 100 feet of six occupied residences. Further modeling was conducted with noise-reducing operation modes (NRO) and/or low-noise trailing edge (LNTE) added to up to 10 turbines, which identified only one exceedance of the 45 dBA limit.	Otter Tail has obtained a sound waiver from the owners of the residence with sound levels in excess of the sound limit, as well as another participating landowner. For the remaining four residences, Otter Tail will either obtain sound waivers or will utilize NRO and/or LNTE blades on up to 10 turbines, as needed.

Table 4: Summary of Environmental Resource Impact Analysis and Avoidance/Minimization Measures

Resource	Potential Impact of Repower Project	Avoidance and/or Minimization Measures
Cultural/Architectural History Resources	Upgrade Project activities will occur within areas previously surveyed for cultural resources or in areas previously disturbed by initial facility construction. The Upgrade Project is not anticipated to impact cultural or architectural history resources.	Prepared an Unanticipated Discoveries Plan.
Recreational Resources	No impacts to recreational resources are anticipated.	Will continue to maintain a setback of 0.25 miles from nearby WPAs.
Land Based Economics	Minimal cropland will be temporarily impacted during construction. No additional long-term impacts to agricultural use or production are anticipated.	Will compensate landowners for any temporary impacts to cropland in accordance with the terms of its wind lease agreements, as applicable.
Soils	Temporary land disturbance may cause soil surface to become more prone to wind and water erosion.	Will implement Best Management Practices (BMPs) to minimize erosion and sedimentation and will restore temporarily impacted areas.
Geologic and Groundwater Resources	No impacts to geological and groundwater resources are anticipated.	None proposed.
Waterbodies, Wetlands, and Floodplain Resources	No impacts are anticipated.	Will implement BMPs to minimize erosion and sedimentation.
Vegetation	Will utilize previously disturbed areas; no trees or shrubs will be removed.	Will comply with the site restoration and reseeded conditions in the Commission's May 2007 Order and all other applicable requirements.

Table 4: Summary of Environmental Resource Impact Analysis and Avoidance/Minimization Measures

Resource	Potential Impact of Repower Project	Avoidance and/or Minimization Measures
Wildlife	<p>Construction impacts will be confined to previously disturbed locations and minimal impacts to wildlife anticipated.</p> <p>The Project is not anticipated to have an impact on threatened or endangered species or have any measurable change in impact on migrating birds or bats.</p>	<p>Will implement BMPs from the Project’s Wildlife Conservation Strategy to minimize risks to birds, bats, and other wildlife.</p>

References

TetraTech EC, INC. 2007. Wetland and Other Waters Delineation Report: Langdon Wind Energy Center, Langdon, North Dakota. TetraTech EC, INC.

USACE [U.S. Army Corps of Engineers]. 1987. Corps of Engineers Wetlands Delineation Manual. USACE, Environmental Laboratory Report No.: Technical Report Y-87-1 (online edition). <http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf>.

Attachments

Figure 1. Upgrade Project Map

Figure 2. Wind Turbine Diagram

Figure 3. Exclusion and Avoidance Area Map

Appendix A – Acoustic Assessment Results and Sound Waivers

Appendix B – Shadow Flicker Assessment Results

Appendix C – Determinations of No Hazard

Appendix D – Microwave Beam Path Analysis

Appendix E – Cultural Resource Report (Public)

Appendix F – Unanticipated Discoveries Plan

Appendix G – IPaC Resource List

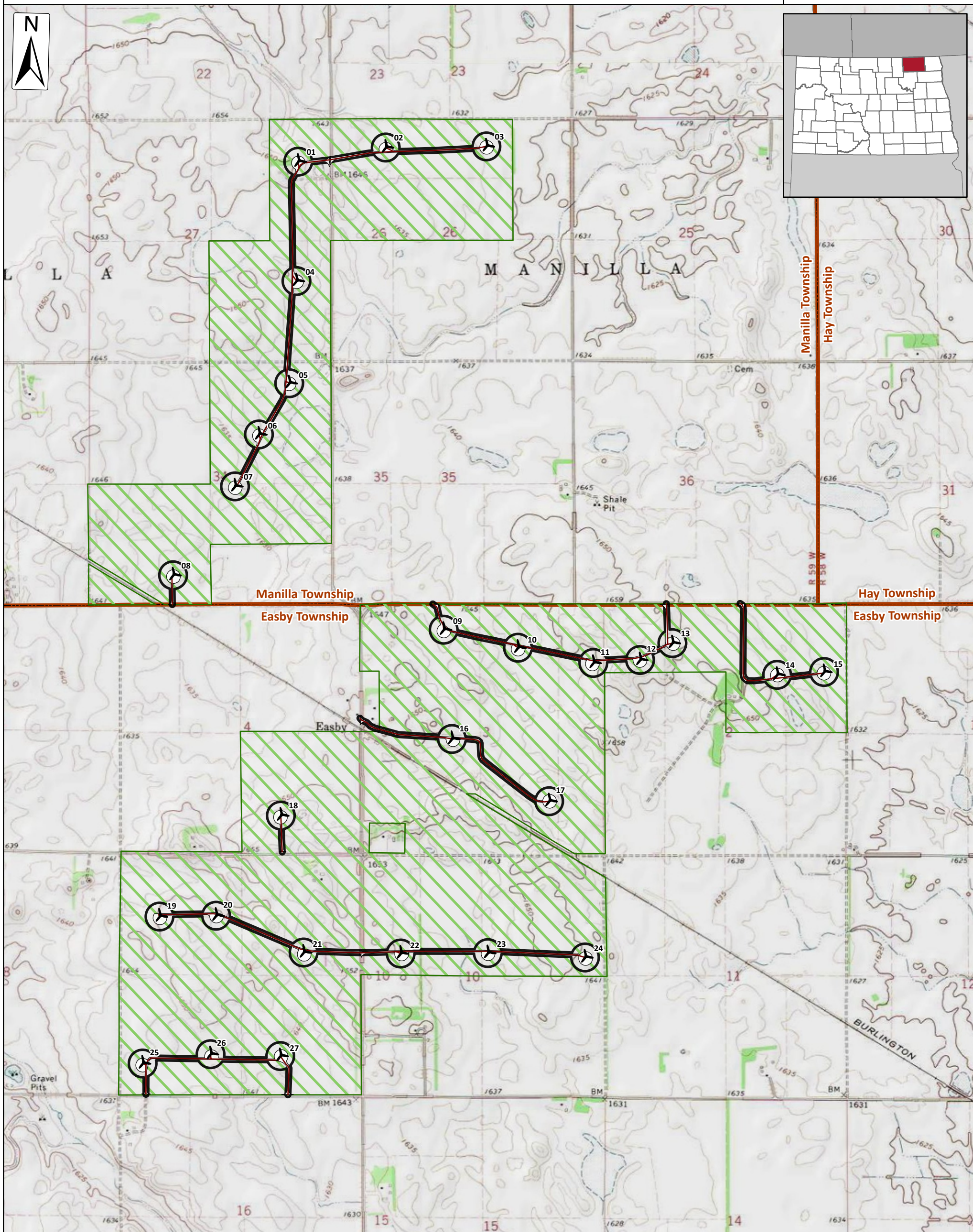
Appendix H – Agency Correspondence

Langdon Wind Project

Issue Date:
3/1/2023

Figure 1 - Site Overview

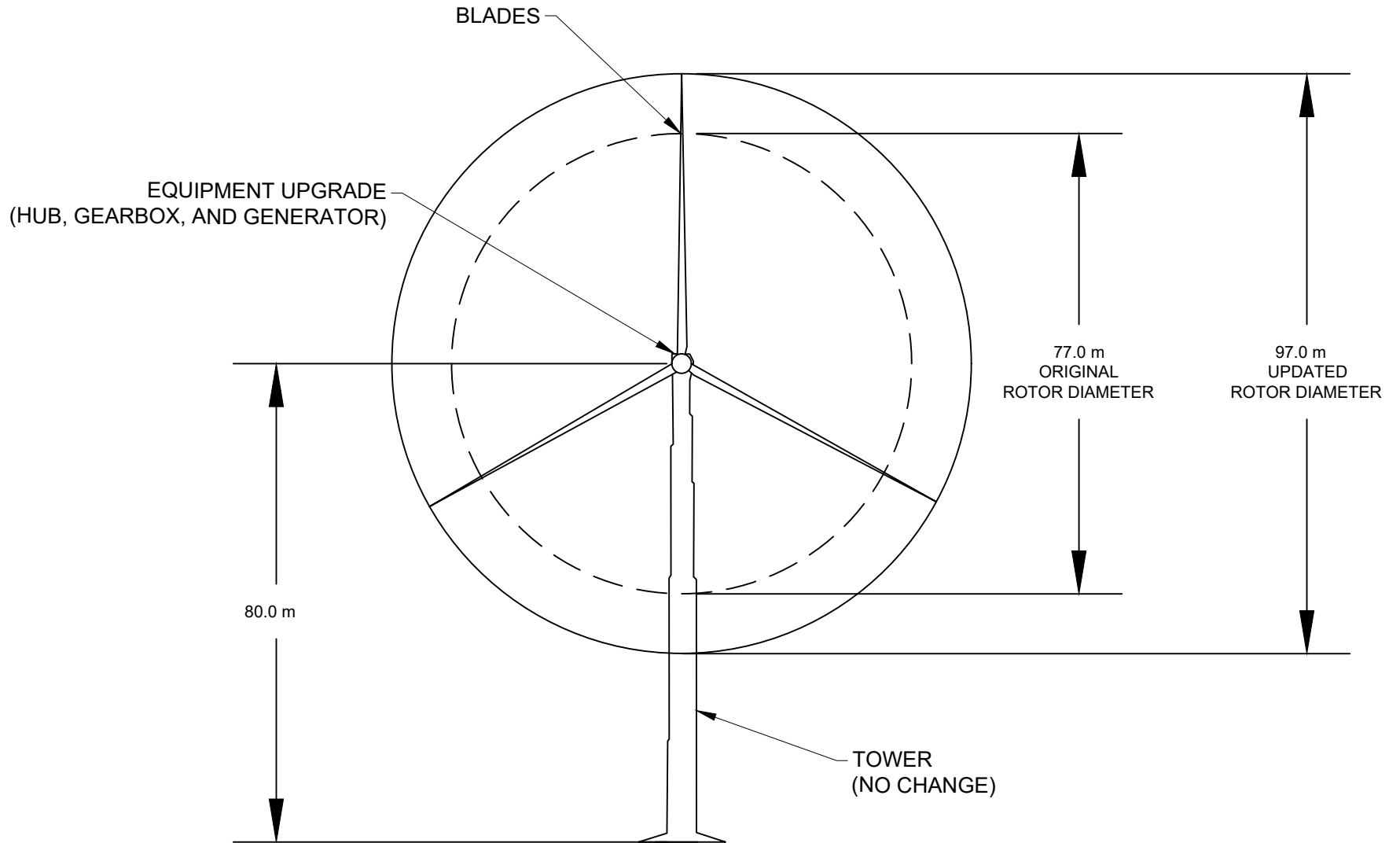
Cavalier County, North Dakota

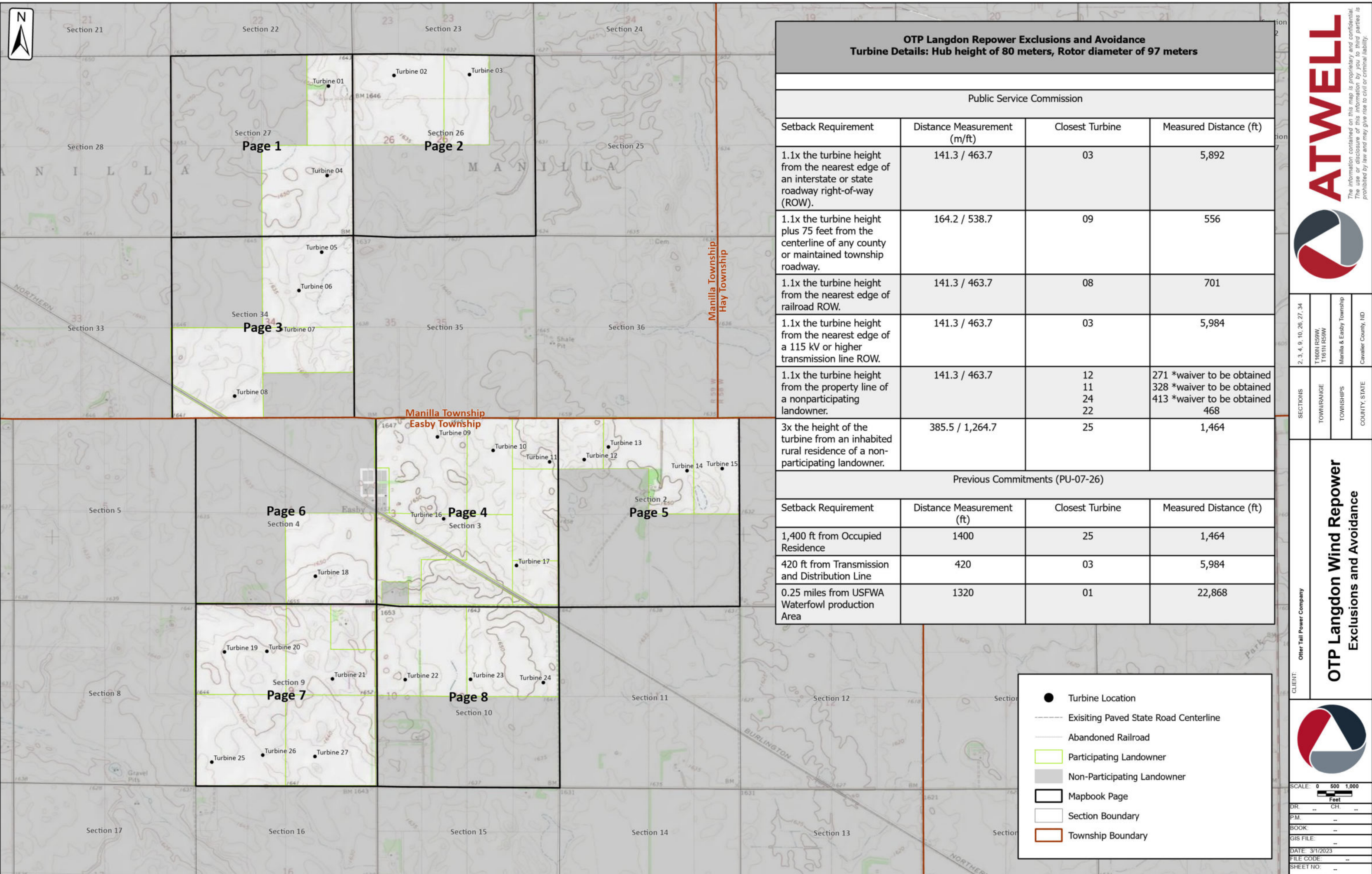


- Existing Turbine Locations
- Participating Parcels
- Existing Access Roads
- Township
- Disturbance Area (~72 acres)
- Environmental Study Area



PROPOSED TURBINE UPGRADE





OTP Langdon Repower Exclusions and Avoidance
Turbine Details: Hub height of 80 meters, Rotor diameter of 97 meters

Public Service Commission

Setback Requirement	Distance Measurement (m/ft)	Closest Turbine	Measured Distance (ft)
1.1x the turbine height from the nearest edge of an interstate or state roadway right-of-way (ROW).	141.3 / 463.7	03	5,892
1.1x the turbine height plus 75 feet from the centerline of any county or maintained township roadway.	164.2 / 538.7	09	556
1.1x the turbine height from the nearest edge of railroad ROW.	141.3 / 463.7	08	701
1.1x the turbine height from the nearest edge of a 115 kV or higher transmission line ROW.	141.3 / 463.7	03	5,984
1.1x the turbine height from the property line of a nonparticipating landowner.	141.3 / 463.7	12 11 24 22	271 *waiver to be obtained 328 *waiver to be obtained 413 *waiver to be obtained 468
3x the height of the turbine from an inhabited rural residence of a non-participating landowner.	385.5 / 1,264.7	25	1,464

Previous Commitments (PU-07-26)


Setback Requirement	Distance Measurement (ft)	Closest Turbine	Measured Distance (ft)
1,400 ft from Occupied Residence	1400	25	1,464
420 ft from Transmission and Distribution Line	420	03	5,984
0.25 miles from USFWA Waterfowl production Area	1320	01	22,868



2, 3, 4, 9, 10, 26, 27, 34	T160N R59W, T161N R59W	Manilla & Easby Township	Cavalier County, ND
SECTIONS	TOWNSHIP	TOWNSHIPS	COUNTY, STATE

OTP Langdon Wind Repower Exclusions and Avoidance

CLIENT: Otter Tail Power Company



SCALE: 0 500 1,000 Feet

DR.	CH.	
P.M.		
BOOK		
GIS FILE		
DATE	3/1/2023	
FILE CODE		
SHEET NO.		



RY GELLNER
23176000

JOAN M
IMHOFF
23177000

JOAN M
IMHOFF
23182000

JOAN M
IMHOFF
23183000

BRUCE RODER
23190000

BRUCE RODER
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LORI EVANS
23211000

STREMICK
B & B
23208000

JASON E
SPANIER
23206000

JASON E
SPANIER
23203000

BM 1646

- Turbine Location
- Occupied Residence
- Access Road
- Existing Overhead Electric Line
- Existing Paved State Road Centerline
- - - Existing Paved County Road Centerline
- + Abandoned Railroad
- Existing 115 kV or higher transmission line ROW (1.1x Turbine Height)
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- Railroad Right-of-Way Setback (1.1x Turbine Height)
- Landowner Occupied Residence Setback (1,400 ft)
- Non-Participating Landowner Property Line Setback (1.1x Turbine Height)
- Section Boundary
- Participating Landowner
- Non-Participating Landowner

Section 28

Section 27

JASON E
SPANIER
23209000

JASON E
SPANIER
23210000

MARVIN HECK
23204000

Section 33

Section 34

91st St NE

Section 27

Section 34

JAMES SPANIER
23243000

EDWIN PEARSON
23242000

Section 26

91st St NE

Section 35

LOUIS
MCGAUVRAN
23248000

01

02

04

05



2, 3, 4, 9, 10, 26, 27, 34	T160N R59W, T161N R59W	Manilla & Easby Township	Cavalier County, ND
SECTIONS	TOWNSHIP	TOWNSHIPS	COUNTY, STATE

CLIENT: Otter Tail Power Company

OTP Langdon Wind Repower Exclusions and Avoidance



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JOAN M
IMHOFF
23183000

Section 22

Section 23

BRUCE RODER
23190000

BRUCE RODER
23189000

ROGER W KRAM
23191000

VERNICE
BALSDON
23194000

Section 22

Section 23

92nd St NE

Section 23

Section 24

Section 24

Section 27

Section 26

Section 25

JASON E
SPANIER
23206000

BM 1646

JASON E
SPANIER
23203000

JASON E
SPANIER
23202000

CHRISTALLE
DALSTED
23201000

LOUIS
MCGAUVRAN
23197000

02

03

111th Ave NE Co Rd 33

112th Ave NE

Section 27

Section 26

MARVIN HECK
23204000

MARVIN HECK
23205000

LOUIS
MCGAUVRAN
23198000

M A N I L L

Section 34

Section 35

Section 26

91st St NE

Section 26

Section 25

Section 25

LOUIS
MCGAUVRAN
23248000

Section 35

LOUIS
MCGAUVRAN
23247000

Section 35

Section 36

LOUIS
MCGAUVRAN
23253000

- Turbine Location
- Occupied Residence
- Access Road
- Existing Overhead Electric Line
- Existing Paved State Road Centerline
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- Non-Participating Landowner



SECTIONS	2, 3, 4, 9, 10, 26, 27, 34
TOWNSHIP	T160N R59W, T161N R59W
TOWNSHIPS	Manilla & Easy Township
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LORI EVANS
23214000

Section 28

JASON E
SPANIER
23209000

Section 27

JASON E
SPANIER
23210000

MARVIN HECK
23204000

91st St NE

Section 26

JAMES SPANIER
23237000

JAMES SPANIER
23243000

EDWIN PEARSON
23242000

LOUIS
MCGAUVRAN
23248000

FAMILY
TRUST MOOS
23244000

MICHAEL ROSE
23245000

MARY JANE
FOLEY
23250000

LOUIS
MCGAUVRAN
23249000

MARGARET
NORMAN
08023000

Section 5

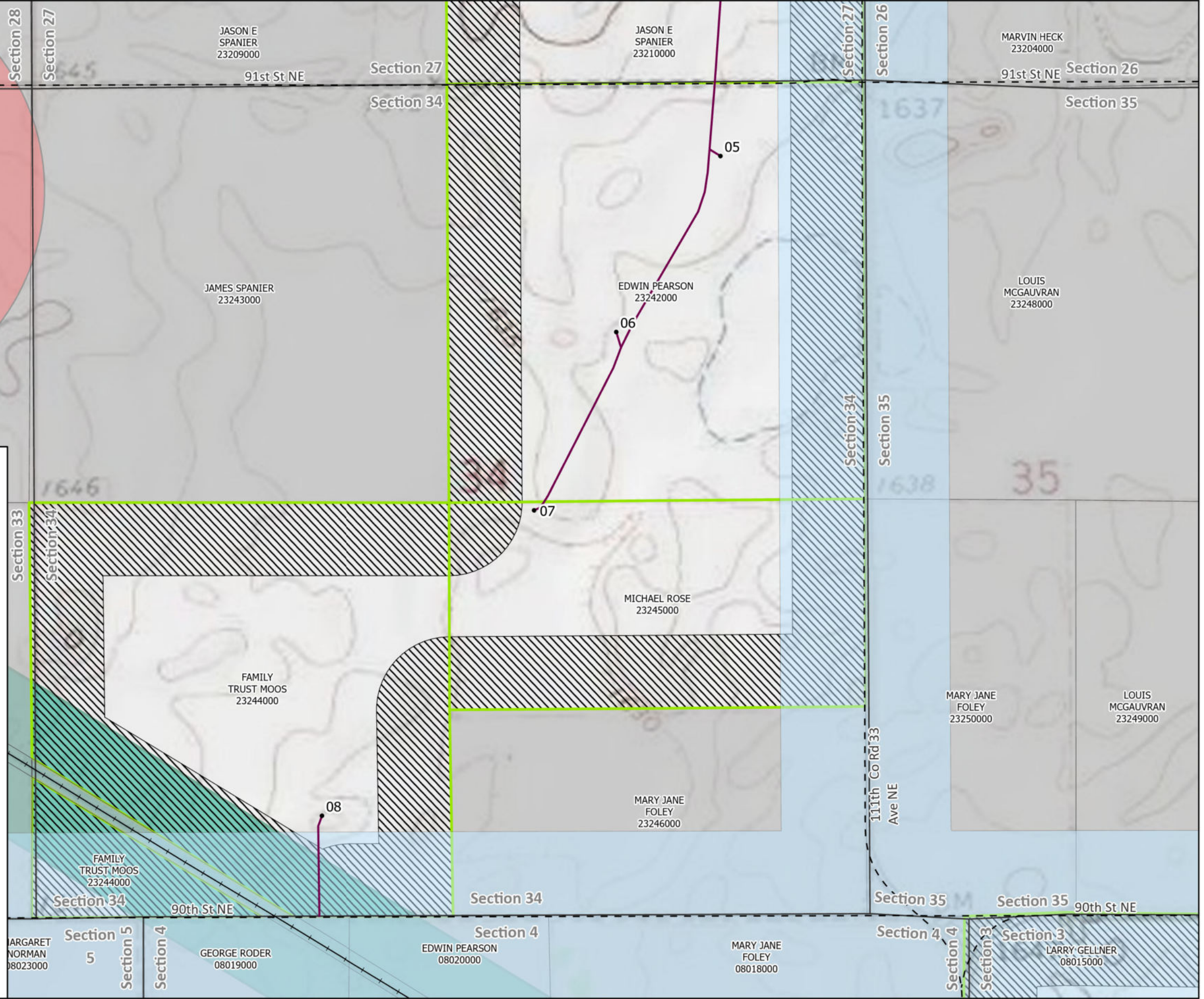
GEORGE RODER
08019000

EDWIN PEARSON
08020000

MARY JANE
FOLEY
08018000

LARRY GELLNER
08015000

- Turbine Location
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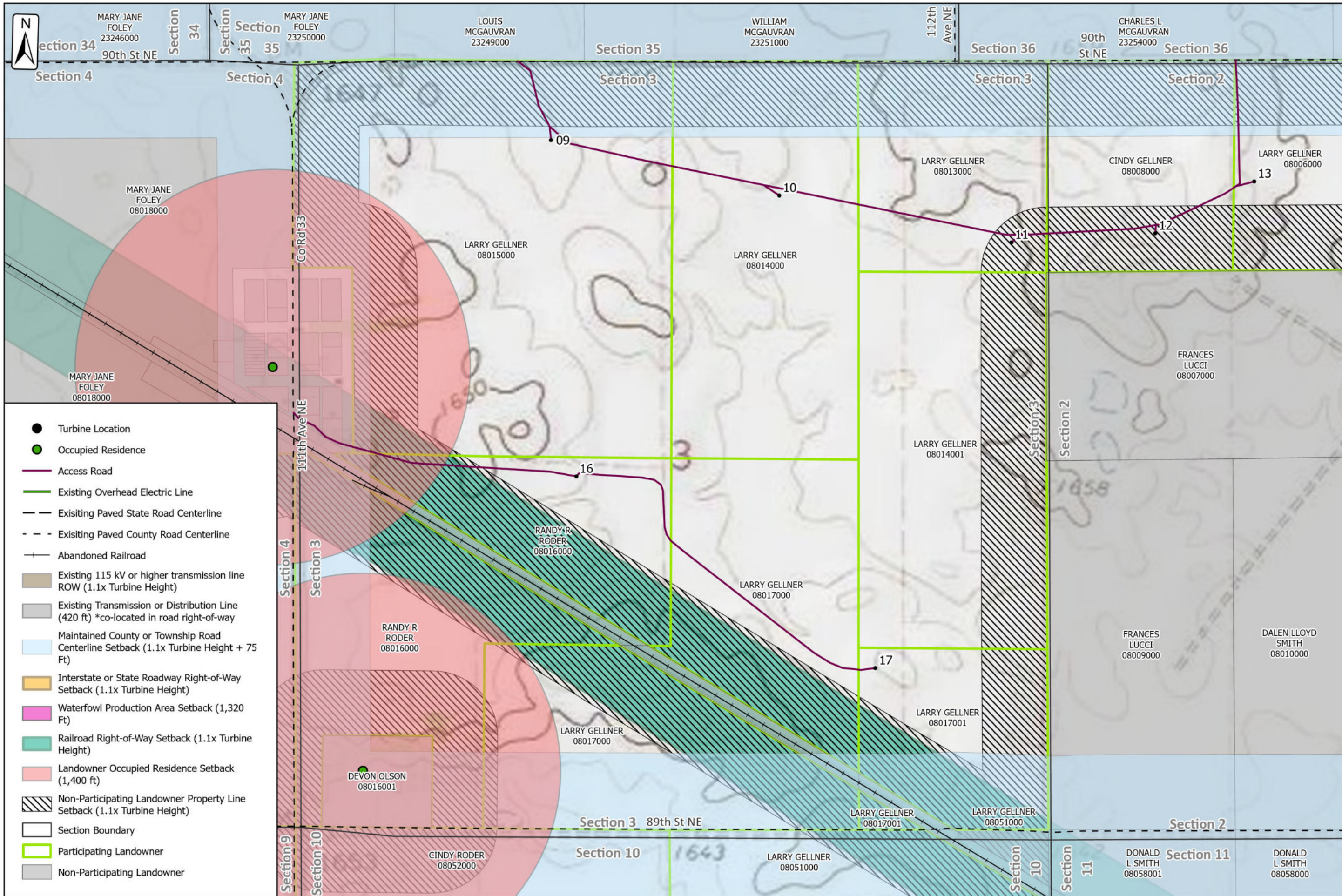
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TOWNSHIPS	Manilla & Easby Township
COUNTY, STATE	Cavalier County, ND

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OTP Langdon Wind Repower Exclusions and Avoidance



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SHEET NO:	3 of 8



- Turbine Location
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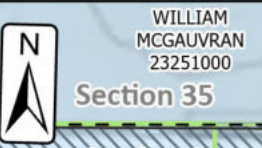
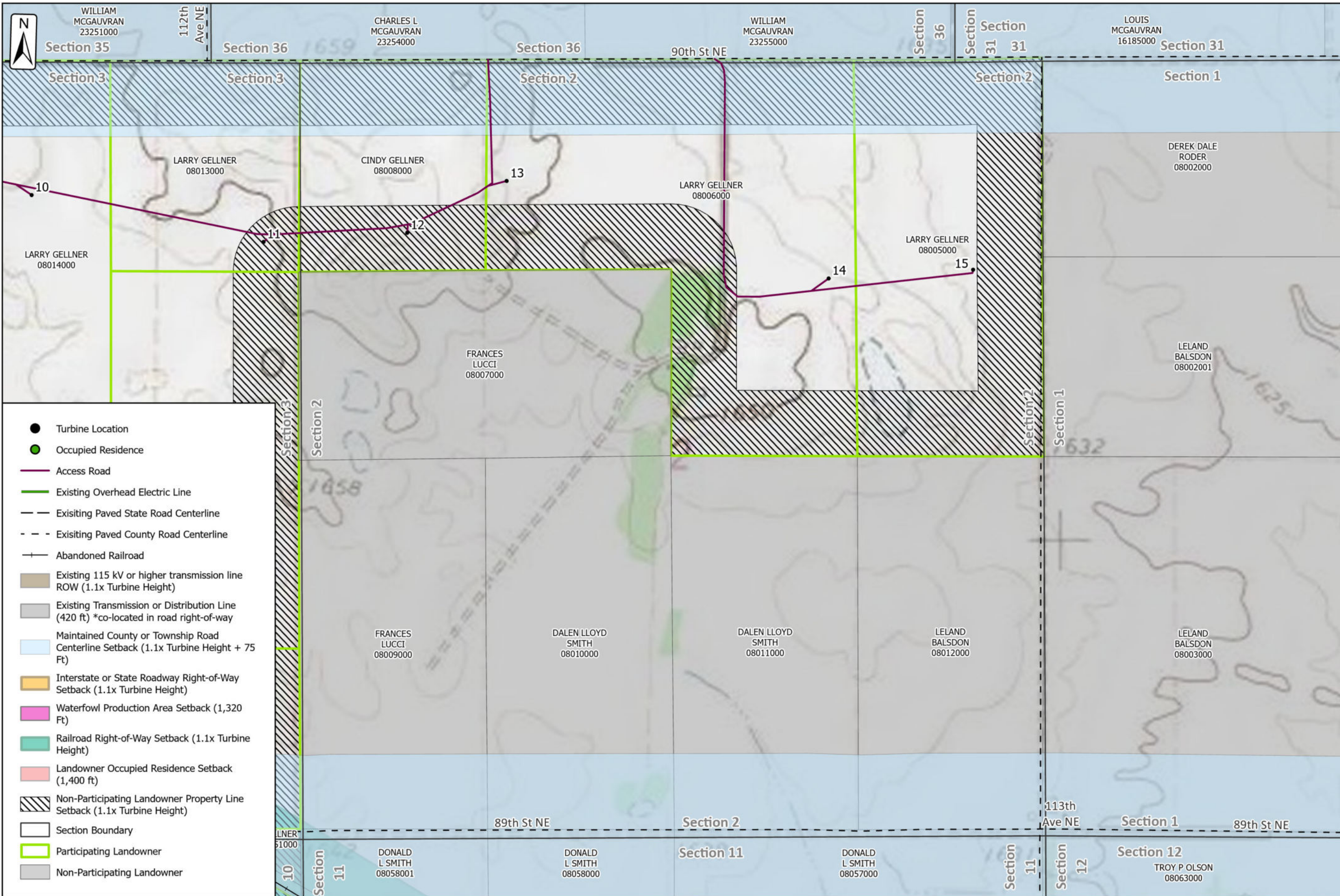
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TOWNSHIP	T160N R59W, T161N R59W
TOWNSHIPS	Manilla & Easy Township
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OTP Langdon Wind Repower Exclusions and Avoidance



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DATE:	3/1/2023
FILE CODE:	
SHEET NO:	4 of 8



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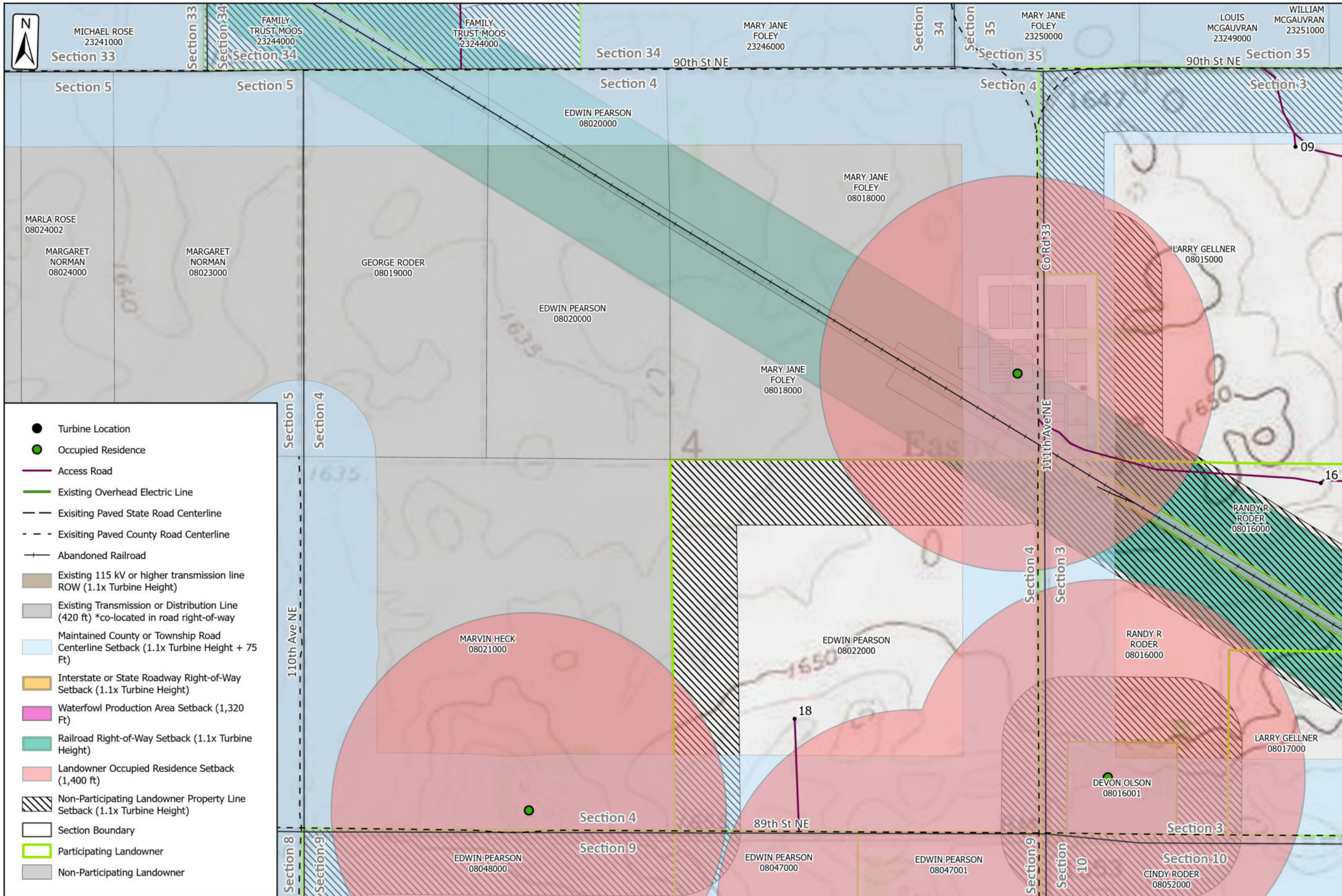


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TOWNSHIP	T160N R59W, T161N R59W
TOWNSHIPS	Manilla & Easy Township
COUNTY, STATE	Cavalier County, ND

OTP Langdon Wind Repower
Exclusions and Avoidance



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- Turbine Location
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2, 3, 4, 9, 10, 26, 27, 34	T160N R59W, T161N R59W	Manilla & Easby Township	Cavalier County, ND
SECTIONS	TOWNSHIP	TOWNSHIPS	COUNTY, STATE

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RNON CLARK
08028000

KENNETH ANDERSON
08029000

Section 5

110th Ave NE

MARVIN HECK
08021000

Section 4

EDWIN PEARSON
08022000

89th St NE

DEVON OLSON
08016001

RANDY R RODER
08016000

LARRY GELLNER
08017000

Section 4

Section 3

Section 3

Section 8

89th St NE

Section 9

Section 10

KENNETH ANDERSON
08042000

EDWIN PEARSON
08048000

EDWIN PEARSON
08047001

EDWIN PEARSON
08047000

CINDY RODER
08052000

19

20

21

22

MARK RATZLAFF
08049000

BRUCE RODER
08050000

BRUCE RODER
08053000

Section 8

Section 9

Section 9

Section 10

111th Ave NE

88th St NE

Section 16

Section 15

MINNKOTA POWER
COOPERATIVE
08054000

Section 10

ROBERT LOWERY
08092000

TROY P OLSON
08091000

BRUCE RODER
08090000

RANDY R RODER
08085000

BRUCE RODER
08080000

Section 16

Section 15

- Turbine Location
- Occupied Residence
- Access Road
- Existing Overhead Electric Line
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- Non-Participating Landowner



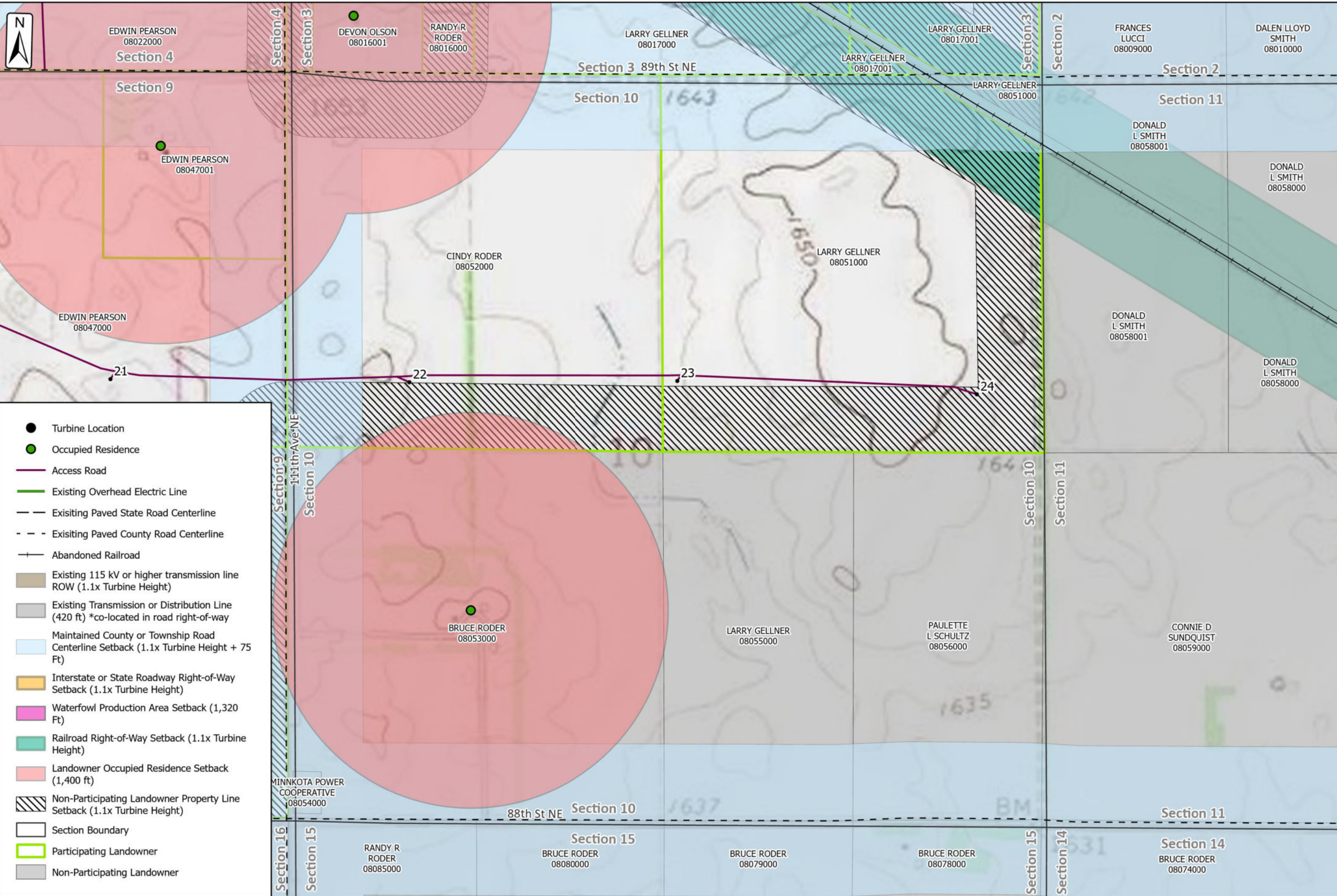
2, 3, 4, 9, 10, 26, 27, 34	T160N R59W, T161N R59W	Manilla & Easy Township	Cavelier County, ND
SECTIONS	TOWNSHIP	TOWNSHIPS	COUNTY, STATE

CLIENT: Otter Tail Power Company

OTP Langdon Wind Repower Exclusions and Avoidance



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- Turbine Location
- Occupied Residence
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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.

SECTIONS	2, 3, 4, 9, 10, 26, 27, 34	TOWNSHIP	T160N R59W, T161N R59W	COUNTY, STATE	Cavalier County, ND
TOWNSHIPS	Manilla & Easby Township				

CLIENT: Otter Tail Power Company

OTP Langdon Wind Repower

Exclusions and Avoidance

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Appendix A – Acoustic Assessment Results and Sound Waivers



SOUND LEVEL ASSESSMENT REPORT

Otter Tail Langdon Wind Repower Project Cavalier County, North Dakota

Prepared for:

Atwell, LLC
311 North Main
Ann Arbor, Michigan 48104

Prepared by:



Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

March 6, 2023

TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY	1-1
2.0	INTRODUCTION	2-1
3.0	SOUND TERMINOLOGY	3-1
4.0	NOISE REGULATIONS	4-1
4.1	Federal Regulations	4-1
4.2	North Dakota State Regulations	4-1
4.3	Cavalier County Regulations	4-1
5.0	MODELED SOUND LEVELS	5-1
5.1	Sound Sources	5-1
5.1.1	Project Wind Turbines	5-1
5.2.2	Existing Wind Turbines	5-1
5.2	Modeling Methodology	5-1
5.3	Sound Level Modeling Results	5-5
6.0	EVALUATION OF SOUND LEVELS	6-1
7.0	CONCLUSIONS	7-1

LIST OF APPENDICES

Appendix A	Sound Source Coordinates
Appendix B	Sound Level Modeling Results - Tabular

LIST OF FIGURES

Figure 2-1	Aerial Locus	2-2
Figure 3-1	Common Indoor and Outdoor Sound Levels	3-3
Figure 5-1	Sound Level Modeling Locations	5-4
Figure 5-2	Sound Level Modeling Results	5-6

LIST OF TABLES

Table 5-2	Summary of Key Sound Level Modeling Inputs	5-3
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1.0 EXECUTIVE SUMMARY

The Langdon Wind Energy Center Repowering Project (the Project) is an existing wind park in Cavalier County, North Dakota that is planned to be repowered by Otter Tail Power Company (Otter Tail). Atwell has retained Epsilon Associates, Inc. (Epsilon) to conduct a sound level assessment for this Project. This report presents the results of the cumulative sound level modeling from the proposed repower and other nearby existing wind turbines in Cavalier County.

This sound level assessment includes computer modeling to predict worst-case future L_{eq} sound levels from the Project, and a comparison of operational sound levels to the North Dakota Administrative Code Energy Conversion Facility Siting Criteria of 45 dBA within 100 feet of an inhabited residence or community building. Sound level modeling was conducted for all Otter Tail Langdon Wind Repower wind turbines and existing Langdon Wind I and Langdon Wind II wind turbines within 1.5 miles of a modeling receptor.

The L_{eq} sound levels modeled at receptors in Cavalier County ranged from 30 to 49 dBA. The highest L_{eq} sound level modeled at a receptor that has signed a waiver with Otter Tail is 49 dBA. The highest L_{eq} sound level modeled at a receptor that has not signed a waiver with Otter Tail is 45 dBA. The L_{eq} sound levels at all receptors without a signed waiver are at or below the limit of 45 dBA within 100 feet of an inhabited residence or community building. Therefore, the Project meets the State's regulations with respect to sound.

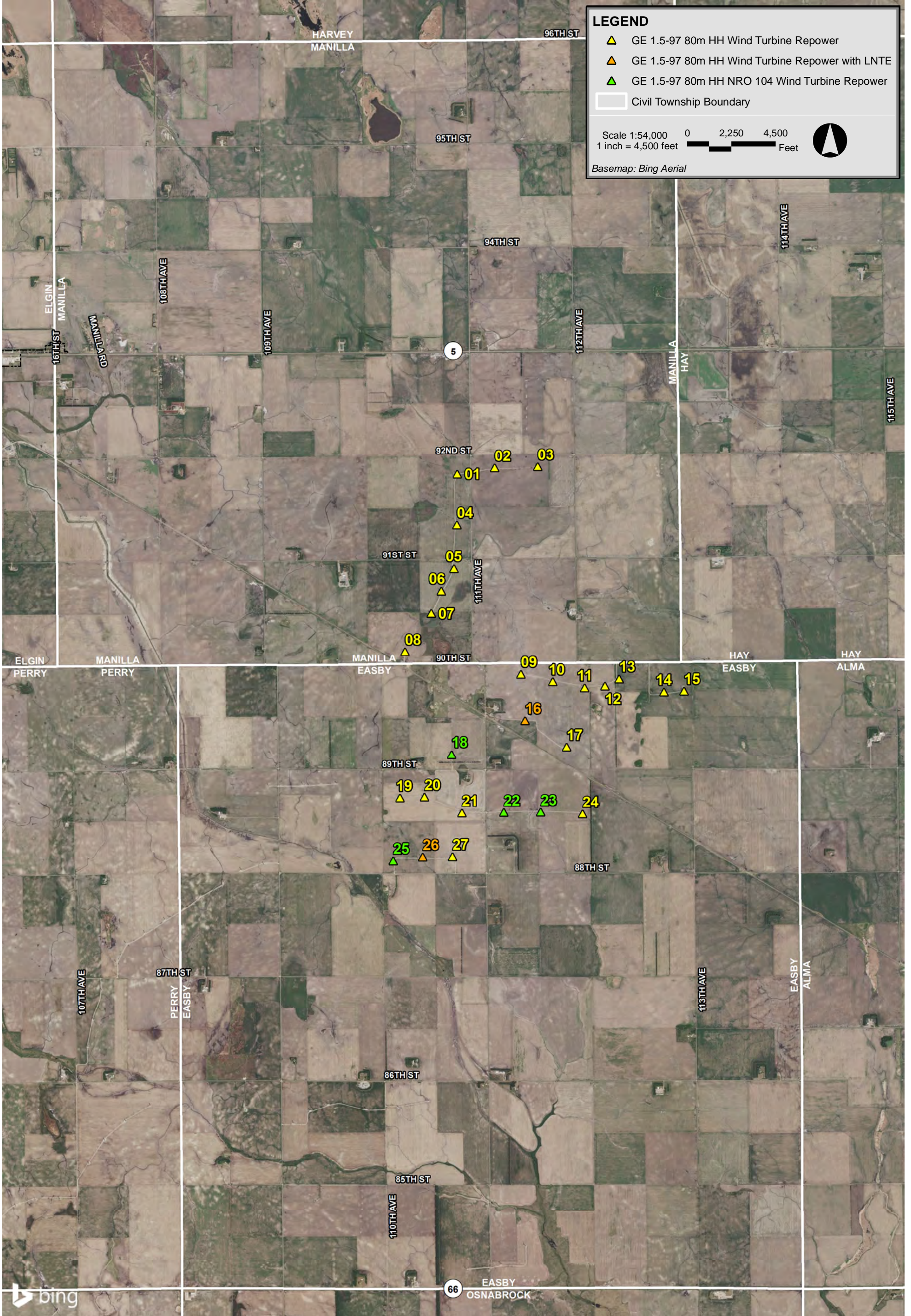
2.0 INTRODUCTION

The proposed repower Project will consist of 27 repowered wind turbines. The proposed wind turbines are all GE 1.5MW units with a rotor diameter of 97 meters and a hub height of 80 meters. Figure 2-1 shows the locations of the 27 wind turbines in Cavalier County over aerial imagery.

A detailed discussion of sound from wind turbines is presented in a white paper prepared by the Renewable Energy Research Laboratory.¹ A few points are repeated herein. Wind turbine sound can originate from two different sources: mechanical sound from the interaction of turbine components, and aerodynamic sound produced by the flow of air over the rotor blades. Prior to the 1990's, both were significant contributors to wind turbine sound. However, recent advances in wind turbine design have greatly reduced the contribution of mechanical sound. Aerodynamic sound has also been reduced from modern wind turbines due to slower rotational speeds and changes in materials of construction. Aerodynamic sound, in general, is broadband (has contributions from a wide range of frequencies). It originates from encounters of the wind turbine blades with localized airflow inhomogeneities and wakes from other turbine blades and from airflow across the surface of the blades, particularly the front and trailing edges. Aerodynamic sound generally increases with increasing wind speed up to a certain point, then typically remains constant, even with higher wind speeds. However, sound levels in general also increase with increasing wind speed with or without the presence of wind turbines.

This report presents the findings of a sound level modeling analysis for the Project. The Project wind turbines were modeled in CadnaA using sound data from GE technical reports. The results of this analysis are found within this report.

¹ Renewable Energy Research Laboratory, Department of Mechanical and Industrial Engineering, University of Massachusetts at Amherst, Wind Turbine Acoustic Noise, June 2002, amended January 2006.



Otter Tail Langdon Wind Repower Cavalier County, North Dakota

3.0 SOUND TERMINOLOGY

There are several ways in which sound levels are measured and quantified. All of them use the logarithmic decibel (dB) scale. The following information defines the sound level terminology used in this analysis.

The decibel scale is logarithmic to accommodate the wide range of sound intensities found in the environment. A property of the decibel scale is that the sound pressure levels of two or more separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a 3-decibel increase (53 dB), which is equal to doubling in sound energy, but not equal to a doubling in decibel quantity (100 dB). Thus, every 3-dB change in sound level represents a doubling or halving of sound energy. The human ear does not perceive changes in the sound pressure level as equal changes in loudness. Scientific research demonstrates that the following general relationships hold between sound level and human perception for two sound levels with the same or very similar frequency characteristics²:

- ◆ 3 dB increase or decrease results in a change in sound that is just perceptible to the average person,
- ◆ 5 dB increase or decrease is described as a clearly noticeable change in sound level, and
- ◆ 10 dB increase or decrease is described as twice or half as loud.

Another mathematical property of decibels is that if one source of sound is at least 10 dB louder than another source, then the total sound level is simply the sound level of the higher-level source. For example, a sound source at 60 dB plus another sound source at 47 dB is equal to 60 dB.

A sound level meter (SLM) that is used to measure sound is a standardized instrument.³ It contains “weighting networks” (e.g., A-, C-, Z-weightings) to adjust the frequency response of the instrument. Frequencies, reported in Hertz (Hz), are detailed characterizations of sounds, often addressed in musical terms as “pitch” or “tone”. The most commonly used weighting network is the A-weighting because it most closely approximates how the human ear responds to sound at various frequencies. The A-weighting network is the accepted scale used for community sound level measurements; therefore, sounds are frequently reported as detected with a sound level meter using this weighting. A-weighted sound levels emphasize middle frequency sounds (i.e., middle pitched – around 1,000 Hz), and de-emphasize low and high frequency sounds. These sound levels are reported in decibels designated as “dBA”. The C-weighting network has a nearly flat response for frequencies between 63 Hz and 4,000 Hz and is noted as dBC. Z-weighted sound levels are measured sound levels without any weighting curve and are otherwise referred to as

² Bies, David, and Colin Hansen. 2009. *Engineering Noise Control: Theory and Practice*, 4th Edition. New York: Taylor and Francis.

³ *American National Standard Electroacoustics – Sound Level Meters – Part 1: Specifications*, ANSI S1.4-2014 (R2019), published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

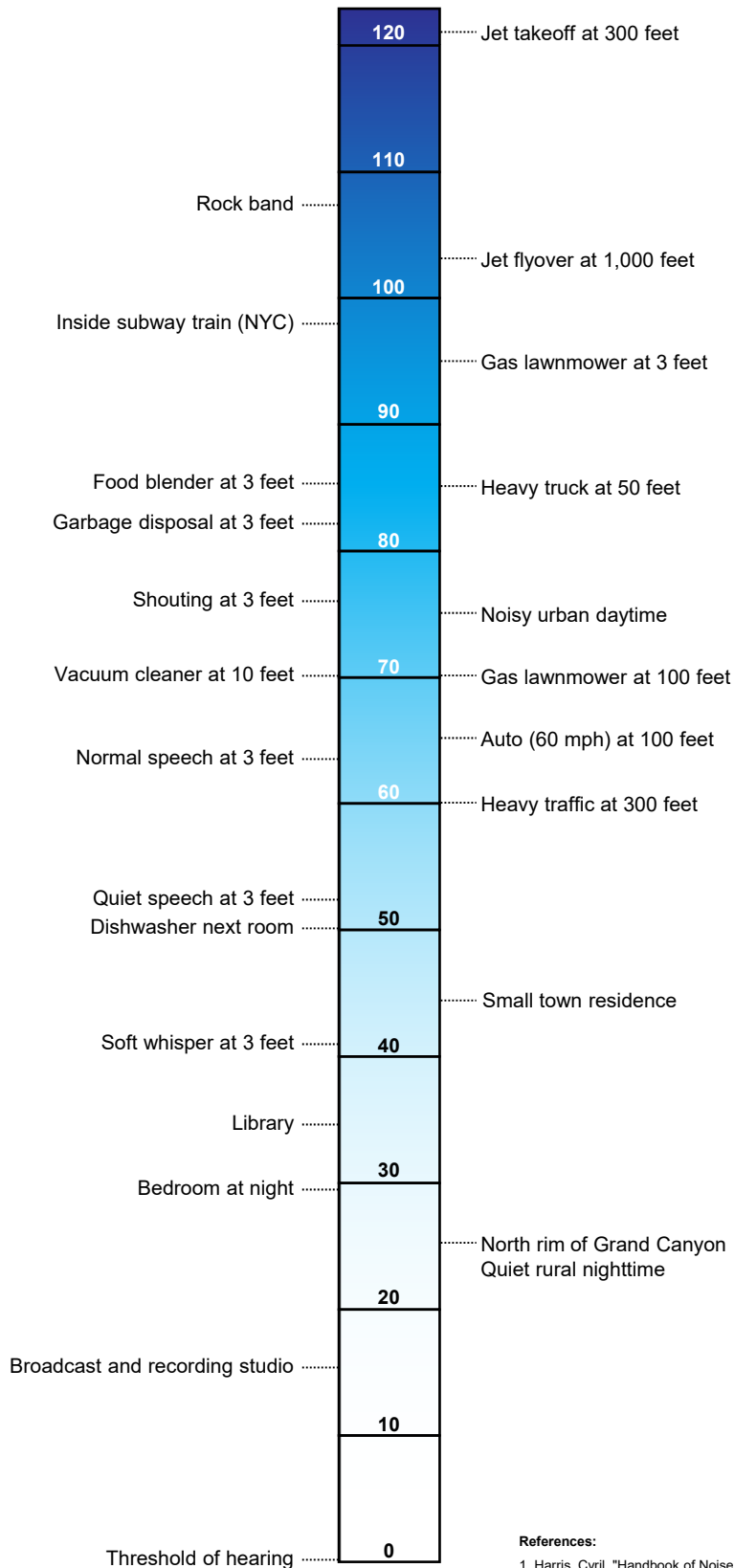
“unweighted”. Sound pressure levels for some common indoor and outdoor environments are shown in Figure 3-1.

Because the sounds in our environment vary with time they cannot simply be described with a single number. Two methods are used for describing variable sounds. These are exceedance levels and the equivalent level, both of which are derived from some number of moment-to-moment A-weighted sound level measurements. Exceedance levels are values from the cumulative amplitude distribution of all the sound levels observed during a measurement period. Exceedance levels are designated L_n , where n can have a value between 0 and 100 in terms of percentage. The L_{eq} is a sound level metric that is commonly reported in community sound level monitoring and is utilized in this report. The L_{eq} is described in further detail below.

- ◆ L_{eq} , the equivalent level, is the level of a hypothetical steady sound that would have the same energy (*i.e.*, the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated L_{eq} and is typically A-weighted. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is mostly determined by loud sounds if there are fluctuating sound levels.

Sound Pressure Level, dBA

COMMON INDOOR SOUNDS **COMMON OUTDOOR SOUNDS**



References:

- Harris, Cyril, "Handbook of Noise Acoustical Measurements and Noise Control", p 1-10., 1998
- "Controlling Noise", USAF, AFMC, AFDTIC, Elgin AFB, Fact Sheet, August 1996
- California Dept. of Trans., "Technical Noise Supplement", Oct, 1998

4.0 NOISE REGULATIONS

4.1 Federal Regulations

There are no federal community noise regulations applicable to this Project.

4.2 North Dakota State Regulations

The Project, located in North Dakota, is required to comply with the Zoning law, which states:

Section 69-06-08-01 Energy Conversion Facility Siting Criteria

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

4.3 Cavalier County Regulations

There are no county community noise regulations applicable to this Project.

Therefore, modeling receptors were evaluated in this analysis against the 45 dBA limit.

5.0 MODELED SOUND LEVELS

5.1 Sound Sources

5.1.1 *Project Wind Turbines*

The sound level analysis for the Project includes 27 wind turbines. These 27 wind turbines are depicted in Figure 5-1. The array consists of one (1) wind turbine model: the GE 1.5-97 at a hub height of 80-meters. Wind turbines #16 and #26 will have Low Noise Trailing Edge (LNTE) blades. Wind turbines #18, #22, #23, and #25 will be in Noise Reduced Operations (NRO) 104 mode. The GE 1.5-97 wind turbines have a rotor diameter of 97 meters. Technical reports from GE^{4,5,6} were provided to Epsilon which documented the expected sound power levels associated with the GE 1.5-97.

5.2.2 *Existing Wind Turbines*

Existing wind turbines are currently in the vicinity of the Project area and are assumed to remain operational. To predict the future wind turbine sound levels in the Project vicinity, a cumulative modeling analysis was conducted which included the sound level contribution from these wind turbines. Coordinates and descriptions for the existing nearby turbines were gathered from public information. The 16 existing wind turbines that were included in the cumulative modeling were modeled as GE 1.6-91 units with 80 meter hub heights and 91 meter rotor diameters. Sound power level data and octave band sound power levels for the wind turbine type were incorporated into the model using data contained within publicly available data⁷.

5.2 Modeling Methodology

The sound impacts associated with the proposed wind turbines were predicted using the CadnaA sound level calculation software developed by DataKustik GmbH. This software uses the ISO 9613-2 international standard for sound propagation.⁸ The benefits of this software are a more refined set of computations due to the inclusion of topography, ground attenuation, multiple building reflections (if applicable), drop-off with distance, and atmospheric absorption. The CadnaA

⁴ General Electric Company, Technical Documentation Wind Turbine Generator Systems 1.6-97 RePower – 60 Hz Product Acoustic Specifications, Rev. 02, 2020.

⁵ General Electric Company, Technical Documentation Wind Turbine Generator Systems 1.6-97 RePower with LNTE – 60Hz Product Acoustic Specifications Normal Specifications, Rev. 01, 2021.

⁶ General Electric Company, Technical Documentation Wind Turbine Generator Systems 1.6-97 RePower with LNTE – 60Hz Product Acoustic Specifications Noise Reduced Operation, Rev. 01, 2021.

⁷ Epsilon Associates, Inc., Langdon I Wind Energy Center Re-power Project Cavalier County, North Dakota, December 4, 2017.

⁸ *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*, International Standard ISO 9613-2:1996 (International Organization for Standardization, Geneva, Switzerland, 1996).

software allows for octave band calculation of sound from multiple sources as well as computation of diffraction.

Inputs and significant parameters employed in the model are described below and summarized in Table 5-1 below.

- ◆ *Project Array:* This analysis is for the wind turbine array dated November 4, 2022. The proposed Project array is identified in Figure 5-1. The wind turbine coordinates are provided in Appendix A. This analysis also includes 16 existing Langdon Wind I and Langdon Wind II wind turbines within 1.5 miles of a modeling receptor. Therefore, a total of 43 wind turbines were included in the sound model.
- ◆ *Modeling Receptor Locations:* A modeling receptor dataset dated October 24, 2022 was provided to Epsilon. The dataset included 30 receptors. Atwell provided additional information indicating if each receptor was inhabited or uninhabited, the resulting 21 inhabited receptors were input to the CadnaA model. All modeling receptors were input as discrete points at a height of 1.5 meters above ground level to mimic the ears of a typical standing person. In order to provide robust modeling coverage of each inhabited location, additional modeling locations were included offset by 100 feet away from the center point of the receptor in each of the four cardinal directions (north, south, east and west). Therefore, each inhabited location was evaluated at a total of five locations; the center point of the receptor itself, and at the four offset locations on land 100 feet from the receptor. This resulted in a total of 105 receptors. The center points of the modeled locations (receptors) are shown in Figure 5-1. Details of each modeling location are presented in Appendix B.
- ◆ *Modeling Grid:* A modeling grid with 20-meter spacing was calculated for the entire Project Area and the surrounding region. The grid was modeled at a height of 1.5 meters above ground level for consistency with the discrete modeling points. This modeling grid allowed for the creation of sound level isolines.
- ◆ *Terrain Elevation:* Elevation contours for the modeling domain were directly imported into CadnaA which allowed for consideration of terrain shielding where appropriate. The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset (NED) developed by the U.S. Geological Survey.
- ◆ *Source Sound Levels:* Sound power levels used in the modeling were described in Section 5.1. Documentation from GE provided levels that represent “worst-case” operational sound level emissions for the Project’s proposed wind turbines were input into the model.
- ◆ *Meteorological Conditions:* A temperature of 10°C (50°F) and a relative humidity of 70% was assumed in the model.

- ◆ *Ground Attenuation:* Spectral ground absorption was calculated using a G-factor of 0 which corresponds to “hard ground” consisting of a hard ground surface. The model, consistent with the standard, allows inputs between 0 (hard ground) and 1 (porous ground). This is a conservative approach as the vast majority of the area is actually agricultural.

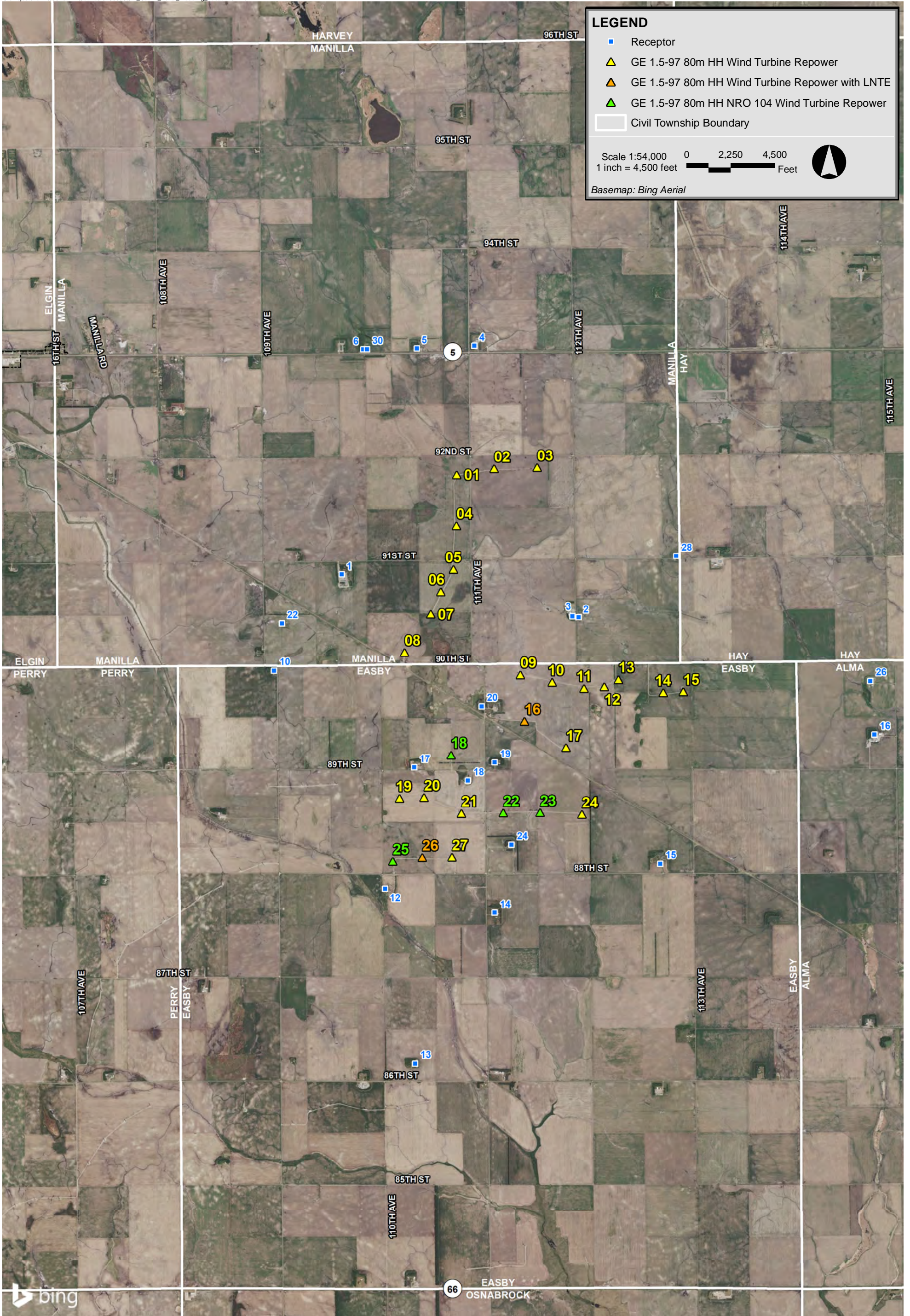
Octave band sound power levels corresponding to the highest available wind turbine broadband sound power level for each wind turbine type were input into CadnaA to model wind turbine generated L_{eq} sound pressure levels during conditions when worst-case sound power levels are expected. Sound pressure levels were modeled at 21 receptors within the vicinity of the Project. In addition to modeling at discrete points, sound levels were also modeled throughout a large grid of points, each spaced 20 meters apart to allow for the generation of sound level isolines.

Several modeling assumptions inherent in the ISO 9613-2 calculation methodology, or selected as conditional inputs by Epsilon, were implemented in the CadnaA model to ensure conservative results (i.e., higher sound levels), and are described below:

- ◆ All modeled sources were assumed to be operating simultaneously and at the design wind speed corresponding to the greatest sound level impacts.
- ◆ As per ISO 9613-2, the model assumed favorable conditions for sound propagation, corresponding to a moderate, well-developed ground-based temperature inversion, as might occur on a calm, clear night or equivalently downwind propagation.
- ◆ Meteorological conditions assumed in the model (T=10°C/RH=70%) were selected to minimize atmospheric attenuation in the 500 Hz and 1 kHz octave bands where the human ear is most sensitive.
- ◆ No additional attenuation due to tree shielding, air turbulence, or wind shadow effects was considered in the model.

Table 5-2 Summary of Key Sound Level Modeling Inputs

Modeling Parameter	Description / Value
Wind Turbine Array	Provided by Atwell
Terrain	U.S.G.S. Data
Wind Turbine Sound Power Levels	GE Specifications Documentation
Meteorological Conditions	T=10°C / RH=70%
Ground Absorption Factor	0

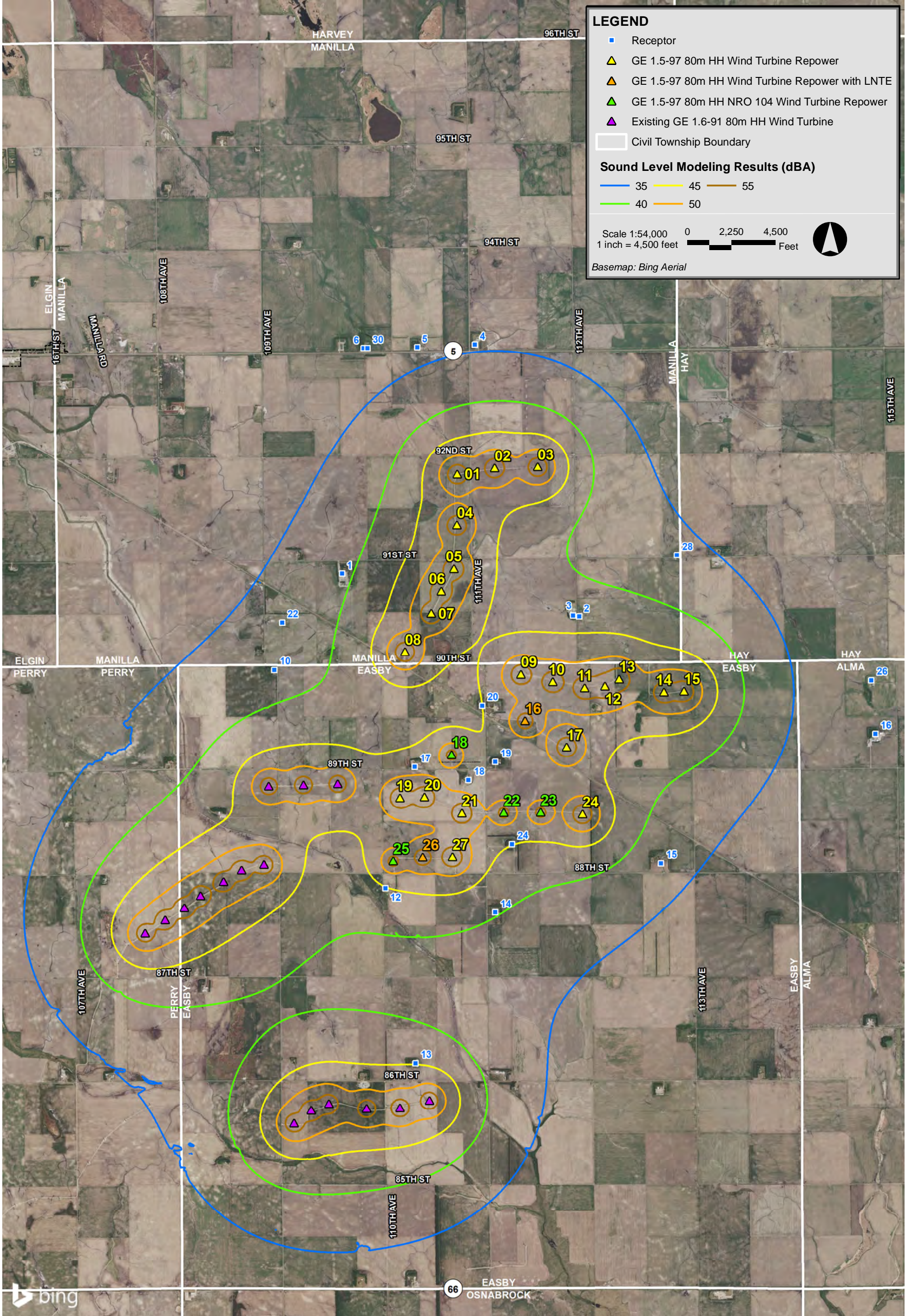


Otter Tail Langdon Wind Repower Cavalier County, North Dakota

5.3 Sound Level Modeling Results

All modeled sound levels, as output from CadnaA are A-weighted equivalent sound levels (L_{eq} , dBA). Table B-1.1 in Appendix B shows the predicted “Cumulative” broadband (dBA) sound levels at the 21 receptors modeled for the Project. The broadband L_{eq} sound levels range from 30 to 49 dBA. These sound levels represent the cumulative worst-case future L_{eq} sound levels produced by all Project wind turbines and other non-Project existing wind turbines in the vicinity of the Project. The maximum modeled sound level of 49 dBA occurs at receptor #17, which has signed a waiver with Otter Tail Power. The highest modeled sound level at a receptor which has not signed a waiver with Otter Tail Power is 45 dBA, which occurs at five receptors (#12, #13, #19, #20, and #24). Table B-1.2 in Appendix B shows the predicted “Cumulative” sound levels sorted from high to low.

In addition to the discrete modeling points, L_{eq} sound level isolines generated from the modeling grid are presented in Figure 5-2.



Otter Tail Langdon Wind Repower Cavalier County, North Dakota

6.0 EVALUATION OF SOUND LEVELS

The Project is subject to the requirements contained in the North Dakota Energy Conversion Facility Siting Criteria. Sound levels from operation of the Project are limited by these regulations to 45 dBA within 100 feet of an inhabited residence or community building. All modeled sound levels, as output from CadnaA and presented in Appendix B, are A-weighted equivalent sound levels (L_{eq} , dBA). These levels may be used in evaluating measured sound pressure levels over typical averaging durations, (i.e., ten (10) minutes or one (1) hour).

A review of Table B-1.2 in Appendix B shows the highest sound level within 100 feet of an inhabited residence or community building that has not signed a waiver with Otter Tail Power in this analysis to be 45 dBA. This occurs at Receptors #12, #13, #19, #20, and #24. Therefore, the Project is in compliance with the North Dakota Administrative Code Energy Conversion Facility Siting Criteria with respect to sound.

7.0 CONCLUSIONS

A comprehensive sound level modeling assessment was conducted for the Otter Tail Langdon Wind Repower Project within Cavalier County, North Dakota. Cumulative sound levels resulting from the operation of all 27 Project wind turbines and other nearby wind turbines were calculated at 21 modeling receptors, and isolines were generated from a grid encompassing the area surrounding the wind turbines. The predicted L_{eq} sound levels at all receptors in the study area ranged from 30 to 49 dBA. Predicted cumulative sound levels at all receptor locations that have not signed waivers with Otter Tail Power are at or below the state limit of 45 dBA within 100 feet of an inhabited residence or community building; therefore, the Project meets the requirements with respect to sound in the regulations.

Appendix A

Sound Source Coordinates

Table A-1: Wind Turbine Coordinates

Wind Turbine ID	Wind Turbine Type	Hub Height (m)	Coordinates NAD83 UTM Zone 14N (meters)	
			X (Easting)	Y (Northing)
1	GE 1.5-97	80	554512.89	5399273.42
2	GE 1.5-97	80	555093.15	5399368.14
3	GE 1.5-97	80	555761.58	5399385.76
4	GE 1.5-97	80	554506.00	5398484.16
5	GE 1.5-97	80	554460.98	5397805.59
6	GE 1.5-97	80	554265.70	5397458.96
7	GE 1.5-97	80	554107.45	5397113.03
8	GE 1.5-97	80	553701.25	5396519.70
9	GE 1.5-97	80	555499.47	5396170.35
10	GE 1.5-97	80	555993.44	5396053.20
11	GE 1.5-97	80	556487.15	5395957.99
12	GE 1.5-97	80	556803.45	5395983.30
13	GE 1.5-97	80	557022.92	5396097.03
14	GE 1.5-97	80	557716.46	5395892.46
15	GE 1.5-97	80	558025.59	5395907.10
16	GE 1.5-97	80	555565.55	5395448.41
17	GE 1.5-97	80	556209.54	5395043.50
18	GE 1.5-97	80	554422.73	5394925.71
19	GE 1.5-97	80	553627.01	5394251.82
20	GE 1.5-97	80	554002.47	5394266.09
21	GE 1.5-97	80	554586.54	5394016.06
22	GE 1.5-97	80	555233.79	5394022.39
23	GE 1.5-97	80	555807.60	5394028.07
24	GE 1.5-97	80	556455.78	5394000.98
25	GE 1.5-97	80	553518.98	5393272.06
26	GE 1.5-97	80	553974.95	5393332.01
27	GE 1.5-97	80	554438.15	5393336.49

Appendix B

Sound Level Modeling Results - Tabular

Table B-1.1: Sound Level Modeling Results Sorted by Receptor ID

Receptor ID	Coordinates UTM NAD83 Zone 14N		Source Only L _{eq} Sound Level (dBA)
	X (m)	Y (m)	
1	552727.47	5397731.93	39
1-E	552757.93	5397732.22	39
1-N	552727.18	5397762.40	39
1-S	552727.75	5397701.46	39
1-W	552697.00	5397731.64	39
2	556403.32	5397067.11	43
2-E	556433.79	5397067.42	43
2-N	556403.02	5397097.58	43
2-S	556403.63	5397036.65	43
2-W	556372.86	5397066.81	43
3	556310.83	5397083.06	43
3-E	556341.30	5397083.37	43
3-N	556310.53	5397113.53	43
3-S	556311.14	5397052.60	43
3-W	556280.37	5397082.76	43
4	554786.86	5401286.18	34
4-E	554817.32	5401286.48	34
4-N	554786.56	5401316.65	34
4-S	554787.15	5401255.72	35
4-W	554756.39	5401285.89	34
5	553893.01	5401245.18	34
5-E	553923.48	5401245.47	34
5-N	553892.72	5401275.65	34
5-S	553893.31	5401214.71	34
5-W	553862.54	5401244.89	34
6	553064.00	5401229.01	32
6-E	553094.47	5401229.30	32
6-N	553063.71	5401259.48	32
6-S	553064.29	5401198.54	32
6-W	553033.54	5401228.72	32
10	551679.19	5396237.94	38
10-E	551709.66	5396238.22	38
10-N	551678.91	5396268.41	38
10-S	551679.47	5396207.48	38
10-W	551648.72	5396237.66	38
12	553399.70	5392853.28	45
12-E	553430.17	5392853.57	45
12-N	553399.41	5392883.75	45
12-S	553399.99	5392822.82	44
12-W	553369.24	5392852.99	45
13	553865.94	5390139.19	45
13-E	553896.41	5390139.48	45

Table B-1.1: Sound Level Modeling Results Sorted by Receptor ID

Receptor ID	Coordinates		Source Only L _{eq} Sound Level (dBA)
	UTM NAD83 Zone 14N		
	X (m)	Y (m)	
13-N	553865.65	5390169.66	44
13-S	553866.23	5390108.73	45
13-W	553835.47	5390138.90	45
14	555099.83	5392477.80	40
14-E	555130.30	5392478.10	40
14-N	555099.53	5392508.27	41
14-S	555100.13	5392447.33	40
14-W	555069.36	5392477.50	41
15	557670.73	5393238.99	37
15-E	557701.20	5393239.31	37
15-N	557670.42	5393269.46	37
15-S	557671.04	5393208.53	37
15-W	557640.26	5393238.68	37
16	560994.89	5395249.28	31
16-E	561025.35	5395249.61	30
16-N	560994.56	5395279.75	31
16-S	560995.22	5395218.82	31
16-W	560964.42	5395248.95	31
17	553852.25	5394735.12	48
17-E	553882.72	5394735.41	48
17-N	553851.96	5394765.58	48
17-S	553852.54	5394704.65	49
17-W	553821.78	5394734.82	48
18	554687.38	5394531.49	48
18-E	554717.85	5394531.78	48
18-N	554687.09	5394561.95	48
18-S	554687.68	5394501.02	48
18-W	554656.91	5394531.19	48
19	555101.52	5394814.86	45
19-E	555131.99	5394815.15	45
19-N	555101.22	5394845.32	45
19-S	555101.82	5394784.39	45
19-W	555071.05	5394814.56	45
20	554900.85	5395685.10	45
20-E	554931.32	5395685.40	45
20-N	554900.55	5395715.57	45
20-S	554901.15	5395654.63	45
20-W	554870.38	5395684.80	45
22	551800.82	5396971.39	37
22-E	551831.29	5396971.67	37
22-N	551800.54	5397001.86	37
22-S	551801.10	5396940.92	37

Table B-1.1: Sound Level Modeling Results Sorted by Receptor ID

Receptor ID	Coordinates UTM NAD83 Zone 14N		Source Only L _{eq} Sound Level (dBA)
	X (m)	Y (m)	
22-W	551770.35	5396971.11	37
24	555362.96	5393534.70	45
24-E	555393.43	5393535.00	45
24-N	555362.66	5393565.17	45
24-S	555363.26	5393504.23	45
24-W	555332.50	5393534.40	45
26	560931.88	5396078.47	31
26-E	560962.34	5396078.80	31
26-N	560931.55	5396108.93	31
26-S	560932.21	5396048.00	31
26-W	560901.41	5396078.13	31
28	557918.14	5398017.75	36
28-E	557948.60	5398018.07	36
28-N	557917.82	5398048.22	36
28-S	557918.45	5397987.28	37
28-W	557887.67	5398017.44	37
30	553120.55	5401228.25	32
30-E	553151.02	5401228.54	32
30-N	553120.26	5401258.72	32
30-S	553120.84	5401197.78	33
30-W	553090.08	5401227.96	32

Table B-1.2: Sound Level Modeling Results Sorted by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Source Only L _{eq} Sound Level (dBA)
	X (m)	Y (m)	
17-S	553852.54	5394704.65	49
17	553852.25	5394735.12	48
17-E	553882.72	5394735.41	48
17-W	553821.78	5394734.82	48
18-S	554687.68	5394501.02	48
18-W	554656.91	5394531.19	48
17-N	553851.96	5394765.58	48
18	554687.38	5394531.49	48
18-E	554717.85	5394531.78	48
18-N	554687.09	5394561.95	48
24-N	555362.66	5393565.17	45
19	555101.52	5394814.86	45
19-E	555131.99	5394815.15	45
19-N	555101.22	5394845.32	45
19-S	555101.82	5394784.39	45
19-W	555071.05	5394814.56	45
20-E	554931.32	5395685.40	45
24-W	555332.50	5393534.40	45
12-N	553399.41	5392883.75	45
13-S	553866.23	5390108.73	45
24	555362.96	5393534.70	45
24-E	555393.43	5393535.00	45
20	554900.85	5395685.10	45
20-N	554900.55	5395715.57	45
20-S	554901.15	5395654.63	45
12-E	553430.17	5392853.57	45
24-S	555363.26	5393504.23	45
13-W	553835.47	5390138.90	45
20-W	554870.38	5395684.80	45
12	553399.70	5392853.28	45
13	553865.94	5390139.19	45
13-E	553896.41	5390139.48	45
12-W	553369.24	5392852.99	45
12-S	553399.99	5392822.82	44
13-N	553865.65	5390169.66	44
2-S	556403.63	5397036.65	43
3-S	556311.14	5397052.60	43
2	556403.32	5397067.11	43
2-E	556433.79	5397067.42	43
2-W	556372.86	5397066.81	43
3	556310.83	5397083.06	43
3-E	556341.30	5397083.37	43

Table B-1.2: Sound Level Modeling Results Sorted by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Source Only L _{eq} Sound Level (dBA)
	X (m)	Y (m)	
3-W	556280.37	5397082.76	43
2-N	556403.02	5397097.58	43
3-N	556310.53	5397113.53	43
14-N	555099.53	5392508.27	41
14-W	555069.36	5392477.50	41
14	555099.83	5392477.80	40
14-E	555130.30	5392478.10	40
14-S	555100.13	5392447.33	40
1-E	552757.93	5397732.22	39
1-S	552727.75	5397701.46	39
1	552727.47	5397731.93	39
1-N	552727.18	5397762.40	39
1-W	552697.00	5397731.64	39
10-S	551679.47	5396207.48	38
10	551679.19	5396237.94	38
10-E	551709.66	5396238.22	38
10-N	551678.91	5396268.41	38
10-W	551648.72	5396237.66	38
15-W	557640.26	5393238.68	37
15	557670.73	5393238.99	37
15-N	557670.42	5393269.46	37
15-S	557671.04	5393208.53	37
15-E	557701.20	5393239.31	37
22-E	551831.29	5396971.67	37
22-S	551801.10	5396940.92	37
22	551800.82	5396971.39	37
22-N	551800.54	5397001.86	37
22-W	551770.35	5396971.11	37
28-S	557918.45	5397987.28	37
28-W	557887.67	5398017.44	37
28	557918.14	5398017.75	36
28-E	557948.60	5398018.07	36
28-N	557917.82	5398048.22	36
4-S	554787.15	5401255.72	35
4	554786.86	5401286.18	34
4-E	554817.32	5401286.48	34
4-W	554756.39	5401285.89	34
4-N	554786.56	5401316.65	34
5-S	553893.31	5401214.71	34
5-E	553923.48	5401245.47	34
5	553893.01	5401245.18	34
5-W	553862.54	5401244.89	34

Table B-1.2: Sound Level Modeling Results Sorted by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Source Only L _{eq} Sound Level (dBA)
	X (m)	Y (m)	
5-N	553892.72	5401275.65	34
30-S	553120.84	5401197.78	33
6-S	553064.29	5401198.54	32
30	553120.55	5401228.25	32
30-E	553151.02	5401228.54	32
6	553064.00	5401229.01	32
6-E	553094.47	5401229.30	32
30-N	553120.26	5401258.72	32
30-W	553090.08	5401227.96	32
6-N	553063.71	5401259.48	32
6-W	553033.54	5401228.72	32
26	560931.88	5396078.47	31
26-S	560932.21	5396048.00	31
26-W	560901.41	5396078.13	31
26-E	560962.34	5396078.80	31
26-N	560931.55	5396108.93	31
16-W	560964.42	5395248.95	31
16	560994.89	5395249.28	31
16-N	560994.56	5395279.75	31
16-S	560995.22	5395218.82	31
16-E	561025.35	5395249.61	30

THIS INSTRUMENT WAS DRAFTED BY
AND AFTER RECORDING RETURN TO:
Otter Tail Power Company
PO Box 496
Fergus Falls, MN 56538
Attention: Bryce Haugen
(218) 739-8385

THIS SOUND WAIVER AGREEMENT (this “**Agreement**”), is dated and effective as of March 6, 2023 (“**Effective Date**”), by and between Marvin Heck and Martha Heck, as Trustees under the Heck Family Revocable Living Trust, dated December 31, 2005 (“**Owner**”), with a mailing address of 203 2nd Ave, Box 236, Munich, North Dakota 58352 and Otter Tail Power Company, a Minnesota corporation (“**OTP**”), with a mailing address of PO Box 496, Fergus Falls, Minnesota 56538.

RECITALS:

A. Owner owns a residence located on certain real property in Cavalier County, North Dakota, as more particularly described on the attached Exhibit A (“**Owner Property**”).

B. OTP owns, operates, and maintains a wind energy generation facility (“**Project**”) on certain real property located adjacent to and in the vicinity of the Owner Property (collectively, the “**Project Property**”). OTP intends to install new turbine technology on the Project (“**Project Upgrades**”).

C. To the extent applicable, OTP intends for the Project, with the Project Upgrades, to comply with the North Dakota Public Service Commission’s (“**Commission**”) siting rules for wind energy generation facilities. One of the Commission’s current rules states that sound levels from a wind energy generation facility must not exceed 45 A-weighted decibels (“**dba**”) within 100 feet of an inhabited residence (“**Sound Requirement**”), unless a waiver is obtained from the owner of the residence. North Dakota Administrative Code Section 69-06-08-01(4). Based on a third-party sound expert’s analysis, Project sound levels with the Project Upgrades may exceed 45 dba (but are expected to be below 50 dba) within 100 feet of Owner’s residence on the Owner Property.

D. Owner is willing to grant to OTP a waiver of the Sound Requirement for the Owner's residence on the Owner Property as it relates to OTP's Project on the Project Property, as set forth below.

AGREEMENT:

NOW, THEREFORE, in consideration of the premises and other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the parties hereto agree that the Recitals set forth above are hereby incorporated into the Agreement and further agree as follows:

1. **Sound Waiver.** Owner agrees to and hereby does waive the Project's compliance with the Sound Requirement with respect to the residence on the Owner Property.
2. **Cooperation.** Owner agrees to not publicly oppose or otherwise object to the Project and to execute and deliver such reasonably requested documents and take such action as may be reasonably requested by OTP to carry out the purposes and intent of this Agreement.
3. **Term of Agreement.** The term of this Agreement shall commence on the Effective Date and shall continue until December 31, 2105.
4. **Consideration.** The consideration for this Agreement is set forth on the attached Exhibit B, which Exhibit B shall be removed before recording this Agreement in the official real property records of the county in which the Owner Property is located. Owner and OTP agree that such removal of Exhibit B prior to recording shall not affect the validity of this Agreement.
5. **Termination.** Owner shall have the right, at any time during the Term, to terminate this Agreement as to all or any part of the Owner Property by providing written notice to Owner. Following any such termination, OTP is authorized to file a release of this Agreement in the official real property records of the county in which the Owner Property is located.
6. **Authority; Title.** Owner represents and warrants that it is the sole owner of the Owner Property in fee simple and has the full and unrestricted right and authority to execute and deliver this Agreement and to grant to OTP the waiver and other rights granted hereunder. Each person signing this Agreement on behalf of Owner is authorized to do so, and all persons having any ownership or interest in the Owner Property have signed this Agreement on behalf of Owner.
7. **Assignment.** OTP shall have the right at any time, without need for consent from Owner, to assign or convey all or any portion of this Agreement to an assignee or assignees, on an exclusive or nonexclusive basis, or to mortgage or collaterally assign all or any part of its interest in the Agreement and its rights under the Agreement to any entity (each a "**Mortgagee**" and collectively, "**Mortgagees**"). OTP may mortgage or encumber any part of OTP's rights and interests under the Agreement without the need for consent from Owner, provided that any such mortgage attaches only to OTP's rights and does not otherwise attach to the Owner Property. Owner shall have the right to sell, convey, or transfer its interest in the Owner Property, or a portion thereof, without the need for consent from OTP, provided that Owner shall, prior to any such sale, conveyance, or other transfer, give written notice to OTP thereof, which notice shall include the name, address, and telephone number of the proposed transferee.

8. **Notice.** All communications required or permitted by this Agreement shall be given in writing by personal delivery (confirmed by courier delivery service) or first-class U.S. mail, postage prepaid, return receipt requested, certified, addressed as follows:

If to Owner:

Marvin Heck & Martha Heck, Trustees
203 2nd Ave, Box 236
Munich, North Dakota 58352

If to OTP:

Otter Tail Power Company
Attn: Bryce Haugen
PO Box 496
Fergus Falls, Minnesota 56538
Phone: 218-739-8385
E-mail: bhaugen@otpc.com

Any party may change its address for purposes of this paragraph by giving notice of such change to the other parties in the manner provided in this Section 7. Any notice provided for herein shall become effective only upon actual receipt by the party to whom it is given, unless such notice is mailed by certified mail, return receipt requested, in which case it shall be deemed to be received five (5) business days after the date mailed.

9. **Recording.** Owner and OTP agree that this Agreement may be recorded by OTP in the official real property records of the county in which the Owner Property is located.

10. **Miscellaneous.** This Agreement shall be governed by the laws of the State of North Dakota. This Agreement constitutes the entire agreement between OTP and Owner with respect to the subject matter hereof and supersedes any and all prior oral or written understandings, representations or statements among the parties with respect to the subject matter hereof. This Agreement may not be amended except in a writing executed by both parties. This Agreement may be executed in two or more counterparts and by different parties on separate counterparts, all of which shall be considered one and the same agreement and each of which shall be deemed an original. Nothing herein shall be deemed to create a joint venture or partnership between parties hereto. In the event of breach of this Agreement, OTP shall be entitled to all remedies provided at law or in equity, including injunctive relief. The prevailing party in any action arising out of, or in connection with, this Agreement shall be entitled to be reimbursed its costs and expenses, including reasonable attorney fees, by the non-prevailing party. NEITHER PARTY SHALL BE ENTITLED TO, AND OWNER AND OTP HEREBY WAIVE ANY AND ALL RIGHTS TO RECOVER, CONSEQUENTIAL, INCIDENTAL, AND PUNITIVE OR EXEMPLARY DAMAGES, HOWEVER ARISING, WHETHER IN CONTRACT, IN TORT, OR OTHERWISE, UNDER OR WITH RESPECT TO ANY ACTION TAKEN IN CONNECTION WITH THIS AGREEMENT.

EXHIBIT A

Legal Description of the Owner Property

The Southwest Quarter (SW-1/4) of Section Four (4),
Township One Hundred Sixty (160), Range Fifty-nine (59) West.
Cavalier County, State of North Dakota

Parcel Identification Number: 08021000

WIND FARM EASEMENT AGREEMENT

1. **Parties.** This is an agreement dated 15 of May, 2007 between Edwin Pearson and Gail Pearson, husband and wife, and their successors in interest ("Owner"), as owners of the real property described on attached Exhibit A ("Owner's Property"), and Langdon Wind, LLC, a Delaware limited liability company, a Delaware limited liability company, and its successors in interest ("FPLE").

2. **Purpose.** This agreement is a grant by Owner to FPLE of the easements and other specified rights in Owner's Property needed by FPLE for its Langdon Wind Farm. It establishes the rights of the parties and their duties to each other with regard to the financing, construction, operation, repair, maintenance, replacement, and removal of all Wind Farm Improvements whether located on or off Owner's Property.

3. **Definitions.** Capitalized terms used in this agreement have the meaning given them in the text of the agreement or in this definitions section.

"Access Rights" means the right of unobstructed ingress and egress to and from the Wind Farm Improvements by FPLE, its agents, contractors, successors and assigns.

"Annual Installment Payments" means the amounts shown in the Easement Compensation Sheet attached as **Exhibit D**.

"Collection Facilities" means the underground and above ground electrical collection and telecommunications lines, splice boxes, and all other devices and equipment used to connect the Turbines to electrical collection lines connected to the power grid and to the Wind Farm's Met Towers and operations and maintenance facilities.

"Easements" means the Turbine Site Easement, Access Easement, Collection Easement, Construction Easement, Wind Non-Obstruction Easement, Noise Easement, Overhang Easement, Met Tower Site Easement and Met Tower Access Easement.

"Easement Properties" means the portions of Owner's Property subject to the Easements granted in Section 6 of this agreement.

"Effective Date" means the date when all conditions precedent set forth in Sections 5.1 and 5.2 of this agreement are satisfied or waived, and all other documents required by FPLE have been signed and delivered by Owner.

"**Exhibit B**" means the preliminary Easement Plan attached to this agreement at the time it is signed showing the approximate planned location of all Wind Farm Improvements and Easements located on the Owner's Property.

"**Exhibit C**" means the final as-built Easement Plan to be attached to this agreement by FPLE as a replacement for **Exhibit B** after construction of the Wind Farm Improvements showing the

to the location of all structures greater than forty (40) feet in height located one thousand (1000) or less from any Turbine or Met Tower whether located on the Wind Farm. Approval shall be based on whether, in FPLE's sole judgment, informed by appropriate professional engineering and meteorological opinions, the proposed structures at the proposed location are likely to cause Interference.

This Wind Non-Obstruction Easement shall not be interpreted to prevent Owner from granting oil and gas exploration or production rights on Owner's Property, however no drilling rigs or other structures shall be located within three hundred (300) feet of any Turbine or within two hundred twenty-five (225) feet of any Met Tower except with FPLE's prior written consent. Owner shall notify FPLE as soon as Owner knows of oil and gas exploration or production plans. To the extent it does not interfere with the proposed oil or gas exploration or production, Owner shall cooperate with FPLE in the exercise of Owner's oil and gas rights to minimize Interference. In the event any oil and gas related activities are commenced on Owner's Property, Owner agrees not to object to an action by FPLE against a third party to reasonably protect FPLE's interests hereunder. In turn, FPLE agrees not to interfere with Owner's right to surface damages from oil and gas operations, exploration, drilling or granting of pipeline easements, as long as any compensation that Owner may receive shall not diminish or adversely affect any compensation due to FPLE for the Wind Farm Improvements.

6.6 Noise Easement. Owner grants FPLE an easement for the right and privilege to generate and maintain audible noise levels in excess of fifty (50) dbA on and above the Noise Easement Property at any or all times of the day or night ("Noise Easement"). The "Noise Easement Property" shall mean the Owner's Property except those portions within a 200-foot radius circle (or lesser distance with Owner's prior written consent) centered on the inside of each presently existing, occupied residence on the Owner's Property. If noise levels emanating from the Turbines exceed fifty (50) dbA without the Owner's written consent as measured within 200 feet (or lesser agreed distance) from the inside of a presently existing residence on Owner's Property by an independent professional applying commonly accepted measurement instruments and standards, FPLE shall reduce the noise level to 50 dbA at 200 feet (or lesser agreed distance) from the residence. Measures to be taken by FPLE may include installing insulation or sound deadening material in the offending Turbine(s); installing landscaping, insulation, and sound deadening material at the residence; or, changing the operation of the Turbine(s) to reduce noise output.

6.7 Overhang Easement. Owner grants FPLE an easement for the right and privilege to permit the rotors of Turbines located on adjacent properties to overhang a portion of the Owner's Property identified and shown on **Exhibit B** (the "Overhang Easement Property") by no more than 110 feet at a height of at least 100 feet above the ground ("Overhang Easement"). Owner shall not interfere with the operation of Turbine rotors that overhang the Overhang Easement Property.

6.8 Met Tower Site Easement. Owner grants FPLE an easement to construct, operate, replace, relocate, remove, and maintain a Met Tower and Collection Facilities on each Met Tower Site identified and located as shown on **Exhibits B or C**. Each Met Tower Site subject to the burden of this easement is referred to as a "Met Tower Site Easement Property."

Owner:

Edwin Pearson and Gail Pearson
Husband and Wife

Edwin Pearson
Edwin Pearson

Gail Pearson
Gail Pearson

FPLE:

Langdon Wind, LLC,
A Delaware limited liability company

By: [Signature]
Name: Dean R. Gossetin
Title: Vice President

EXHIBIT A

Legal description of Owner's Property

Parcel 1

Northeast Quarter (NE $\frac{1}{4}$) of Section 34, Township 161 North, Range 59 West of the Fifth Principal Meridian in Cavalier County, North Dakota.

Parcel 2

Northeast Quarter of the Northeast Quarter (NE $\frac{1}{4}$ NE $\frac{1}{4}$) of Section 9, Township 160 North, Range 59 West of the Fifth Principal Meridian in Cavalier County, North Dakota.

AFTER RECORDING RETURN TO

Orin Shakerdge, Esq.
 FPL Energy, LLC
 700 Universe Blvd. (LAW/JB)
 Juno Beach, FL 33408

State of North Dakota]
 County of Cavalier]
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**ASSIGNMENT AND ASSUMPTION
 OF REAL PROPERTY INTERESTS**

THIS ASSIGNMENT AND ASSUMPTION OF REAL PROPERTY INTERESTS (the "Assignment") is made and dated as of this 26th day of November, 2007 (the "Effective Date") by and between Langdon Wind, LLC, a Delaware limited liability company ("Assignor") and Otter Tail Corporation, a Minnesota Corporation doing business as Otter Tail Power Company ("Assignee").

RECITALS

WHEREAS, Assignor is currently developing a wind-powered electric generating project with a nameplate capacity of approximately 159 megawatts ("MW") located in Cavalier County, North Dakota (the "Langdon Project");

WHEREAS, Assignee desires to purchase a 40.5 MW portion of the Langdon Project and the Assets related thereto (the "OTP Project");

WHEREAS, Assignor desires to sell, and Assignee desires to purchase the OTP Project on the terms and subject to the conditions set forth in the Purchase and Sale Agreement entered into by and between Assignor and Assignee on August 30, 2007 ("Agreement");

WHEREAS, Assignor entered into Wind Farm Easement Agreements and Collection Easements (collectively the "Easements") with various property owners for the purpose of constructing, operating and maintaining the Langdon Project;

WHEREAS, pursuant to the Agreement, Assignor desires to assign to Assignee, and Assignee desires to accept from Assignor an assignment of those Easements in the Langdon Project for the OTP Project as more specifically set forth herein.

NOW, THEREFORE, in consideration of Ten and NO/100 Dollars (\$10.00), and other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, the parties agree as follows:

AGREEMENT

State of North Dakota]
County of Cavalier]
Recorded : 11/26/2007 at 4:10 PM

(This space reserved for recording information)

1. Assignor hereby grants, assigns, transfers and conveys to Assignee, all of its rights, title and interest in and to the Easements set forth in **Exhibit "A"** and legally described in **Exhibit "B"** attached hereto and made a part hereof..

2. Assignee hereby accepts said assignment as the successor to the Easements and agrees to comply with each of the terms and conditions of the assigned Easements, from and after the Effective Date. Assignor and Assignee shall provide written notice of this Assignment to the various property owners that are parties to the Easements.

3. If any provision of this Assignment or the application of any such provision to any person or circumstance shall be held invalid, illegal or unenforceable in any respect by a court of competent jurisdiction, such invalidity, illegality or unenforceability shall not affect any other provision hereof.

4. No provision set forth in this Assignment shall be deemed to enlarge, alter or amend the terms or provisions of the Easements. This Assignment shall be governed by and construed in accordance with the laws of the State of North Dakota.

5. This Assignment may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

6. This Assignment shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns and may be executed in counterparts, each of which shall be deemed an original and all of which shall be one and the same instrument.

State of North Dakota]
County of Cavalier]
Recorded : 11/26/2007 at 4:10 PM

(This space reserved for recording information)

IN WITNESS WHEREOF, Langdon and OTP have executed this Assignment as of the Effective Date.


LANGDON:
Langdon Wind, LLC,
a Delaware limited liability company

By: *[Signature]*
Name: **Dean R. Gosselin**
Title: **Vice President**

STATE OF FLORIDA

COUNTY OF PALM BEACH

The foregoing instrument was duly acknowledged before me this 20th day of November, 2007, by Dean R. Gosselin, as Vice President of Langdon Wind, LLC, a Delaware limited liability company, who subscribed to the foregoing instrument and acknowledged that he executed the same on behalf of said limited liability company and that he was duly authorized to do so.

NOTARY PUBLIC-STATE OF FLORIDA
 Nancy E. Llana
Commission # DD708596
Expires: NOV. 14, 2011
BONDED THRU ATLANTIC BONDING CO, INC.

Nancy E. Llana
Notary Public, State of Florida
Nancy E. Llana
Notary Printed Name
11/14/2011
My Commission Expires:

State of North Dakota]
County of Cavalier]
Recorded : 11/26/2007 at 4:10 PM

(This space reserved for recording information)

IN WITNESS WHEREOF, Langdon and OTP have executed this Assignment as of the Effective Date.

OTP:
Otter Tail Corporation,
a Minnesota corporation d/b/a Otter Tail Power
Company

By: *Chuck MacFarlane*
Name: *Chuck MacFarlane*
Title: *President*

STATE OF MINNESOTA

COUNTY OF OTTER TAIL

The foregoing instrument was duly acknowledged before me this 19th day of November, 2007, by Chuck MacFarlane, as President of Otter Tail Corporation, a Minnesota corporation d/b/a Otter Tail Power Company, who subscribed to the foregoing instrument and acknowledged that he executed the same on behalf of said limited liability company and that he was duly authorized to do so.

Darla M. Neville
Notary Public, State of Minnesota
Darla M. Neville
Notary Printed Name
1-31-2010
My Commission Expires:



State of North Dakota]
County of Cavalier]
Recorded : 11/26/2007 at 4:10 PM

(This space reserved for recording information)

EXHIBIT A
Easements to be Assigned

Tract 43.

That certain Wind Farm Easement Agreement by and between Richard Moos and Wanda Moos, husband and wife, subject to a life estate in Rosalia Moos, a single woman ("Owner") and Langdon Wind, LLC, a Delaware limited liability company ("FPLE") dated May 15, 2007. Memorandum of Easements recorded as Document No.: 227979 in Cavalier County, North Dakota.

Tract 44.

That certain Wind Farm Easement Agreement by and between Marvin Heck and Martha Beth Heck, husband and wife, subject to a life estate of Edwin Pearson, a married man to Gail Pearson ("Owner") and Langdon Wind, LLC, a Delaware limited liability company ("FPLE") dated May 15, 2007. Memorandum of Easements recorded as Document No.: 227981 in Cavalier County, North Dakota.

Tract 45.

That certain Wind Farm Easement Agreement by and between Dawn Heck, a single woman and Stacy Heck, a single woman, and subject to a life estate of Edwin Pearson, a married man to Gail Pearson ("Owner") and Langdon Wind, LLC, a Delaware limited liability company ("FPLE") dated May 15, 2007. Memorandum of Easements recorded as Document No.: 227995 in Cavalier County, North Dakota.

Tracts 46A & 46B. That certain Wind Farm Easement Agreement by and between Edwin Pearson and Gail Pearson, husband and wife ("Owner") and Langdon Wind, LLC, a Delaware limited liability company ("FPLE") dated May 15, 2007. Memorandum of Easements recorded as Document No.: 227996 in Cavalier County, North Dakota.

Tract 47.

That certain Wind Farm Easement Agreement by and between Jeff Ratzlaff, a single man and Mark Ratzlaff and Rebecca Ratzlaff, husband and wife ("Owner") and Langdon Wind, LLC, a Delaware limited liability company ("FPLE") dated May 15, 2007. Memorandum of Easements recorded as Document No.: 227991 in Cavalier County, North Dakota.

Appendix B – Shadow Flicker Assessment Results



SHADOW FLICKER MODELING REPORT

Langdon Wind Energy Center Repower Project Cavalier County, North Dakota

Prepared for:

Atwell, LLC
311 North Main
Ann Arbor, Michigan 48104

Prepared by:



Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

February 24, 2023

TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY	1-1
2.0	INTRODUCTION	2-1
3.0	SHADOW FLICKER MODELING	3-1
3.1	Modeling Methodology	3-1
3.2	Results	3-5

LIST OF APPENDICES

Appendix A	Wind Turbine Coordinates
Appendix B	Shadow Flicker Modeling Results: Modeling Receptors

LIST OF FIGURES

Figure 2-1	Aerial Locus	2-2
Figure 3-1	Shadow Flicker Modeling Locations	3-3
Figure 3-2	Shadow Flicker Modeling Results	3-6

LIST OF TABLES

Table 3-1	Monthly Percent of Possible Sunshine	3-4
Table 3-2	Operational Hours per Wind Direction Sector	3-4

1.0 EXECUTIVE SUMMARY

The Langdon Wind Energy Center Repowering Project (the Project) is an existing wind park in Cavalier County, North Dakota that is planned to be repowered by Otter Tail Power Company (Otter Tail). Atwell has retained Epsilon Associates, Inc. (Epsilon) to conduct a shadow flicker assessment for the proposed Project. This report presents results of the shadow flicker modeling from the proposed repower and other existing Langdon Wind wind turbines in Cavalier County.

Shadow flicker modeling was conducted for the 27 Otter Tail Langdon General Electric (GE) repowered wind turbines and a total of 16 existing Langdon Wind I and Langdon Wind II wind turbines; thus, a grand total of 43 wind turbines were included in the shadow flicker model. The purpose of this analysis is to predict the annual durations of wind turbine shadow flicker at nearby receptors. Shadow flicker modeling was conducted for all Otter Tail Langdon Wind Repower wind turbines and existing Langdon Wind I and Langdon Wind II wind turbines within 1.5 miles of a modeling receptor.

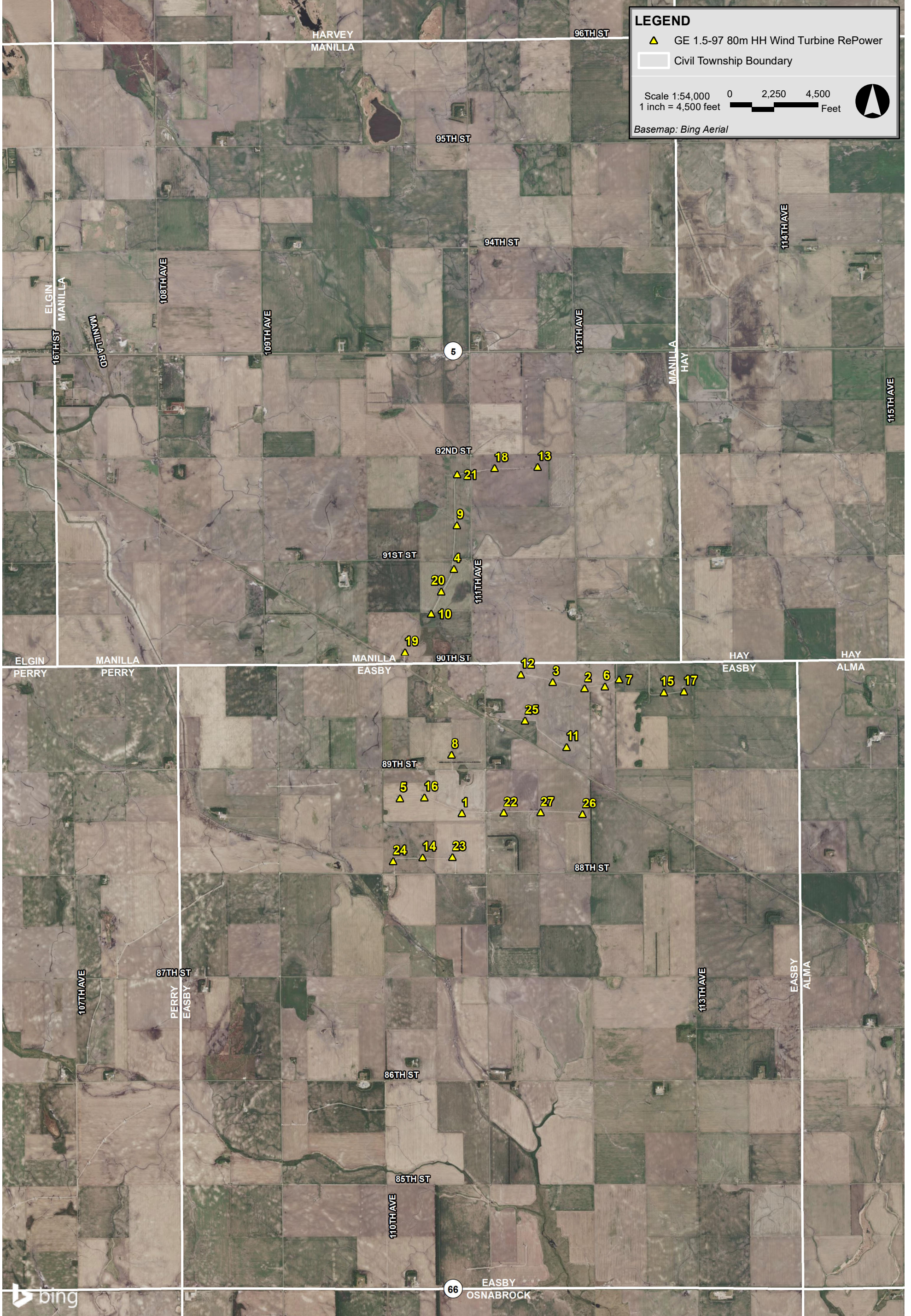
The maximum expected cumulative annual duration of shadow flicker at a modeling receptor resulting from the operation of all Otter Tail Langdon Wind and existing Langdon Wind I and Langdon Wind II wind turbines is 18 hours, 21 minutes per year. The modeling results are conservative in that modeling receptors were treated as “greenhouses” (i.e., having windows on all sides) and the surrounding area was assumed to be without vegetation or structures (“bare earth”).

2.0 INTRODUCTION

The Langdon Wind Energy Center Repower Project will consist of 27 repowered wind turbines. The proposed wind turbines are all GE 1.5 MW units with a rotor diameter of 97 meters and a hub height of 80 meters. Figure 2-1 shows the locations of the 27 wind turbines over aerial imagery.

Shadow flicker can be defined as an intermittent change in the intensity of light in a given area resulting from the operation of a wind turbine due to its interaction with the sun. An indoor observer experiences repeated changes in the brightness of the room as shadows cast from the wind turbine blades briefly pass by windows as the blades rotate. In order for this to occur, the wind turbine must be operating, the sun must be shining, and the window must be within the shadow region of the wind turbine, otherwise there is no shadow flicker. A stationary wind turbine only generates a stationary shadow similar to any other structure.

This report presents the findings of a shadow flicker modeling study for the Project. The wind turbines were modeled with the WindPRO software package using information provided by Atwell. The expected annual duration of shadow flicker was calculated at modeling receptors and shadow flicker isolines for the area surrounding the Project were generated. The results of the modeling are found within this report.



Otter Tail Langdon Wind Repower Cavalier County, North Dakota

3.0 SHADOW FLICKER MODELING

3.1 Modeling Methodology

Shadow flicker was modeled using a software package, WindPRO version 3.6. WindPRO is a software suite developed by EMD International A/S and is used for assessing potential environmental impacts from wind turbines. Using the Shadow module within WindPRO, worst-case shadow flicker in the area surrounding the wind turbines was calculated based on data inputs including: location of the wind turbines, location of discrete receptor points, wind turbine dimensions, flicker calculation limits, and terrain data. Based on these data, the model was able to incorporate the appropriate sun angle and maximum daily sunlight for this latitude into the calculations. The resulting worst-case calculations assume that the sun is always shining during daylight hours and that the wind turbine is always operating. The WindPRO Shadow module can be further refined by incorporating sunshine probabilities and wind turbine operational estimates by wind direction over the course of a year. The values produced by this further refinement are known as the “expected” shadow flicker. Both worst-case and expected annual shadow flicker durations are presented in this section.

This analysis is for the wind turbine array sent to Epsilon on November 4, 2022. Locations of the turbines are shown in Figure 3-1 and the coordinates are provided in Appendix A. All 27 wind turbines are GE 1.5-97 wind turbines with a 97-meter rotor diameter and a hub height of 80 meters. This analysis also includes the 16 Langdon Wind I and Langdon Wind II wind turbines within 1.5 miles of a modeling receptor. Therefore, a total of 43 wind turbines were included in the shadow flicker model. Each wind turbine has the following characteristics based on either the technical data provided by Atwell or publicly available information:

		<u>GE 1.5-97</u>	<u>GE 1.6-91</u>
◆ Rated Power	=	1,600 kW	1,600 kW
◆ Hub Height	=	80 meters	80 meters
◆ Rotor Diameter	=	97 meters	91 meters
◆ Cut-in Wind Speed	=	3 m/s	3 m/s
◆ Cut-out Wind Speed	=	25 m/s	31 m/s
◆ Maximum RPM	=	16.2 rpm	-

To-date, there are no federal, state, or local regulations regarding the maximum radial distance from a wind turbine to which shadow flicker should be analyzed applicable to this Project. In the United States, shadow flicker is commonly evaluated out to a distance of ten times the rotor diameter. For this Project, ten times the largest rotor diameter of the proposed wind turbines corresponds to a distance of 0.6 miles (970 m). Conservatively, this analysis includes shadow flicker calculations out to 1.25 miles (2,012 m) from each wind turbine in the model for the proposed layout and existing wind turbines.

A modeling receptor dataset dated October 24, 2022 was provided to Epsilon. The dataset included 30 receptors. Atwell provided additional information indicating if each receptor was

inhabited or uninhabited, the resulting 21 inhabited receptors were input to the WindPRO model. Each modeling point was assumed to have a window facing all directions (“greenhouse” mode) which yields conservative results. All modeling receptors are identified in Figure 3-1. The model was set to limit calculations to 2,012 meters from a wind turbine, the equivalent of 1.25 miles. Consequently, shadow flicker at any of the modeling receptors greater than the corresponding limitation distance from a wind turbine was zero. In addition to modeling discrete points, shadow flicker was calculated at grid points in the area surrounding the modeled wind turbines to generate flicker isolines. A 20-meter spacing was used for this grid.

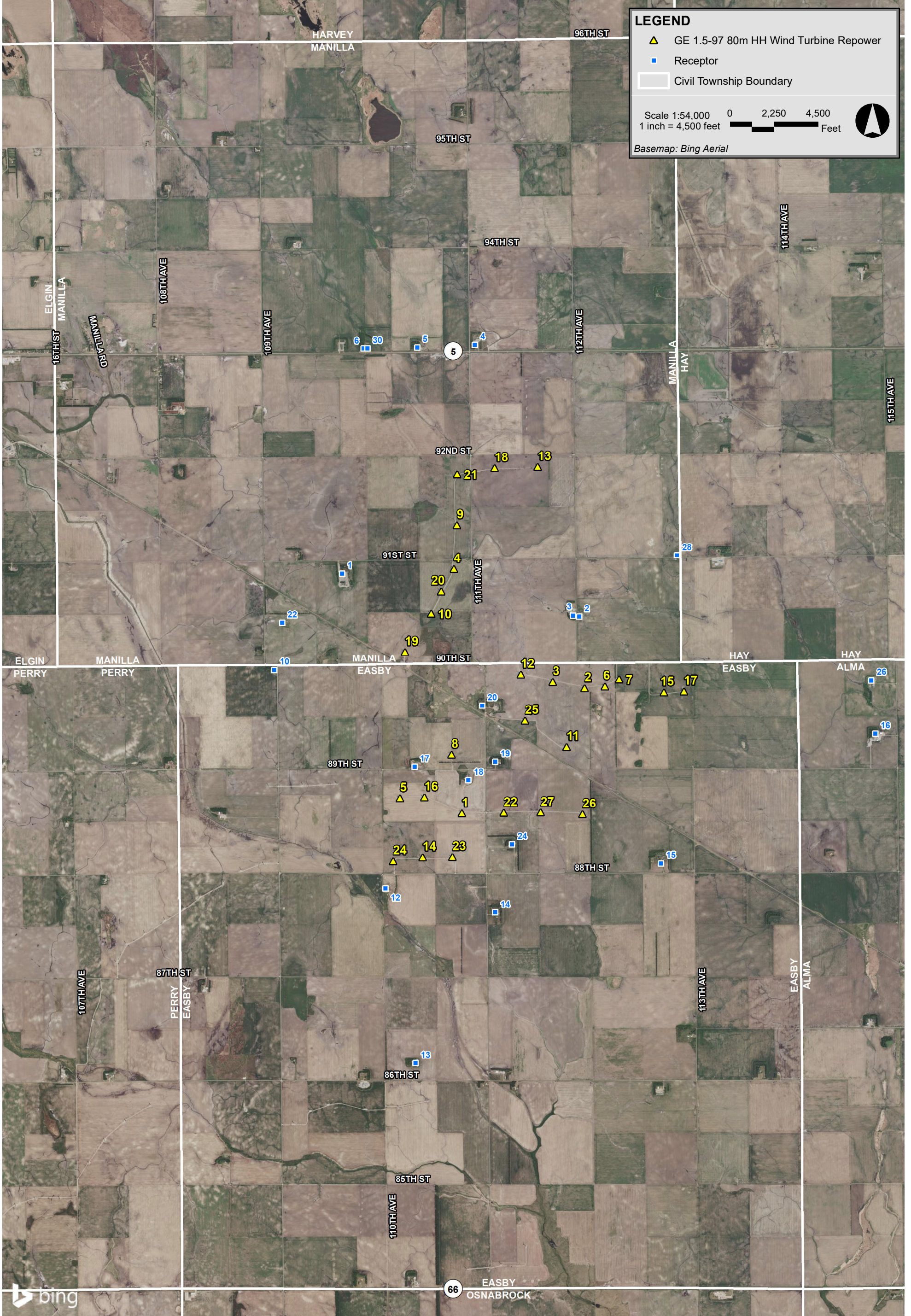
The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset (NED) developed by the U.S. Geological Survey. Conservatively, obstacles, i.e., buildings and vegetation, were excluded from the analysis. This is effectively a “bare earth” scenario which is conservative. When accounted for in the shadow flicker calculations, such obstacles may significantly mitigate or eliminate the flicker effect depending on their size, type, and location. In addition, shadow flicker durations were calculated only when the angle of the sun was at least 3° above the horizon.

Monthly sunshine probability values were input for each month from January to December. These numbers were obtained from a publicly available historical dataset for Bismarck, North Dakota from the National Oceanic and Atmospheric Administration’s (NOAA) National Centers for Environmental Information (NCEI).¹ Table 3-1 shows the percentage of sunshine hours by month used in the shadow flicker modeling. These values are the percentages that the sun is expected to be shining during daylight hours.

The number of hours the wind turbines are expected to operate for the 16 cardinal wind directions was input into the model. A publicly available dataset² using measured data for a five-year period of hourly wind directions and wind speeds at 3 meters and 10 meters was obtained by Epsilon. Epsilon then scaled this dataset to 80 meters to calculate the typical annual number of operational hours per wind direction sector. These hours per wind direction sector are used by WindPRO to estimate the “wind direction” and “operation time” reduction factors. Based on this dataset, the wind turbines would operate 83% of the year. Table 3-2 shows the distribution of operational hours for the 16 wind directions.

¹ NCEI (formerly NCDC), <https://www1.ncdc.noaa.gov/pub/data/ccd-data/pctpos20.dat>. Accessed in December 2022.

² North Dakota Agricultural Weather Network (NDAWN), 2017-2021, Langdon, ND.



Otter Tail Langdon Wind Repower Cavalier County, North Dakota

Table 3-1 Monthly Percent of Possible Sunshine

Month	Possible Sunshine
January	54%
February	52%
March	61%
April	58%
May	64%
June	67%
July	75%
August	72%
September	67%
October	53%
November	42%
December	45%

Table 3-2 Operational Hours per Wind Direction Sector

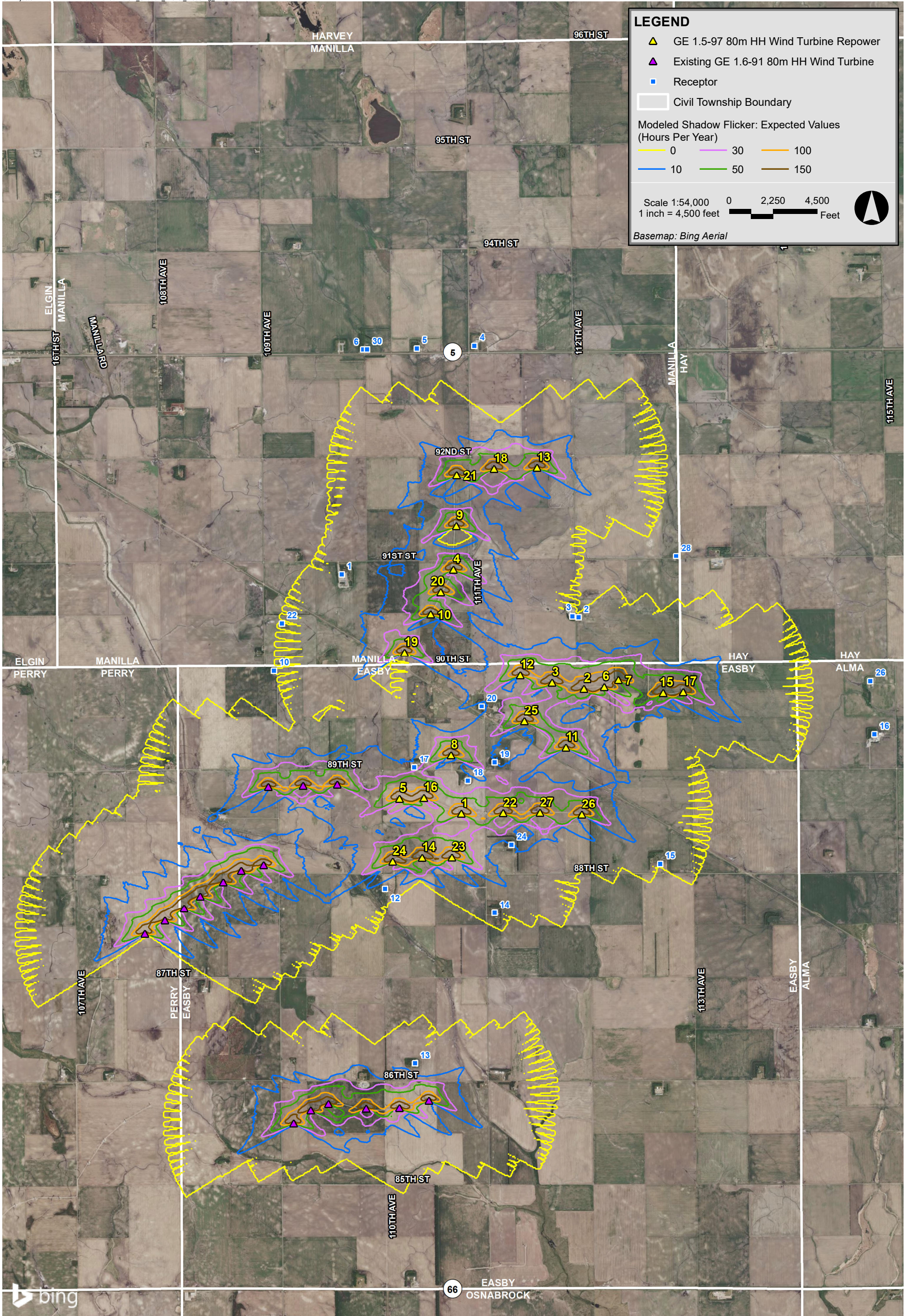
Wind Sector	Operational Hours
N	455
NNE	394
NE	334
ENE	289
E	237
ESE	233
SE	307
SSE	402
S	550
SSW	581
SW	487
WSW	483
W	566
WNW	733
NW	775
NNW	411
Annual	7,237

3.2 Results

Following the modeling methodology outlined in Section 3.1, WindPRO was used to calculate shadow flicker at the 21 discrete modeling receptor points. Calculations were conducted for the Project + existing Langdon I and Langdon II (cumulative) scenarios. In addition to the discrete modeling points, shadow flicker isolines were generated based on the grid calculations for the cumulative scenario. Table B-1.1 in Appendix B presents the modeling results for the receptors sorted by ID. Table B-1.2 in Appendix B presents the modeling results for the receptors sorted by Expected Flicker. Both worst-case and expected values are presented.

The modeled worst-case annual shadow flicker duration for all 21 receptors ranged from 0 hours, 0 minutes per year to 61 hours, 13 minutes per year. The maximum flicker duration was at receptor #18.

The predicted expected annual shadow flicker duration ranged from 0 hours, 0 minutes per year to 18 hours, 21 minutes per year. The maximum expected flicker duration calculated was at receptor #17. Eight (8) of the receptors were predicted to experience no annual shadow flicker. Nine (9) of the receptors were predicted to experience some shadow flicker but less than 10 hours per year. The modeling results showed that 4 of the receptors would be expected to have between 10 hours and 30 hours of shadow flicker per year. Zero (0) receptors are expected to have over 30 hours of flicker per year. Figure 3-2 displays the modeled flicker isolines (expected hrs/yr) over aerial imagery in relation to modeled wind turbines and modeling receptors.



Otter Tail Langdon Wind Repower Cavalier County, North Dakota

Appendix A

Wind Turbine Coordinates

Table A-1: Wind Turbine Coordinates

Wind Turbine ID	Wind Turbine Type	Hub Height (m)	Coordinates NAD83 UTM Zone 14N (meters)	
			X (Easting)	Y (Northing)
1	GE 1.5-97	80	554586.54	5394016.06
2	GE 1.5-97	80	556487.15	5395957.99
3	GE 1.5-97	80	555993.44	5396053.20
4	GE 1.5-97	80	554460.98	5397805.59
5	GE 1.5-97	80	553627.01	5394251.82
6	GE 1.5-97	80	556803.45	5395983.30
7	GE 1.5-97	80	557022.92	5396097.03
8	GE 1.5-97	80	554422.73	5394925.71
9	GE 1.5-97	80	554506.00	5398484.16
10	GE 1.5-97	80	554107.45	5397113.03
11	GE 1.5-97	80	556209.54	5395043.50
12	GE 1.5-97	80	555499.47	5396170.35
13	GE 1.5-97	80	555761.58	5399385.76
14	GE 1.5-97	80	553974.95	5393332.01
15	GE 1.5-97	80	557716.46	5395892.46
16	GE 1.5-97	80	554002.47	5394266.09
17	GE 1.5-97	80	558025.59	5395907.10
18	GE 1.5-97	80	555093.15	5399368.14
19	GE 1.5-97	80	553701.25	5396519.70
20	GE 1.5-97	80	554265.70	5397458.96
21	GE 1.5-97	80	554512.89	5399273.42
22	GE 1.5-97	80	555233.79	5394022.39
23	GE 1.5-97	80	554438.15	5393336.49
24	GE 1.5-97	80	553518.98	5393272.06
25	GE 1.5-97	80	555565.55	5395448.41
26	GE 1.5-97	80	556455.78	5394000.98
27	GE 1.5-97	80	555807.60	5394028.07

Appendix B

Shadow Flicker Modeling Results: Modeling Receptors

Table B-1.1: Shadow Flicker Modeling Results at Discrete Points - Sorted by Receptor ID

Receptor ID	Coordinates NAD83 UTM Zone 14N (meters)		Worst Case Shadow Flicker Hours per Year	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)	(HH:MM/year)	(HH:MM/year)
1	552727.47	5397731.93	5:10	1:34
2	556403.32	5397067.11	12:47	3:07
3	556310.83	5397083.06	3:28	0:56
4	554786.86	5401286.18	0:00	0:00
5	553893.01	5401245.18	0:00	0:00
6	553064.00	5401229.01	0:00	0:00
10	551679.19	5396237.94	0:00	0:00
12	553399.70	5392853.28	9:32	3:24
13	553865.94	5390139.19	20:11	5:01
14	555099.83	5392477.80	1:52	0:41
15	557670.73	5393238.99	4:26	1:37
16	560994.89	5395249.28	0:00	0:00
17	553852.25	5394735.12	56:50	18:21
18	554687.38	5394531.49	61:13	16:39
19	555101.52	5394814.86	33:36	10:41
20	554900.85	5395685.10	26:44	8:06
22	551800.82	5396971.39	0:26	0:07
24	555362.96	5393534.70	30:17	10:28
26	560931.88	5396078.47	0:00	0:00
28	557918.14	5398017.75	0:00	0:00
30	553120.55	5401228.25	0:00	0:00

Table B-1.2: Shadow Flicker Modeling Results at Discrete Points - Sorted by Expected Flicker

Receptor ID	Coordinates NAD83 UTM Zone 14N (meters)		Worst Case Shadow Flicker Hours per Year	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)	(HH:MM/year)	(HH:MM/year)
17	553852.25	5394735.12	56:50	18:21
18	554687.38	5394531.49	61:13	16:39
19	555101.52	5394814.86	33:36	10:41
24	555362.96	5393534.70	30:17	10:28
20	554900.85	5395685.10	26:44	8:06
13	553865.94	5390139.19	20:11	5:01
12	553399.70	5392853.28	9:32	3:24
2	556403.32	5397067.11	12:47	3:07
15	557670.73	5393238.99	4:26	1:37
1	552727.47	5397731.93	5:10	1:34
3	556310.83	5397083.06	3:28	0:56
14	555099.83	5392477.80	1:52	0:41
22	551800.82	5396971.39	0:26	0:07
4	554786.86	5401286.18	0:00	0:00
5	553893.01	5401245.18	0:00	0:00
6	553064.00	5401229.01	0:00	0:00
10	551679.19	5396237.94	0:00	0:00
16	560994.89	5395249.28	0:00	0:00
26	560931.88	5396078.47	0:00	0:00
28	557918.14	5398017.75	0:00	0:00
30	553120.55	5401228.25	0:00	0:00

Appendix C – Determinations of No Hazard

Aeronautical Study Number	Structure Name (as filed, cannot be changed)	Status
2022-WTE-6181-OE	OT1	Determination Does Not Exceed
2022-WTE-6182-OE	OT2	Determination Does Not Exceed
2022-WTE-6183-OE	OT3	Determination Does Not Exceed
2022-WTE-6184-OE	OT4	Determination Does Not Exceed
2022-WTE-6185-OE	OT5	Determination Does Not Exceed
2022-WTE-6186-OE	OT6	Determination Does Not Exceed
2022-WTE-6187-OE	OT7	Determination Does Not Exceed
2022-WTE-6188-OE	OT8	Determination Does Not Exceed
2022-WTE-6189-OE	OT9	Determination Does Not Exceed
2022-WTE-6190-OE	OT10	Determination Does Not Exceed
2022-WTE-6191-OE	OT11	Determination Does Not Exceed
2022-WTE-6192-OE	OT12	Determination Does Not Exceed
2022-WTE-6193-OE	OT13	Determination Does Not Exceed
2022-WTE-6194-OE	OT14	Determination Does Not Exceed
2022-WTE-6195-OE	OT15	Determination Does Not Exceed
2022-WTE-6196-OE	OT16	Determination Does Not Exceed
2022-WTE-6197-OE	OT17	Determination Does Not Exceed
2022-WTE-6198-OE	OT18	Determination Does Not Exceed
2022-WTE-6199-OE	OT19	Determination Does Not Exceed
2022-WTE-6200-OE	OT20	Determination Does Not Exceed
2022-WTE-6201-OE	OT21	Determination Does Not Exceed
2022-WTE-6202-OE	OT22	Determination Does Not Exceed
2022-WTE-6203-OE	OT23	Determination Does Not Exceed
2022-WTE-6204-OE	OT24	Determination Does Not Exceed
2022-WTE-6205-OE	OT25	Determination Does Not Exceed
2022-WTE-6206-OE	OT26	Determination Does Not Exceed
2022-WTE-6207-OE	OT27	Determination Does Not Exceed

Appendix D – Microwave Beam Path Analysis

Wind Power GeoPlanner™

Microwave Study

OTP Langdon Wind



Prepared on Behalf of
Atwell, LLC

November 21, 2022



COMSEARCH
A CommScope Company

Table of Contents

1. Introduction	- 1 -
2. Project Overview	- 1 -
3. Two-Dimensional Fresnel Zone Analysis	- 2 -
4. Conclusion	- 5 -
5. Contact	- 5 -
Appendix: Turbine Locations	- 6 -

1. Introduction

Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 MHz – 23 GHz). Comsearch has developed and maintains comprehensive technical databases containing information on licensed microwave networks throughout the United States. These systems are the telecommunication backbone of the country, providing long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services. This report focuses on the potential impact of wind turbines on licensed, proposed and applied non-federal government microwave systems.

2. Project Overview

Project Information

Name: OTP Langdon Wind

County: Cavalier

State: North Dakota

Number of Turbines: 27

Blade Diameter: 97 meters

Hub Height: 80 meters

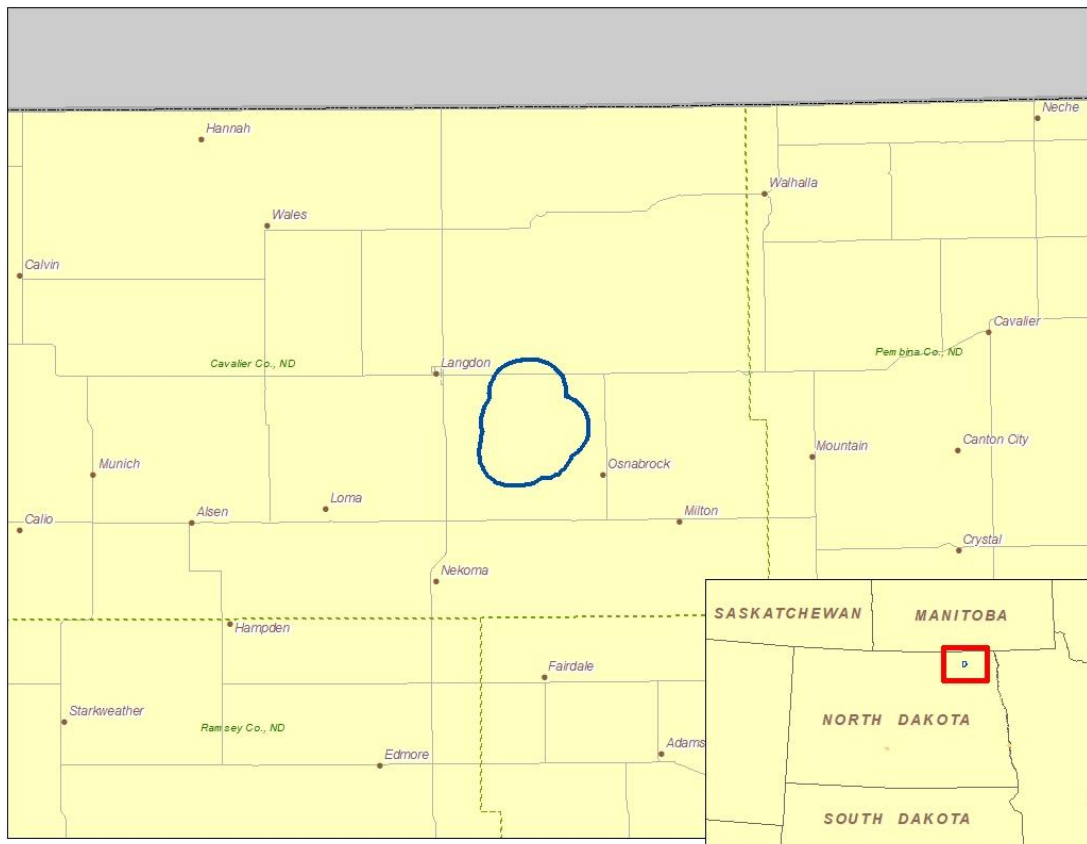


Figure 1: Area of Interest

3. Two-Dimensional Fresnel Zone Analysis

Methodology

Our obstruction analysis was performed using Comsearch’s proprietary microwave database, which contains all non-government licensed, proposed and applied paths from 0.9 - 23 GHz¹. First, we determined all microwave paths that intersect the area of interest² and listed them in Table 1. These paths and the area of interest that encompasses the planned turbine locations are shown in Figure 2.

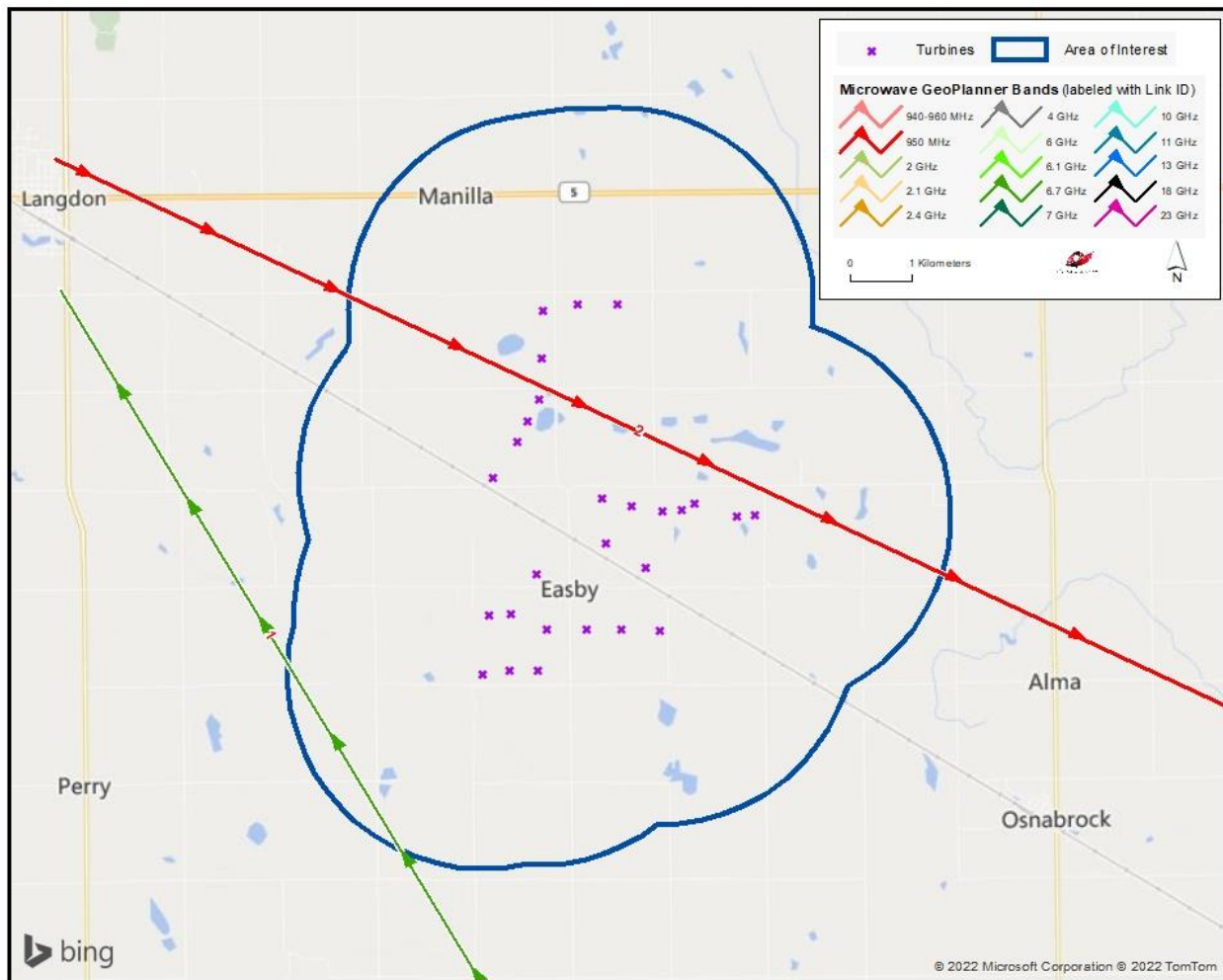


Figure 2: Microwave Paths that Intersect the Area of Interest

¹ Please note that this analysis does not include unlicensed microwave paths or federal government paths that are not registered with the FCC.

² We use FCC-licensed coordinates to determine which paths intersect the area of interest. It is possible that as-built coordinates may differ slightly from those on the FCC license.

ID	Status	Callsign 1	Callsign 2	Band	Path Length (km)	Licensee
1	Licensed	KZC46	KPN81	6.7 GHz	43.15	Minnkota Power Cooperative Inc.
2	Licensed	WQFA924	RXONLY	950 MHz	31.66	Simmons Broadcasting, Inc.

Table 1: Summary of Microwave Paths that Intersect the Area of Interest

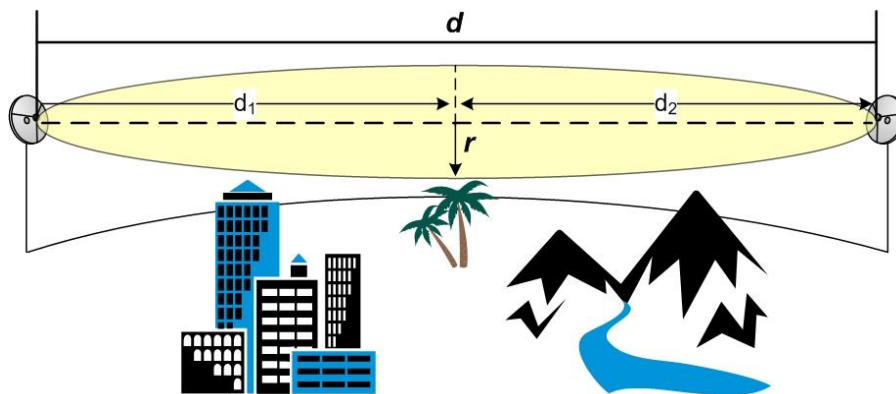
(See enclosed mw_geopl.xlsx for more information and GP_dict_matrix_description.xls for detailed field descriptions)

Verification of Coordinate Accuracy

It is possible that as-built coordinates may differ from those on the FCC license. For this project, one path crosses within close proximity of the proposed turbines and the tower locations for this path will have a critical impact on the result. Therefore, we verified these locations using aerial photography. Some of the towers were found to be slightly off and were moved to their locations based on the aerial photos³.

Next, we calculated a Fresnel Zone for each path based on the following formula:

$$r \cong 17.3 \sqrt{\frac{n}{F_{GHz}} \left(\frac{d_1 d_2}{d_1 + d_2} \right)}$$



Where,

- r = Fresnel Zone radius at a specific point in the microwave path, meters
- n = Fresnel Zone number, 1
- F_{GHz} = Frequency of microwave system, GHz
- d₁ = Distance from antenna 1 to a specific point in the microwave path, kilometers
- d₂ = Distance from antenna 2 to a specific point in the microwave path, kilometers

³ See enclosed mw_geopl.shp (adjusted locations based on aerial photography/basis for report images and results) and mw_geopl_fcc.shp (locations solely based on FCC licensed information) for details.

In general, this is the area where the planned wind turbines should be avoided, if possible. Likewise, Comsearch recommends that an area directly in front of each microwave antenna should be avoided. This corresponds to the Consultation Zone which measures 1 kilometer along the main beam of the antenna and 24 ft (7.3 meters) wide. A depiction of the Fresnel Zones and Consultation Zones for each microwave path listed can be found in Figure 3, and is also included in the enclosed shapefiles^{4,5}.

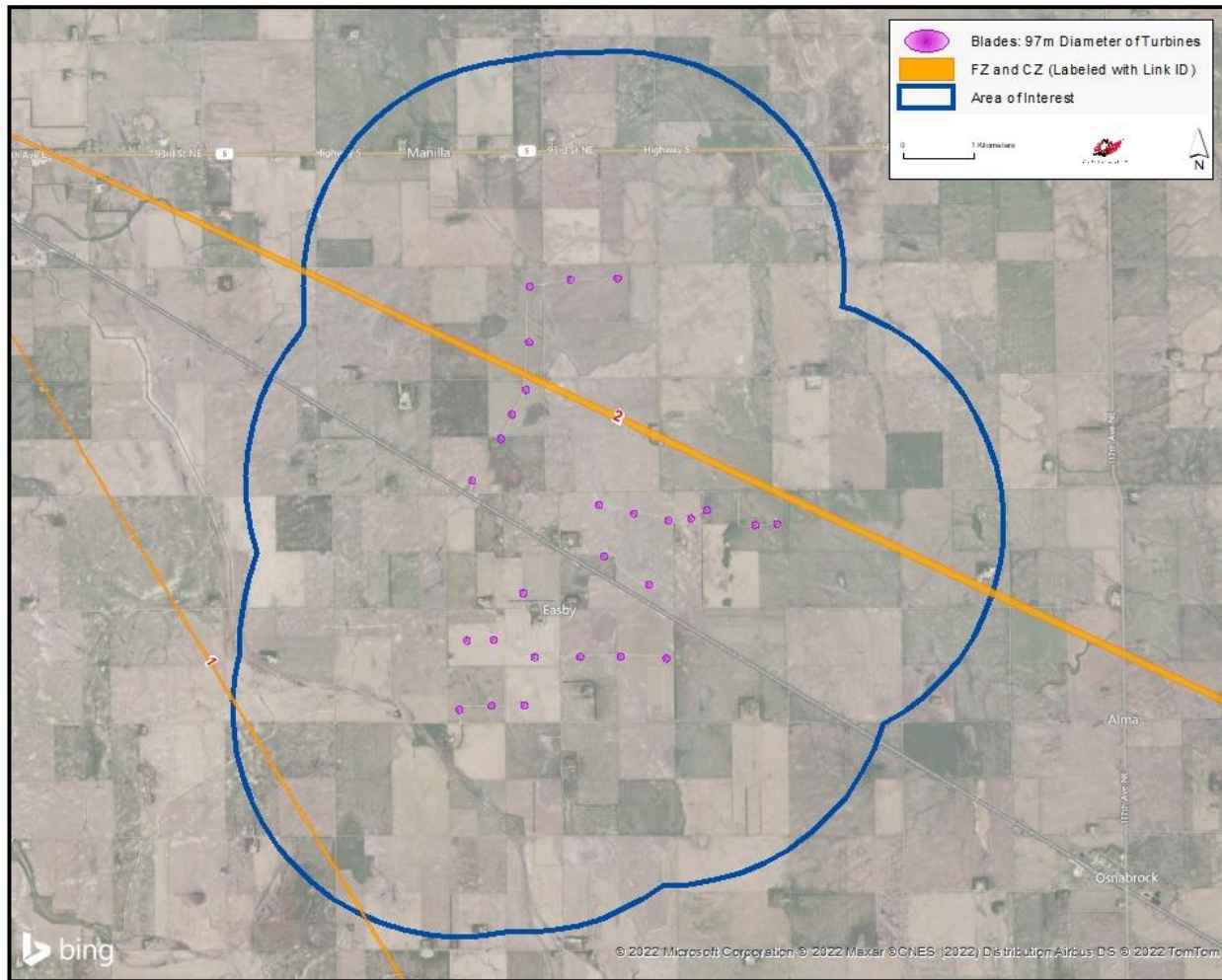


Figure 3: Microwave Paths with Fresnel Zones

⁴ The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 14 projected coordinate system.

⁵ Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data provided in this report is governed by Comsearch's data license notification and agreement located at http://www.comsearch.com/files/data_license.pdf.

4. Conclusion

Total Microwave Paths	Paths with Affected Fresnel Zones	Total Turbines	Turbines intersecting the Fresnel Zones
2	0	27	0

Table 2: Fresnel Zone Analysis Result

Our study identified two microwave paths intersecting the OTP Langdon Wind area of interest. The Fresnel and Consultation Zones for these microwave paths were calculated and mapped in order to assess the potential impact from the turbines. A total of 27 turbines were considered in the analysis, each with a blade diameter of 97 meters and a hub height of 80 meters. Of those turbines, none were found to have potential obstruction with the microwave systems in the area.

5. Contact

For questions or information regarding the Microwave Study, please contact:

Contact person: David Meyer
 Title: Senior Manager
 Company: Comsearch
 Address: 21515 Ridgetop Circle, Suite 300, Sterling, VA 20166
 Telephone: 703-726-5656
 Fax: 703-726-5595
 Email: David.Meyer@CommScope.com
 Web site: www.comsearch.com

Appendix: Turbine Locations

Turbine	Latitude	Longitude
1	48.696801	-98.258196
2	48.714100	-98.232104
3	48.715001	-98.238802
4	48.730900	-98.259402
5	48.699005	-98.271204
6	48.714299	-98.227801
7	48.715302	-98.224802
8	48.704998	-98.260302
9	48.737000	-98.258700
10	48.724701	-98.264300
11	48.705899	-98.236002
12	48.716099	-98.245501
13	48.744999	-98.241503
14	48.690701	-98.266596
15	48.713398	-98.215403
16	48.699101	-98.266100
17	48.713501	-98.211199
18	48.744900	-98.250597
19	48.719399	-98.269900
20	48.727799	-98.262103
21	48.744099	-98.258502
22	48.696801	-98.249400
23	48.690701	-98.260302
24	48.690201	-98.272799
25	48.709599	-98.244700
26	48.696499	-98.232798
27	48.696801	-98.241602

Appendix E – Cultural Resource Report



CLASS I LITERATURE REVIEW

LANGDON RE-POWER WIND FARM PROJECT CAVALIER COUNTY, NORTH DAKOTA

Prepared for

Otter Tail Power Company
215 S. Cascade Street
Fergus Falls, Minnesota 56537

Atwell Project No. 22006034

Submitted by Atwell, LLC

January 26, 2023

EXECUTIVE SUMMARY

In November of 2022, Atwell, LLC (Atwell) was contracted by Otter Tail Power Company (OTP) to conduct a Class I literature review for the proposed Langdon Wind Re-Power Project (Project) located in Cavalier County, North Dakota (Figure 1). The Project includes replacing current wind turbine technology with longer blades and new hub and gearbox with turbine generators being refurbished at 27 wind turbine locations. The existing Langdon Wind turbines are GE 1.5 megawatt [MW] turbines with a 77-meter rotor diameter and a total height of 118.5 meters, and these will be replaced with new wind turbine technology (GE 1.5 MW turbines with 97-meter rotor diameter and a total height of 128.5 meters). The existing 27 turbine locations remain the same and OTP plans to use the existing turbine structural steel towers, turbine foundations, collection/communication systems, permanent access roads, and other associated facilities whose locations will not change.

During installation of the repowering technology, existing access roads and the gravel ring around the turbines may be temporarily widened to accommodate delivery and staging of components and equipment. The areas where temporary access roads and construction easements will occur were previously surveyed and/or previously disturbed during initial project construction.

Currently, no federal trigger has been identified for this Project; therefore, Section 106 regulations do not apply. Should Section 106 be triggered, methods for archaeological and aboveground architectural investigations should be determined through consultation with the lead federal agency and the State Historical Society of North Dakota (SHSND).

The SHSND files were reviewed and rendered the following information:

- One previously identified archaeological site lead is in the Project Area.
- No previously documented architectural resources are in the Project Area.
- No architectural or archaeological resources listed on the National Register of Historic Places are in the Project Area.

Based on a review of the data presented above in conjunction with the fact that 40.05 acres of the 71.7-acre Project Area have been previously surveyed and all 71.7 acres of the Project Area have been previously disturbed by the original construction of the wind farm, Atwell makes the following recommendations:

- The Project proceed as planned without additional cultural resource work prior to the re-power project.

PUBLIC DOCUMENT - NON-PUBLIC DATA HAS BEEN EXCISED

- An Unanticipated Discovery Plan be developed to establish procedures and relevant contact information in the event that human remains or archaeological deposits are discovered during the construction, operational, and decommission phases of the Project.
 - If buried archaeological resources are encountered, all activity should cease in the immediate area and within a 100-foot buffer area, and the artifacts should be left in place. The Client's archaeologist should be contacted immediately, and unanticipated discovery procedures should be initiated.
 - If human remains are encountered, construction should stop in the immediate area of discovery and within a 100-foot buffer area, and law enforcement should be notified immediately. Law enforcement officials should determine whether the discovery is a crime scene and whether the remains are prehistoric or historic Native American remains. The SHSND should be contacted immediately if the human remains are determined to be prehistoric or historic in nature and/or Native American remains.

TABLE OF CONTENTS

FIGURES..... II

TABLES II

1 INTRODUCTION..... 1

 1.1 Background 1

 1.2 Applicable Regulations 1

2 METHODS 2

3 ENVIRONMENT 2

4 LITERATURE SEARCH 3

 4.1 Previous Cultural Resources Studies..... 3

 4.2 Previously Recorded archaeological sites..... 4

 4.3 Previously Recorded Architectural History Properties..... 4

5 CONCLUSIONS AND RECOMMENDATIONS 4

 5.1 Conclusions 4

 5.2 Recommendations 5

6 REFERENCES..... 6

FIGURES

- 1 Site Location Map
- 2 Class I Literature Review Results

TABLES

Table 1. Previously Conducted Cultural Resources Surveys 3

Table 2. Previously Documented Archaeological Resources within the Project
Area 4

Table 3. Previously Documented Archaeological Resources within One Mile 4

1 INTRODUCTION

1.1 BACKGROUND

Atwell, LLC (Atwell) was contracted by Otter Tail Power Company (OTP) to conduct a Class I literature review for the proposed Langdon Wind Re-Power Project (Project) located in Cavalier County, North Dakota (Figure 1). The Project Area consists of 71.7 acres of mixed-use agricultural land in the following townships: Manilla Township (Township 161 North, Range 59 West; Sections 26, 27 and 34); Easby Township (Township 160 North, Range 59 West; Sections 2, 3, 4, 9, and 10).

The Project involves replacing current wind turbine technology with longer blades and new hub and gearbox with turbine generators being refurbished at 27 wind turbine locations. The existing Langdon Wind turbines are GE 1.5 megawatt [MW] turbines with a 77-meter rotor diameter and a total height of 118.5 meters, and these will be replaced with new wind turbine technology (GE 1.5 MW turbines with 97-meter rotor diameter and a total height of 128.5 meters). The existing 27 turbine locations remain the same and OTP plans to use the existing turbine structural steel towers, turbine foundations, collection/communication systems, permanent access roads, and other associated facilities whose locations will not change.

During installation of the repowering technology, existing access roads and the gravel ring around the turbines may be temporarily widened to accommodate delivery and staging of components and equipment. The areas where temporary access roads and construction easements will occur were previously surveyed and/or previously disturbed during initial project construction.

1.2 APPLICABLE REGULATIONS

North Dakota does not have laws that mandate cultural resources surveys for private projects lacking characteristics that would trigger Section 106 of the National Historic Preservation Act of 1966, as amended (54 U.S.C. 306108), and its implementing regulations (36 CFR 800). The exception to this is human remains. Human remains are protected under the North Dakota Century Code 23-06-27 (Protection of Human Burial Sites, Human Remains, and Burial Goods).

The North Dakota Public Service Commission has siting authority over the Project, and requires analysis of potential impacts to cultural resources pursuant to its siting criteria (NDAC § 69-06-08-01).

Currently, no federal trigger has been identified for this project; therefore, Section 106 regulations do not apply. Should Section 106 be triggered, methods for archaeological pedestrian survey and aboveground architectural survey should be determined through

consultation with the lead federal agency and the State Historical Society of North Dakota (SHSND).

An Unanticipated Discovery Plan is being developed to establish procedures and relevant contact information in the event that human remains or archaeological deposits are discovered during the construction, operational, and decommission phases of the Project.

2 METHODS

In November of 2022, staff from Atwell conducted background research at the SHSND for information on previously identified archaeological sites and architectural properties within one mile (1.6 km) of the Project Area and on surveys previously conducted within the Project Area.

3 ENVIRONMENT

The Project Area is located in Cavalier County, North Dakota in a primarily rural agricultural area that is sparsely populated and supports a mix of grasslands, cultivated cropland, hayfields, and pasturelands. Agricultural use (cultivated crops, hay, and pasture) is the primary land use within the Project Area. The Project Area is bisected by State Highway 66 and is located predominantly east of State Highway 1. Small farmsteads are in the Project Area as well as small tracts of forested areas, wetlands, and natural stream corridors; however, these natural features are of limited size. Small isolated woodlots, generally associated with wind breaks for farmsteads, are also scattered within the Project Area. Public roads are generally situated in a grid-like arrangement.

The Project Area is located within the Northern Black Prairie ecoregion of the Northern Glaciated Plains (Bryce et al. 1996). According to the United States Geological Service (USGS) ecoregion mapping data, this ecoregion is characterized by the following:

The Northern Black Prairie represents a broad phenological transition zone marking the introduction from the north of a boreal influence in climate. Aspen and birch appear in wooded areas, willows grow on wetland perimeters, and rough fescue, common to the Rocky Mountain foothills, becomes evident in grassland associations. This ecoregion has the shortest growing season and the lowest January temperatures of any Level IV Ecoregion in the Dakotas. Most of the area is used for growing small grains, with durum wheat being a major crop (Bryce et al. 1996).

The surficial geology in the region is relatively flat with little visual relief. The surface soil texture is primarily loam that is well drained (USDA 2017). Within the Project Area, the topography is generally flat, with approximate elevations between 1,594 and 1,684 feet above mean sea level (amsl).

Natural Resource Conservation Service (NRCS) Soil Survey data for Cavalier County identified 17 different types of soils within the Project Area. These soils vary greatly in texture, natural drainage, slope, and other characteristics. The Project Area is dominated by a variety of loam texture soils. Approximately 80 percent of the Project Area is mapped as the following soil types:

- Hamerly-Tonka complex, 0 to 3 percent slopes (F100A);
- Svea-Buse loams, 3 to 6 percent slopes (F154B);
- Barnes-Svea loams, 0 to 3 percent slopes (F143A);
- Vallers-Hamerly loams, saline, 0 to 3 percent slopes (F119A); and
- Hamerly-Cresbard loams, 0 to 3 percent slopes (F135A).

4 LITERATURE SEARCH

4.1 PREVIOUS CULTURAL RESOURCES STUDIES

Research indicated that two archaeological surveys have been conducted within the current Project Area (Figure 2 Map Set).

Table 1. Previously Conducted Cultural Resources Surveys

Survey Number	Authors	Year	Title
010328	Ed Stine and Aaron Barth	2007	Langdon Wind Energy Center Phase II: A Class II and III Cultural Resources Inventory in Cavalier County, North Dakota.
017894	Atwell	2018	Class II and III Cultural Resources Inventory for the Langdon Wind Energy Center Repower Project, Cavalier County, North Dakota.

In 2007, a Class II and Class III cultural resources inventory was conducted by Metcalf Archaeological Consultants, Inc., on behalf of Langdon Wind, LLC to document cultural resources within the footprint of a proposed wind farm expansion in Cavalier County, North Dakota (Figure 2 Map Set; Stine and Barth 2007). The investigation identified two isolated finds, 32CVX68 and 32CVX69, neither of which fall within the current Project Area.

In 2018, a Class II and Class III cultural resources inventory was conducted by Atwell, LLC, on behalf of Langdon Wind, LLC as part of the proposed repowering of the existing Langdon Wind Energy Center in Cavalier County, North Dakota (Figure 2 Map Set; Atwell 2018). The

investigation identified two historical site leads, 32CVX87 and 32CVX89, and one isolated find, 32CVX88, none of which fall within the current Project Area.

4.2 PREVIOUSLY RECORDED ARCHAEOLOGICAL SITES

One archaeological site lead, 32CVX15, has been previously recorded within the current Project Area (see Figure 2 Map Set; Table 2). There is very little information recorded on the site form, but it appears that the Easby Post Office was once located somewhere within the general vicinity of the Project Area. Previous survey within the site lead boundary, in the vicinity of the Project Area, did not reveal any archaeological deposits (Stine and Barth 2007).

Table 2. Previously Documented Archaeological Resources within the Project Area

Site Number	Description	Status
32CVX15	Easby Post Office	Unevaluated

One additional sites has been previously identified within one mile of the Project Area (Figure 2 Map Set; Table 3).

Table 3. Previously Documented Archaeological Resources within One Mile

Site Number	Description	Status
32CV121	BNSF Railroad	Unevaluated

4.3 PREVIOUSLY RECORDED ARCHITECTURAL HISTORY PROPERTIES

No historical architectural properties have been recorded within the Project Area or within one mile of the Project Area.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

As a result of the literature review, Atwell has reached the following conclusions:

- One previously identified archaeological site lead is in the Project Area.
- No previously documented architectural resources are within the Project Area.

- No architectural or archaeological resources listed on the NRHP are within the Project Area.
- No cemeteries are located within the Project Area.

Currently, no federal trigger has been identified for this project; therefore, Section 106 regulations do not apply. Should Section 106 be triggered, methods for archaeological pedestrian survey and aboveground architectural survey should be determined through consultation with the lead federal agency and the SHSND.

5.2 RECOMMENDATIONS

Based on a review of the data presented above in conjunction with the fact that 40.05 acres of the 71.7-acre Project Area have been previously surveyed and all 71.7 acres of the Project Area have been previously disturbed by the original construction of the wind farm, Atwell makes the following recommendations:

- The Project proceed as planned without additional cultural resource work prior to the re-power project.
- An Unanticipated Discovery Plan be developed to establish procedures and relevant contact information in the event that human remains or archaeological deposits are discovered during the construction, operational, and decommission phases of the Project.
 - If buried archaeological resources are encountered, all activity should cease in the immediate area and within a 100-foot buffer area and the artifacts should be left in place. The Client's archaeologist should be contacted immediately, and unanticipated discovery procedures should be initiated.
 - If human remains are encountered, construction should stop in the immediate area of discovery and within a 100-foot buffer area, and law enforcement should be notified immediately. Law enforcement officials should determine whether the discovery is a crime scene and whether the remains are prehistoric or historic Native American remains. The SHSND should be contacted immediately if the human remains are determined to be prehistoric or historic in nature and/or Native American remains.

6 REFERENCES

Atwell 2018 *Class I Cultural Resources Inventory for the Langdon Wind Energy Center Repower Project Cavalier County, North Dakota*. Atwell, LLC, Southfield, Michigan.

Bryce, S.A., J.M. Omernik, D.A. Pater, M. Ulmer, J. Schaar, J. Freeouf, P. Johnson, P. Kuck, and S.H. Azevedo 1996 *Ecoregions of North Dakota and South Dakota*. U.S. Geological Survey, Reston, Virginia.

Stine, Ed, and Aaron Barth 2007a *Langdon Wind Energy Center: A Class II and Class III Cultural Resource Inventory in Cavalier County, North Dakota*. NDSHPO Number 07-400. Metcalf Archaeological Consultants, Inc., Bismarck, North Dakota.

USDA 2017 Web Soil Survey. *U.S. Department of Agriculture, Natural Resources Conservation Service*. <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>.

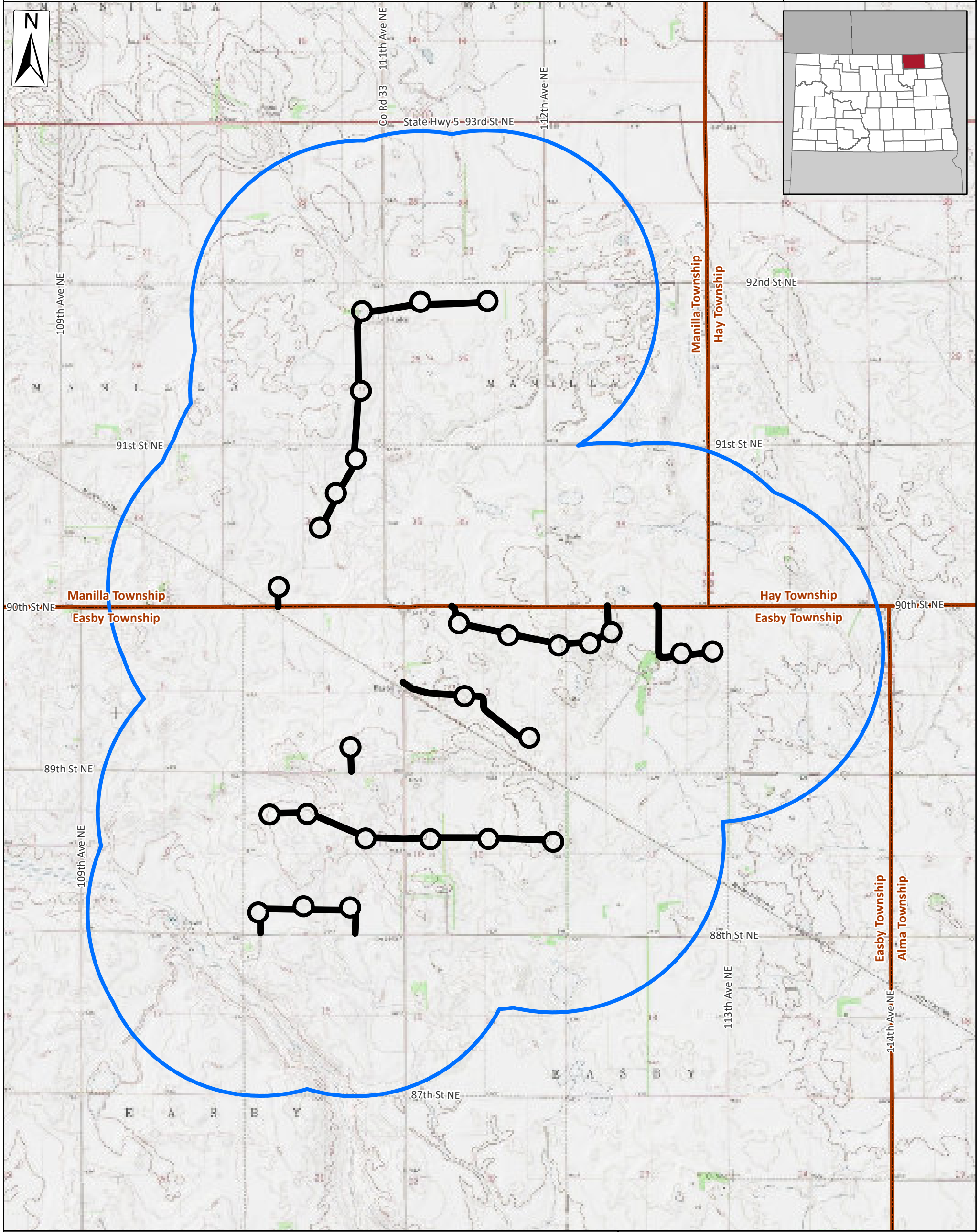
FIGURES




Langdon Re-Power Wind Farm

Issue Date:
1/24/2023

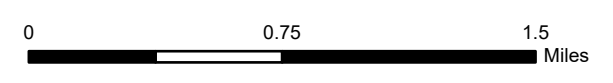
Figure 1 – Site Location

Cavalier County, North Dakota



-  Study Area
-  1 mile Buffer
-  Township

SOURCE: USGS Topo Map

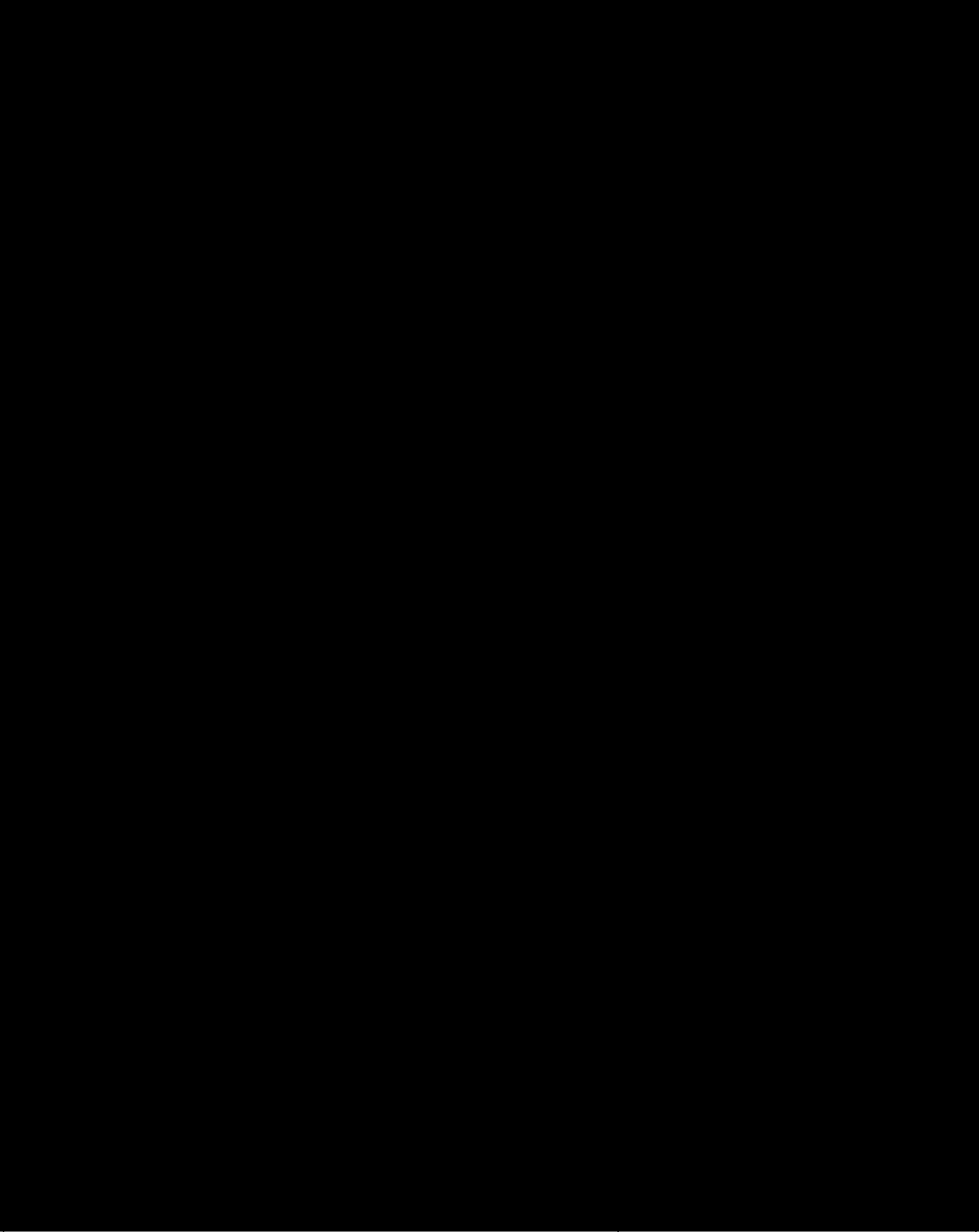


Langdon Re-Power Wind Farm

Issue Date:
1/24/2023

Figure 2 – Known Cultural Resources Index

Cavalier County, North Dakota



▲ Architectural Sites	✈ Existing Turbine Locations	1 mile Buffer	<small>SOURCE: USGS Topo Map</small>
■ Archaeological Site	— Existing Access Roads	Mapbook Page	
■ Archaeological Site Lead	□ Disturbance Area (~72 acres)	Township	
■ Archeological Survey	□ Study Area		
■ Survey Corridor (Metcalf, 2007)			



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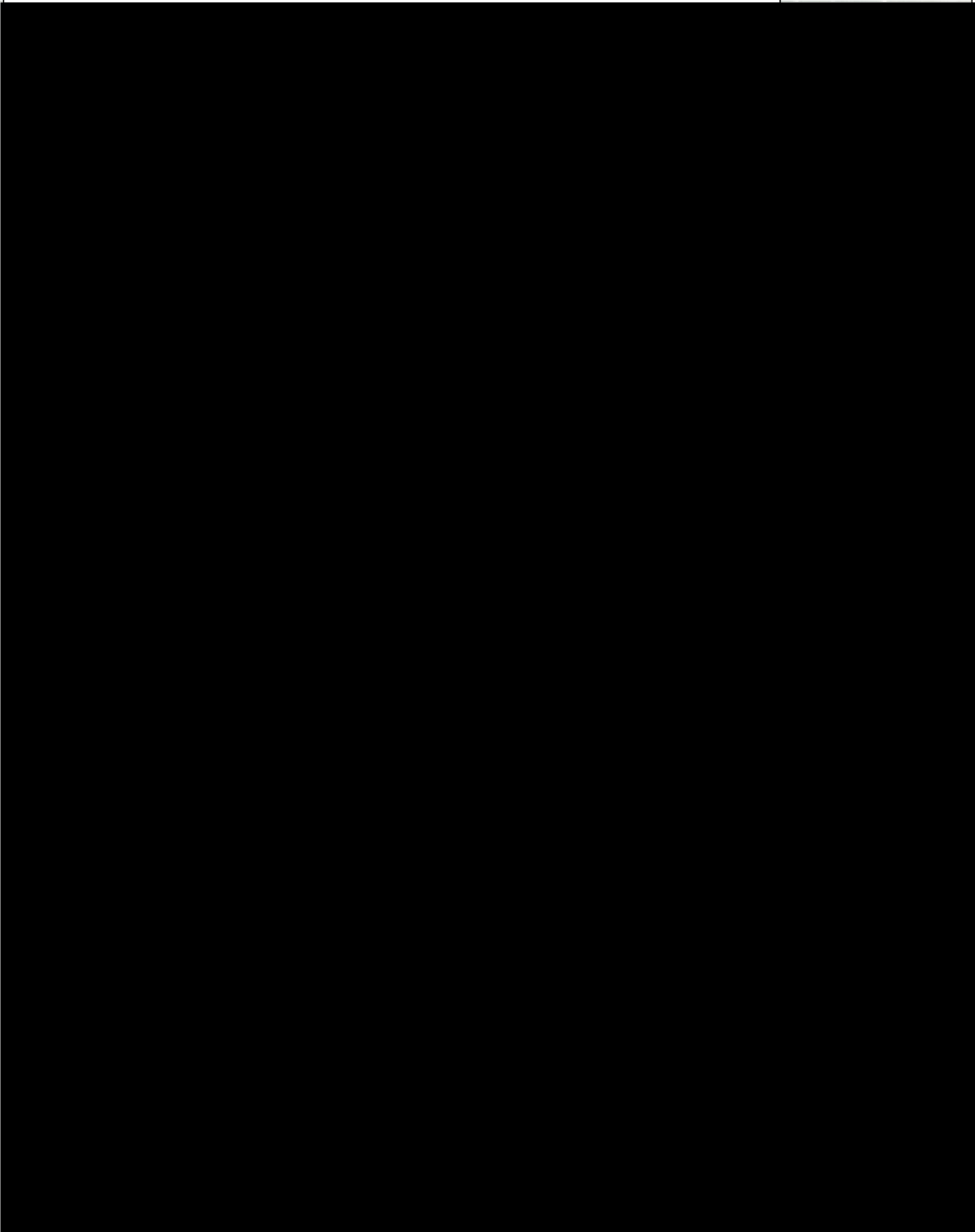
Langdon Re-Power Wind Farm

Figure 2 – Known Cultural Resources

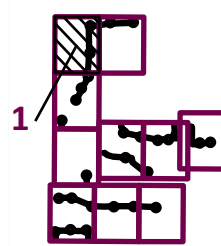
Page 1 of 10

Cavalier County, North Dakota

Issue Date:
1/24/2023



- ▲ Architectural Sites
- ▣ Archaeological Site (SHPO)
- ▤ Archaeological Site Lead
- ▥ Survey Corridor (Metcalf, 2007)
- ▦ Archeological Survey (SHPO)
- ✈ Existing Turbine Locations
- Existing Access Roads
- Disturbance Area (~72 acres)
- ▭ Study Area
- ▭ Township



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SOURCE: 1965 Topo Map

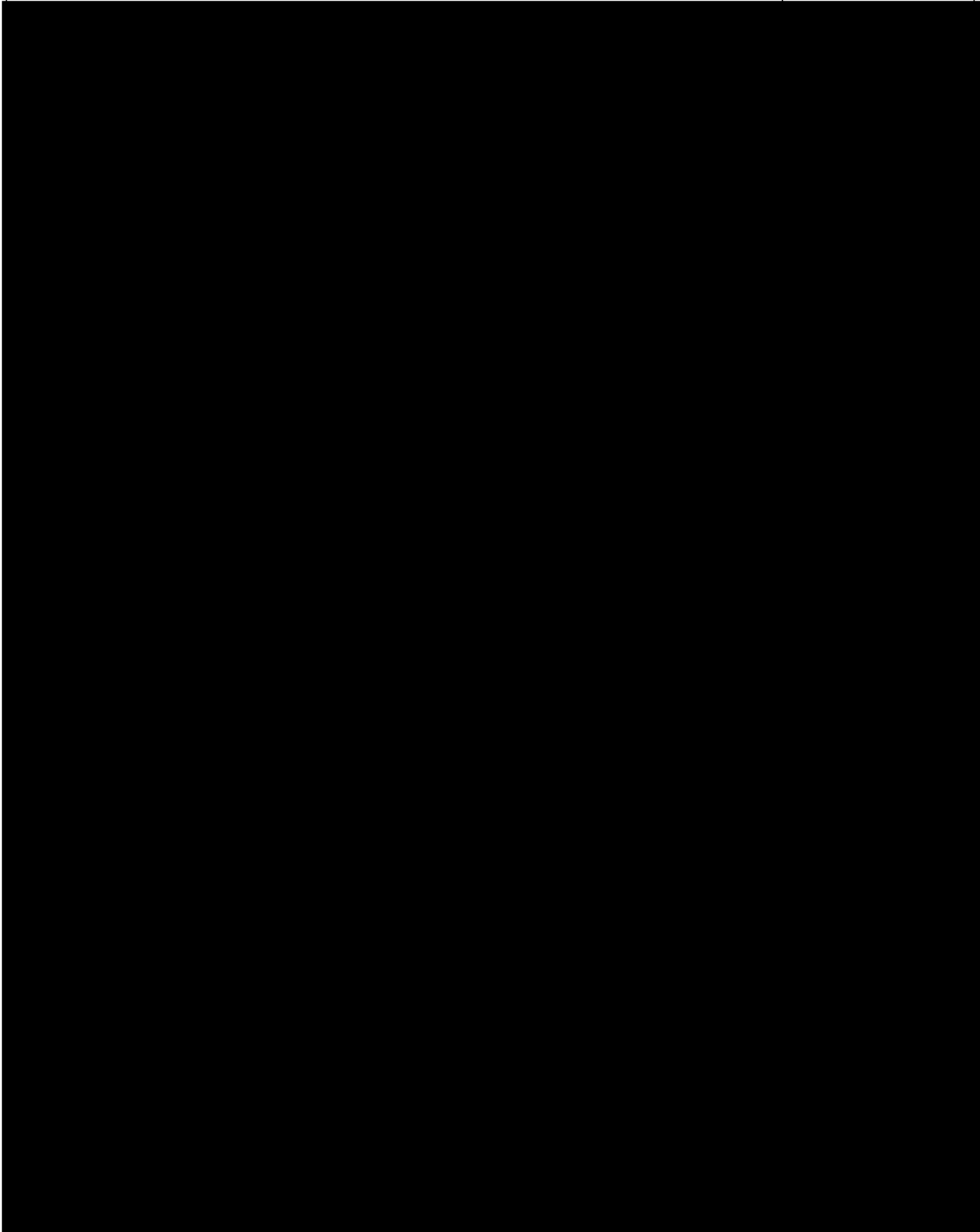
Langdon Re-Power Wind Farm

Issue Date:
1/24/2023

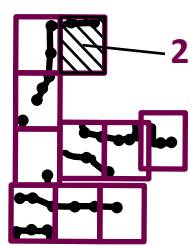
Figure 2 – Known Cultural Resources

Page 2 of 10

Cavalier County, North Dakota



- ▲ Architectural Sites
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- ▭ Study Area
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SOURCE: 1965 Topo Map

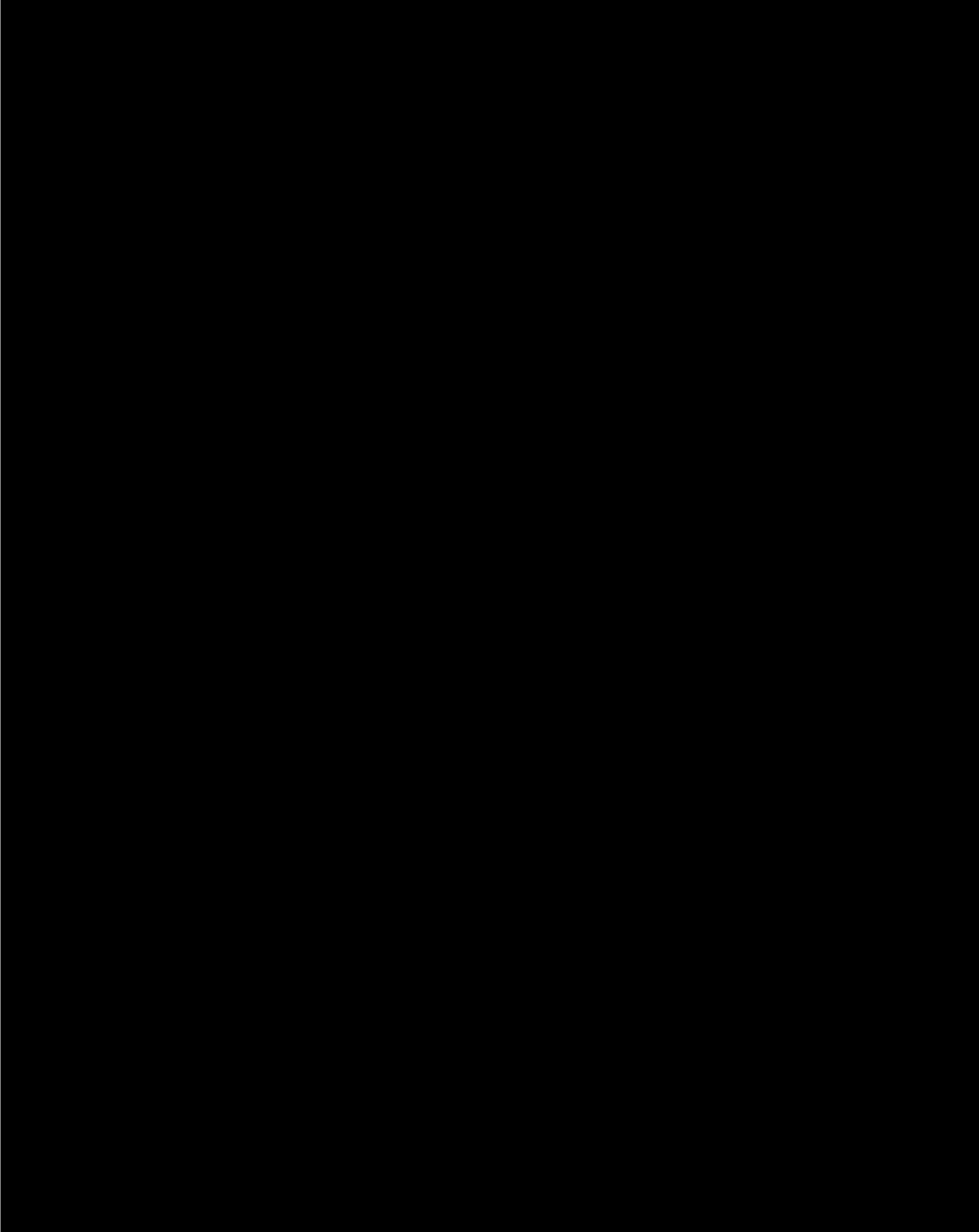
Langdon Re-Power Wind Farm

Figure 2 – Known Cultural Resources

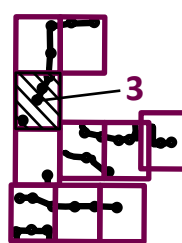
Page 3 of 10

Cavalier County, North Dakota

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- ▭ Township



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SOURCE: 1965 Topo Map

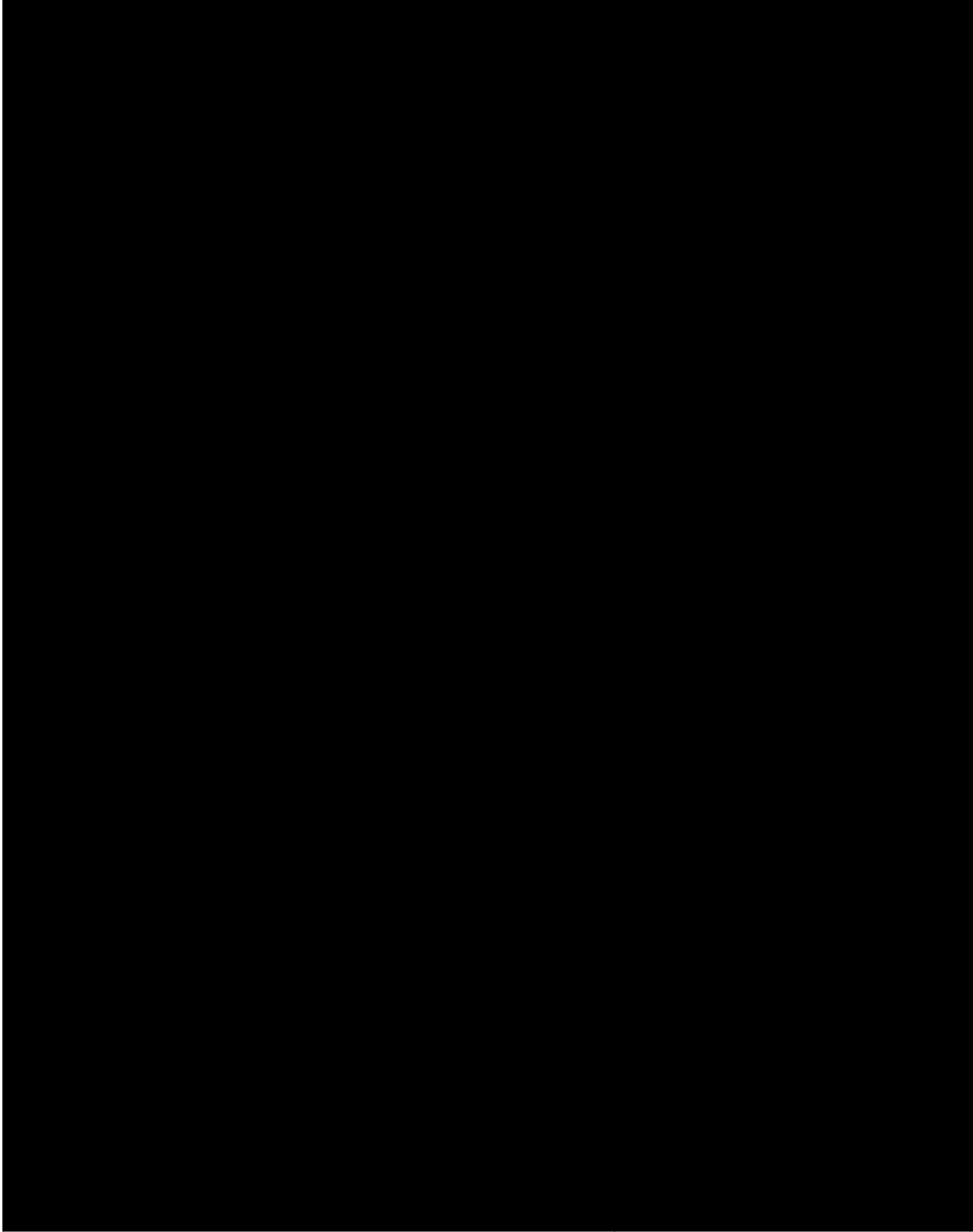
Langdon Re-Power Wind Farm

Issue Date:
1/24/2023

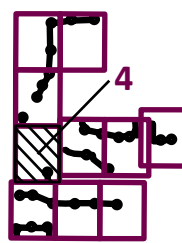
Figure 2 – Known Cultural Resources

Page 4 of 10

Cavalier County, North Dakota



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- Existing Access Roads
- Disturbance Area (~72 acres)
- ▭ Study Area
- ▭ Township



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SOURCE: 1965 Topo Map

Langdon Re-Power Wind Farm

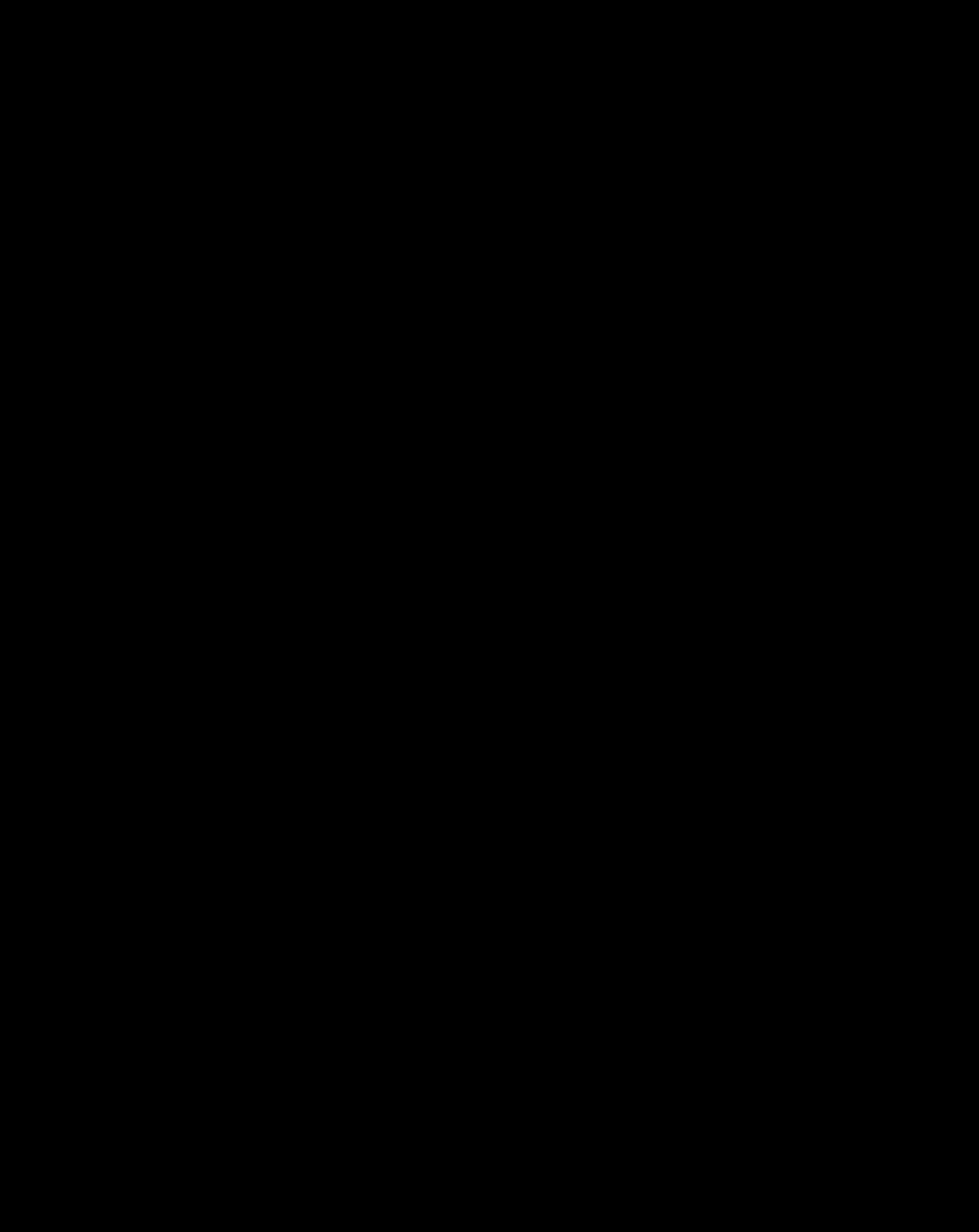
Figure 2 – Known Cultural Resources

Page 5 of 10

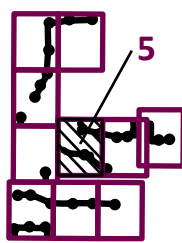
Cavalier County, North Dakota

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- ▭ Township



ATWELL



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SOURCE: 1965 Topo Map

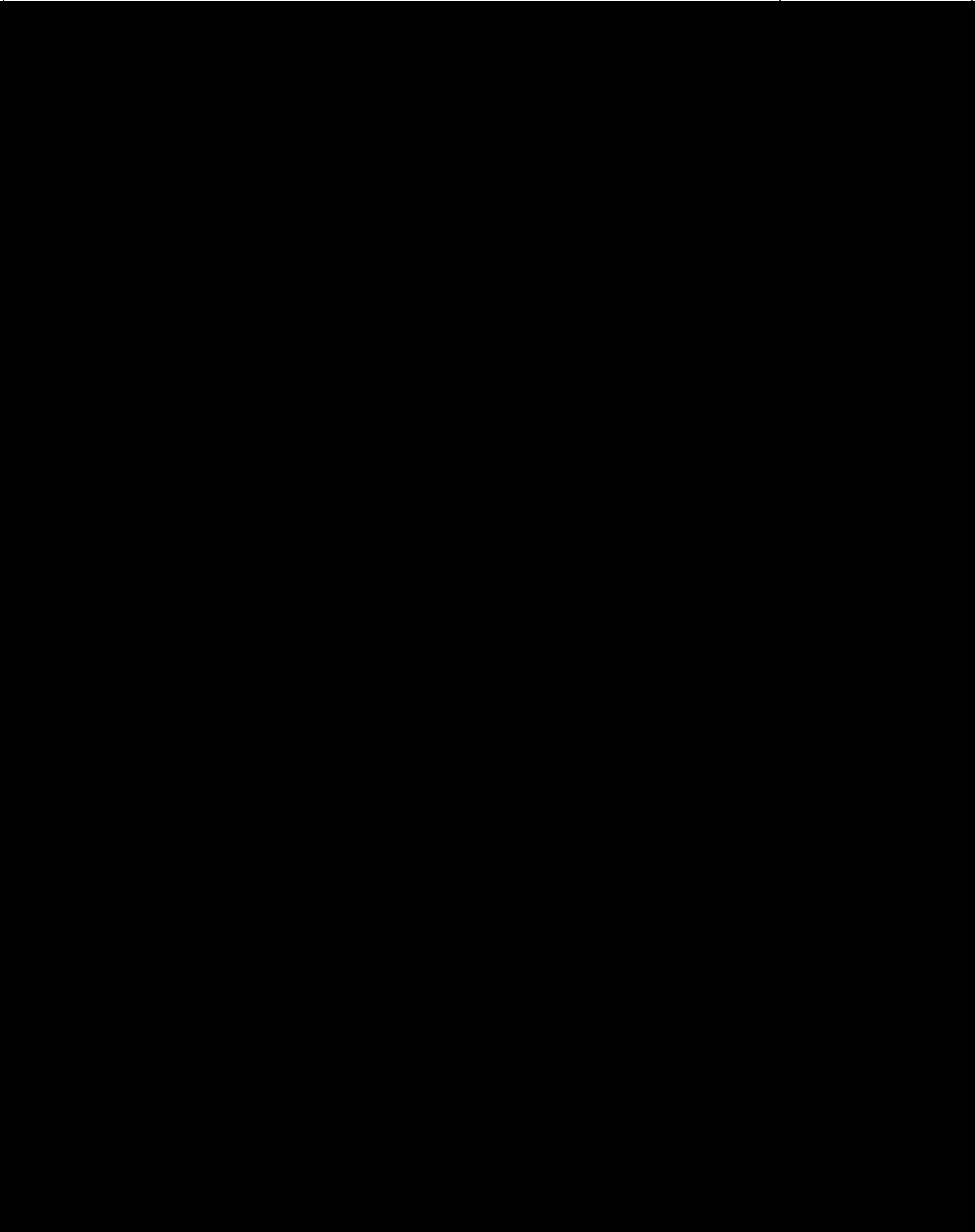
Langdon Re-Power Wind Farm

Issue Date:
1/24/2023

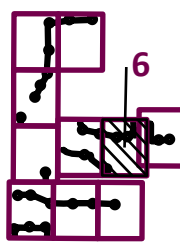
Figure 2 – Known Cultural Resources

Page 6 of 10

Cavalier County, North Dakota



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SOURCE: 1965 Topo Map

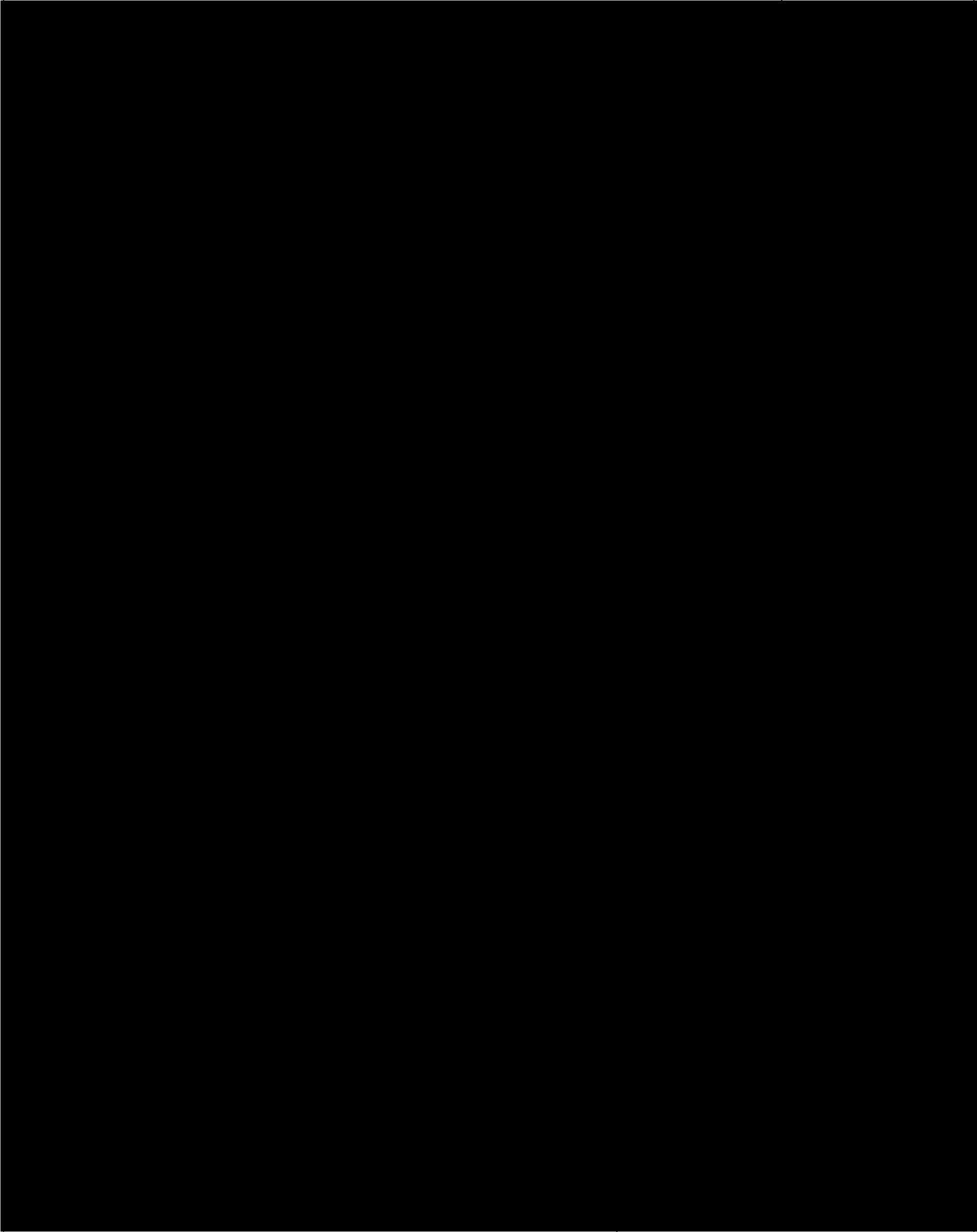
Langdon Re-Power Wind Farm

Figure 2 – Known Cultural Resources

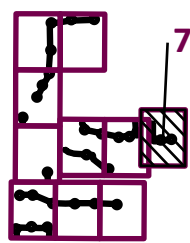
Page 7 of 10

Cavalier County, North Dakota

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0 0.1 Miles

SOURCE: 1965 Topo Map

Langdon Re-Power Wind Farm

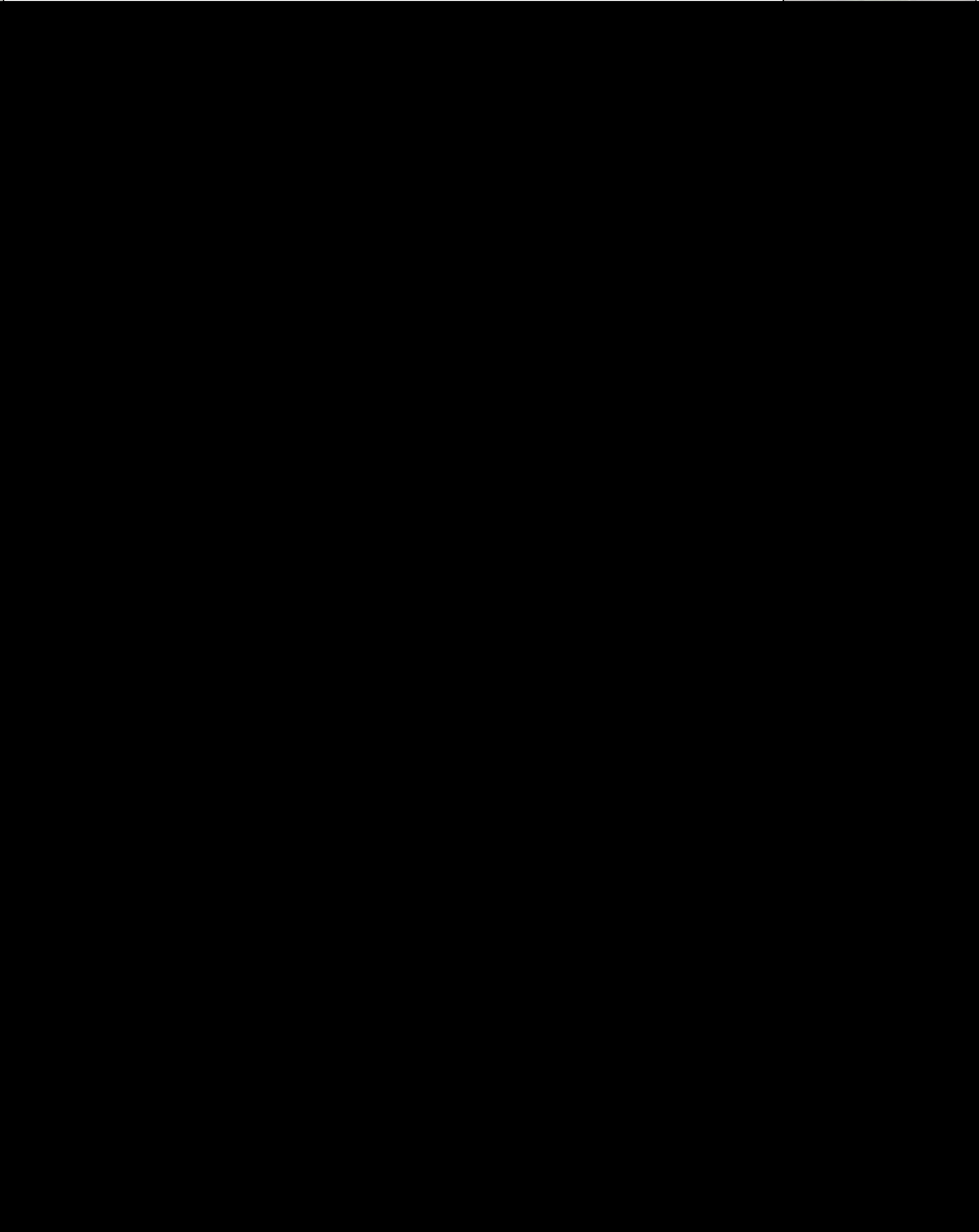
Figure 2 – Known Cultural Resources

Page 8 of 10

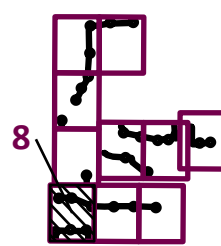
Cavalier County, North Dakota

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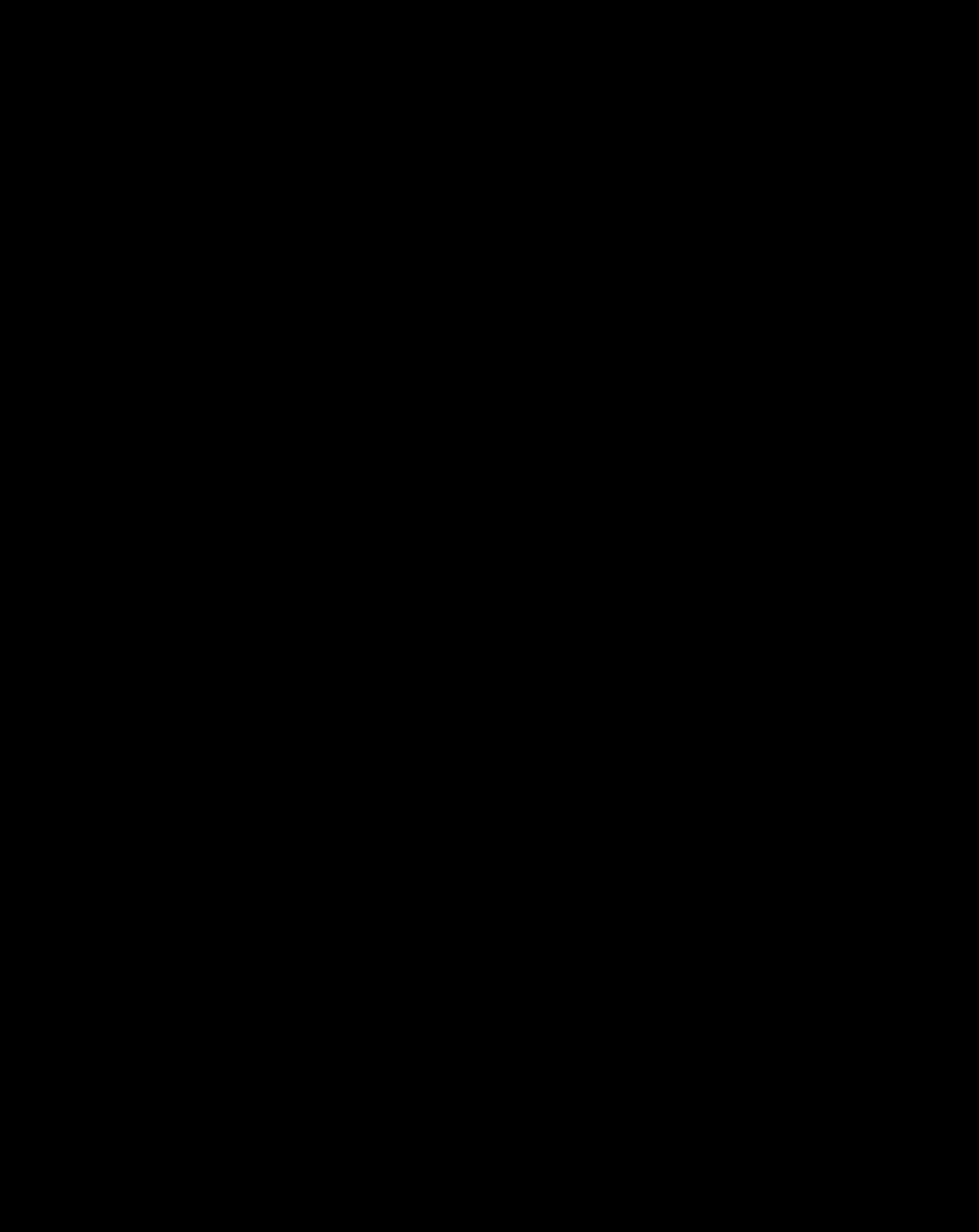
Langdon Re-Power Wind Farm

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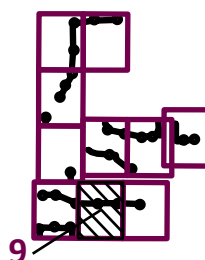
Figure 2 – Known Cultural Resources

Page 9 of 10

Cavalier County, North Dakota



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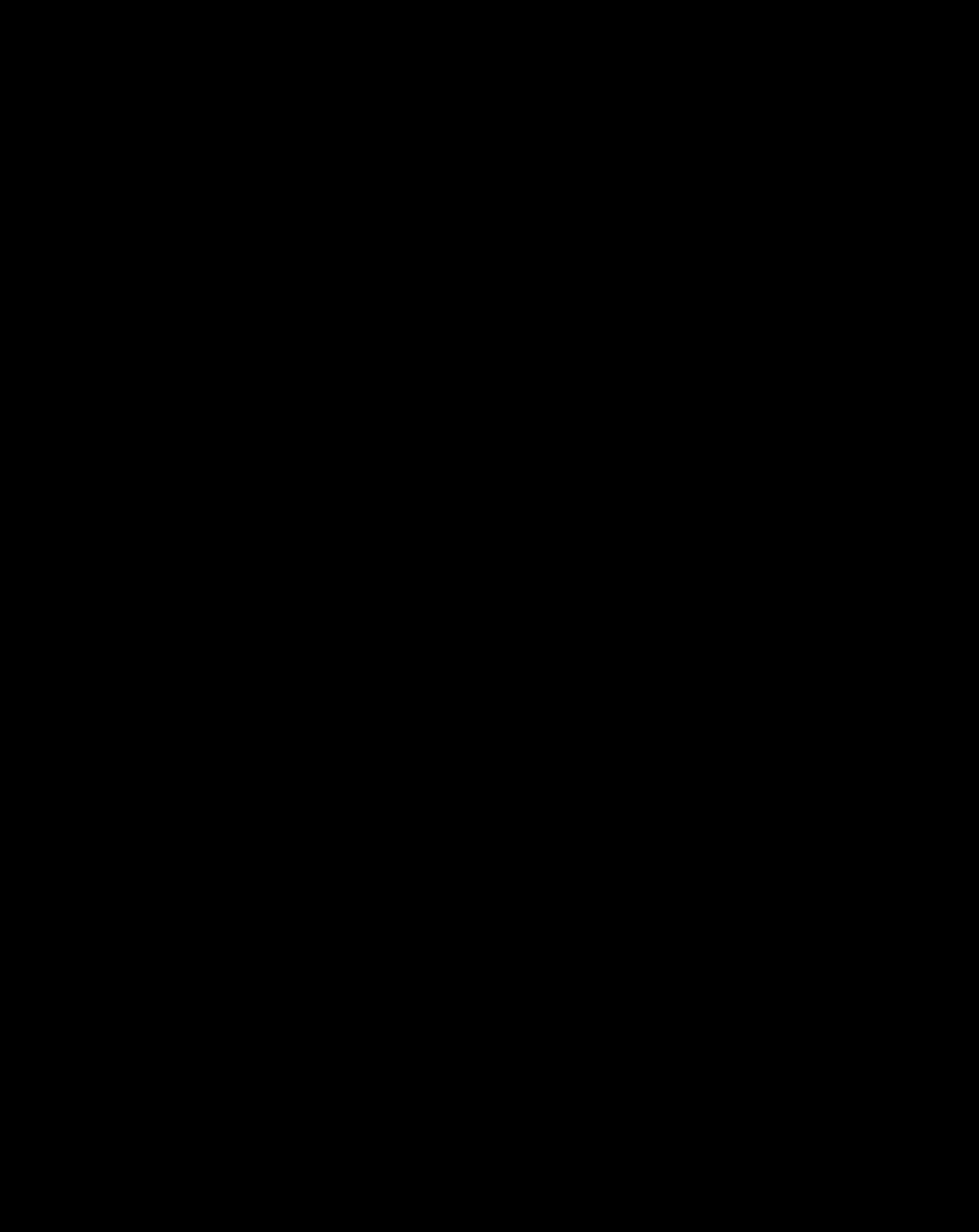
Langdon Re-Power Wind Farm

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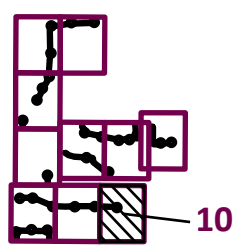
Figure 2 – Known Cultural Resources

Page 10 of 10

Cavalier County, North Dakota



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0 0.1 Miles

SOURCE: 1965 Topo Map

Appendix F – Unanticipated Discoveries Plan



UNANTICIPATED DISCOVERIES PLAN

LANGDON WIND FARM PROJECT CAVALIER COUNTY, NORTH DAKOTA

Prepared for

Otter Tail Power Company
215 S. Cascade Street
Fergus Falls, Minnesota 56537

Atwell Project No. 22006034

Submitted by Atwell, LLC

March 1, 2023

Contents

1	INTRODUCTION.....	1
2	SUMMARY OF ARCHAEOLOGICAL INVESTIGATIONS.....	2
3	REGULATORY BACKGROUND AND AUTHORITY	3
4	UNANTICIPATED DISCOVERY PROCEDURES.....	4
4.1	Archaeological Material.....	4
4.2	Human Remains and Unmarked Burials.....	5
5	KEY PERSONNEL AND OFFICIALS.....	8

Appendices

Appendix A: Examples of Archaeological Resources

1 Introduction

This Unanticipated Discoveries Plan (UDP) has been developed to lay out specific protocols and procedures to be taken should unanticipated archaeological resources be discovered during construction, operation, or decommission of the proposed Langdon Wind Project (Project) located in Cavalier County, North Dakota. *Unanticipated Discoveries* are previously unknown or unrecorded archaeological resources, including human remains, discovered during Project activities. A series of steps to minimize physical impacts to archaeological resources is outlined in this UDP.

The protocols and procedures in the UDP outline actions to be taken if unanticipated discoveries are encountered during construction, operations, and decommission. The UDP is applicable to ground disturbing work associated with the Project during the construction, operations, and decommissioning phases. It may be revised from time to time to make adjustments in accordance with regulatory changes, approved practices, or expansion into previous non-Project areas.

The UDP includes procedures in accordance with the State Historical Society of North Dakota (SHSND) for compliance with state requirements. In addition, general requirements for meeting the National Historic Preservation Act (NHPA) are included in the UDP.

The objectives of these procedures are to identify and promote avoidance and/or the preservation and recording of any archaeological material discovered. A key component of the UDP is notification of archaeological authorities to resolve any issues that may arise from unanticipated discoveries.

2 Summary of Archaeological Investigations

An archaeological literature review, completed in November of 2022, indicated that two previous archaeological surveys had been conducted within the Project Area, one of which covered a significant portion of the Project Area. The literature review also indicated that one archaeological site lead, 32CVX15, has been previously recorded within the current Project Area. There is very little information recorded on the site form, but it appears that the Easby Post Office was once located somewhere within the general vicinity of the Project Area. Previous survey within the site lead boundary, in the vicinity of the Project Area, did not reveal any archaeological deposits.

Based on the literature review in conjunction with the fact that the Project Area has largely been previously surveyed and disturbed by the original construction of the wind farm, Atwell makes the following recommendations:

- The Project proceed as planned without additional cultural resource work prior to construction.
- An UDP be developed to establish procedures and relevant contact information in the event that human remains or archaeological deposits are discovered during the construction, operational, and decommission phases of the Project.
 - If buried archaeological resources are encountered, all activity should cease in the immediate area and within a 100-foot buffer area and the artifacts should be left in place. The Client's archaeologist should be contacted immediately, and unanticipated discovery procedures should be initiated.
 - If human remains are encountered, construction should stop in the immediate area of discovery and within a 100-foot buffer area, and law enforcement should be notified immediately. Law enforcement officials should determine whether the discovery is a crime scene and whether the remains are prehistoric or historic Native American remains. The SHSND should be contacted immediately if the human remains are determined to be prehistoric or historic in nature and/or Native American remains.

The report was submitted to the SHSND on January 30, 2023. Otter Tail Power Company (Otter Tail) is coordinating with SHSND regarding the concurrence letter.

3 Regulatory Background and Authority

The UDP is designed to meet North Dakota and federal regulations governing the discovery of archeological materials and human remains. The applicable state and federal regulations are:

- North Dakota Century Code 55-10-11 – Recognition of Federal Historical Preservation Law;
- North Dakota Century Code 23-06-27 – Protection of human burial sites, human remains, and burial goods;
- Section 106 of the National Historic Preservation Act, (NHPA), as Amended; and

Currently, no federal trigger has been identified for this Project; therefore, Section 106 regulation do not apply. However, this UDP has been designed to comply with Section 106 should a federal trigger be identified in the future.

North Dakota has stringent state laws protecting human burials. A human burial can be marked or unmarked. An “unmarked burial” includes any location where human remains have been or may be found inadvertently and where there is no surficial evidence of a burial site (i.e., cemetery fence lines, tombstones, grave markers, etc.). This includes all prehistoric or historic Native American burials as well as all early historic-period Euro-American, African-American, and other isolated burials and abandoned cemeteries that are no longer being used for internments or being maintained in good condition. Human burials are protected under North Dakota Century Code 23-06-27. This law outlines the penalties for disturbing these resources as well and outlines the reporting protocol in the event an unmarked grave, burial, or historic cemetery is discovered.

4 Unanticipated Discovery Procedures

The general process for managing unanticipated discoveries is outlined in the following section, followed by information specific to archaeological sites and human remains or unmarked burials.

A responsible person who will be involved with all aspects of Project-related ground disturbing work during the construction, operations, and decommissioning phases should be identified. The designated responsible person (cultural liaison) should be present onsite during most Project activities and have some level of training, awareness, and sensitivity to the cultural resources that may be encountered within the Project site. This person will act as the Project liaison with the owner, Project archeologist, and cultural resources authorities in the event of unanticipated discoveries. S/he also will serve as the initial contact in the event of unanticipated discoveries during Project activities and be listed in the contacts section of this UDP.

During the Project kick-off meeting, all contractors will be made aware of the UDP and will be provided contact information for the cultural liaison, who will contact the Project archeologist to evaluate the need for further action. Whenever new personnel are brought onsite, they also will be informed of the UDP and the contact information. A copy of the UDP, including contact information, shall be posted in an accessible location onsite for reference as needed.

4.1 Archaeological Material

For purposes of the UDP, “archaeological material” could be from prehistoric or historic periods and includes, though not exclusively, the following types of materials (see Appendix A for additional examples):

- An area of charcoal or charcoal-stained soils associated with historic-period or prehistoric-period remains, such as bones, pottery sherds, shell, stone tools or chips;
- An arrowhead, pottery sherds, shell, stone tool, or stone chips;
- A historic-period bottle, old glass fragments, square nails, bricks and mortar, decorated white ware ceramics, etc.;
- A cluster of shell, sherds, and/or bones or large field stones or burned rocks in association with stone tools or chips;
- Dredging, pumping, industrial, and/or agricultural equipment older than 50 years;
- Buried structures, brick foundation piers or concrete slabs from remnant outbuildings or residences;
- A cluster of darkened soils in association with bones; and
- Undisturbed mounds of soil in areas that were once wetlands or shorelines.

The following general procedure is to be executed if archaeological material is discovered.

1. The site supervisor/foreman is informed of the discovery. The site supervisor/foreman will then contact the cultural liaison.
2. All construction activity within 100 feet of the discovery area/feature/site will cease immediately.
3. All remains or materials are to be left in place unless in jeopardy because of Project activities.
4. The area will be secured to prevent any damage or loss of removable objects. If feasible, a fence or other barrier will be erected to demarcate and protect the discovery area.
5. The cultural liaison will contact the Project archeologist, who will record the discovery location and delineate the extent of the discovery relative to planned Project activities. The Project archeologist will assess, record, and photograph the find.
6. Within 48 hours of the discovery, the Project archeologist will notify the SHSND and provide a brief written summary of the discovery that will include a recommendation on the NRHP eligibility of the resources, the effect of Project activity on historic properties, if present, and a proposed treatment to resolve adverse effects, if applicable.
7. The SHSND will review the recommendation made by the Project archaeologist and determine the appropriate course of action.
8. If cultural resources or remains have the potential to be culturally significant to a living Native American Tribe, the SHSND will notify the appropriate Tribes.
9. If human remains or unmarked burial sites are discovered, procedures in the next section should be followed.

4.2 Human Remains and Unmarked Burials

It is recommended that the Project follow the unanticipated discoveries protocol outlined in this section if any human remains or unmarked burial sites are discovered during Project activities.

Human remains may include any human body parts. Burial artifacts and burial sites are not easily recognized, but generally would include intact prehistoric pots, clusters of artifacts, or modern grave features (e.g., headstones, coffin parts, etc.). If in doubt whether the bones or other materials are human, it is best to stop work in the immediate area of the discovery and seek advice from the Project archaeologist.

Procedures for unanticipated discoveries involving human remains or unmarked burials are outlined below. In the event that human remains, an unmarked burial, or an abandoned cemetery is encountered by Project staff, the following procedures are applicable.

1. On discovery of the remains, construction activities (including excavation or any other below ground work) within 100 feet of the discovery will cease.
2. The site supervisor/foreman will be informed of the discovery. The site supervisor/foreman will then notify the cultural liaison.
3. Temporary site protection measures (e.g., high visibility warning tape and stakes, avoidance signs in language[s] understandable to the Project team, etc.) will be installed around the discovery area to prevent unintentional incursion and potential damage to the remains.
4. The cultural liaison will contact local law enforcement (e.g., police department, county sheriff) within 24 hours. Local law enforcement will notify the appropriate medical examiner's office.
5. The cultural liaison will contact the Project archaeologist, who will be or will engage a qualified professional archaeologist who is permitted in North Dakota and who has a background in osteology, forensic anthropology, physical anthropology, or equivalent.
6. The Project archaeologist will notify the SHSND within 48 hours of the discovery and provide the SHSND with a brief summary of the findings and recommendations.
7. The local law enforcement officials must be given site access to assess the nature and age of the remains. If the medical examiner's office determines that the human remains are older than 50 years of age and there is no need for a legal inquiry or criminal investigation, the SHSND will have jurisdiction over the remains.
8. If the SHSND believes the remains may have ethnic affinity with a living Native American Tribe, the SHSND will notify the appropriate Tribal representative(s) of the discovery.
9. Consultation will be initiated between the Project personnel (consisting of Otter Tail or their agent, the Project archaeologist or qualified professional archaeologist, and the cultural liaison) and the SHSND to determine the final disposition of the human remains. The below will be considered during consultation if the remains are determined to be Native American.
 - a. The National Park Services' Native American Graves Protection and Repatriation Act (NAGPRA) (U.S. Code 25, §3001, et seq.) database and Tribal websites.
 - b. Information available at the Great Plains Regional Office of the Bureau of Indian Affairs.
 - c. The potential interest of additional state-recognized Tribes.

10. No work that will cause a direct effect to the discovery area will proceed until all human remains and associated artifacts have been recovered, and, where applicable, the appropriate regulatory agencies have given clearance for the Project work to proceed.

5 Key Personnel and Officials

In the event of an unanticipated discovery, the key personnel and agency officials listed below should be contacted consistent with the steps outlined above.

Cultural Liaison

Bryce Haugen
Energy Supply
215 S. Cascade St.
Fergus Falls, MN 56537
(701) 739-8385
bhaugen@otpc.com

Project Archaeologist

Matthew Chouest
2 Towne Square
Southfield, MI 48076
(517) 231-2053
mchouest@atwell-group.com

State Historical Society of North Dakota (SHSND)

Andrew J. Robinson
State Archaeologist
State Historical Society of North Dakota
Archaeology and Historic Preservation
612 East Boulevard Avenue
Bismarck, ND 58505-0830
Phone: (701) 328-3575
Email: andrewrobinson@nd.gov

Cavalier County Sheriff's Office

901 3rd Street #4
Langdon, NH 58249
Phone: (701) 256-2555

Cavalier County Coroner's Office

909 2nd Street
Langdon, ND 58249
Phone: (701) 256-6100

APPENDIX A - EXAMPLES OF ARCHAEOLOGICAL RESOURCES

Surface or subsurface structures, shelters, facilities, or features, including, but not limited to

- domestic structures
- storage structures
- cooking structures
- ceremonial structures
- artificial mounds
- earthworks
- fortifications
- canals
- reservoirs
- gardens or fields
- bedrock mortars
- grinding surfaces
- rock alignments
- cairns
- trails
- borrow pits
- cooking pits
- refuse pits
- burial pits or graves
- hearths
- kilns
- post molds
- wall trenches

- middens
- Surface or subsurface artifact concentrations or scatters
- Whole or fragmentary tools, implements, containers, weapons or weapon projectiles, clothing, and ornaments, including, but not limited to:
 - pottery
 - other ceramics
 - cordage
 - basketry
 - other weaving
 - bottles
 - other glassware
 - bone
 - ivory
 - shell
 - metal
 - wood
 - hide
 - feathers
 - pigments
 - flaked stone
 - ground stone
 - pecked stone
- By-products, waste products, or debris resulting from manufacture or use of human-made or natural materials
- Organic waste, including, but not limited to: vegetal and animal remains, coprolites
- Human remains, including, but not limited to: bone, teeth, mummified flesh, burials, cremations

- Rock carvings, rock paintings, intaglios, and other works of artistic or symbolic representation
- Rock shelters and caves or portions thereof containing any of the above material remains
- All portions of shipwrecks, including, but not limited to: armaments, apparel, tackle, cargo
- Any portion or piece of any of the foregoing

Appendix G – IPaC Resource List

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Cavalier County, North Dakota



Local office

North Dakota Ecological Services Field Office

☎ (701) 250-4481

📠 (701) 355-8513

3425 Miriam Avenue

Bismarck, ND 58501-7926

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

-
1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Insects

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <https://www.fws.gov/program/migratory-birds/species>
- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>
- Nationwide conservation measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern \(BCC\)](#) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
<p>Black Tern <i>Chlidonias niger</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3093</p>	Breeds May 15 to Aug 20
<p>Bobolink <i>Dolichonyx oryzivorus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.</p>	Breeds May 20 to Jul 31
<p>Hudsonian Godwit <i>Limosa haemastica</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.</p>	Breeds elsewhere
<p>Lesser Yellowlegs <i>Tringa flavipes</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679</p>	Breeds elsewhere
<p>Short-billed Dowitcher <i>Limnodromus griseus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480</p>	Breeds elsewhere

Willet *Tringa semipalmata*

Breeds Apr 20 to Aug 5

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (l)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

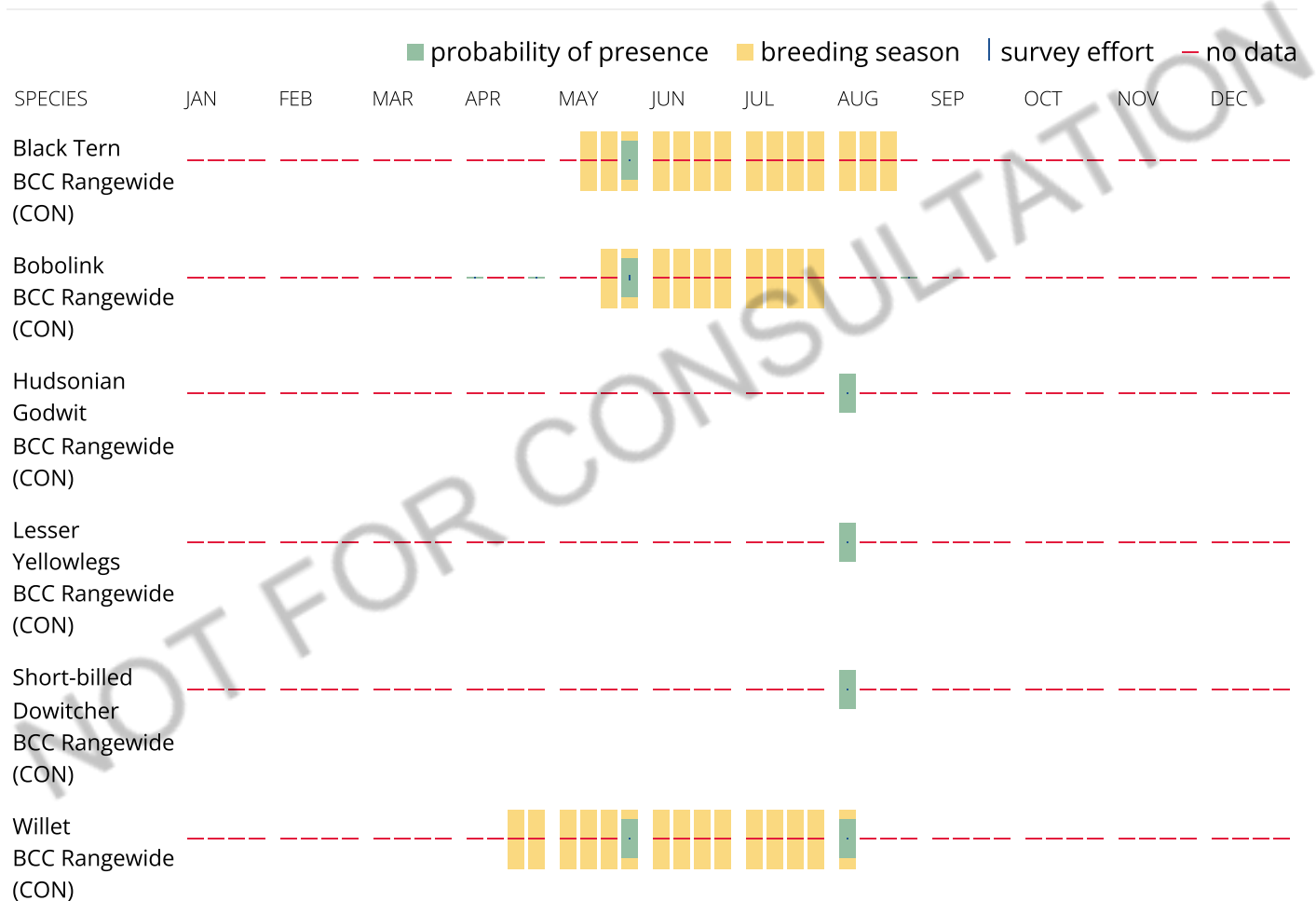
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (-)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go to the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the [RAIL Tool](#) and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Coastal Barrier Resources System

Projects within the [John H. Chafee Coastal Barrier Resources System](#) (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local [Ecological Services Field Office](#) or visit the [CBRA Consultations website](#). The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

There are no known coastal barriers at this location.

Data limitations

The CBRS boundaries used in IPaC are representations of the controlling boundaries, which are depicted on the [official CBRS maps](#). The boundaries depicted in this layer are not to be considered authoritative for in/out determinations close to a CBRS boundary (i.e., within the "CBRS Buffer Zone" that appears as a hatched area on either side of the boundary). For projects that are very close to a CBRS boundary but do not clearly intersect a unit, you may contact the Service for an official determination by following the instructions here: <https://www.fws.gov/service/coastal-barrier-resources-system-property-documentation>

Data exclusions

CBRS units extend seaward out to either the 20- or 30-foot bathymetric contour (depending on the location of the unit). The true seaward extent of the units is not shown in the CBRS data, therefore projects in the offshore areas of units (e.g., dredging, breakwaters, offshore wind energy or oil and gas projects) may be subject to CBRA even if they do not intersect the CBRS data. For additional information, please contact CBRA@fws.gov.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

This location did not intersect any wetlands mapped by NWI.

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

Appendix H – Agency Correspondence

OTP Langdon Repower Projects Agency Correspondence Log

Date	Deliverable	Communication Type	To	From	Discussion
NTIA					
11/23/2022		Email	John McFall (NTIA)	Frank O'Brien (COMSEARCH)	Request for NTIA Review
1/18/2023		Letter	Frank O'Brien (COMSEARCH)	John McFall (NTIA)	Response to the OTP Langdon Wind Project in North Dakota request for NTIA review. No Issues were identified by the government agencies for the project area.
SHPO					
1/30/2023	Report, Data	Mail and Online Submission	Lisa Steckler (State Historical Society of North Dakota)	Mark Doperalski (Atwell)	Hard copy of the Class I report and manuscript were mailed to the SHPO. The report, manuscript and relevant GIS data were submitted online.
USFWS					
12/8/2022	Map, Data, Request Letter	Email	USFWS North Dakota Field Office	Leonard Powell (Atwell)	Formal request for information regarding natural resources from the USFWS for the OPT Repower Project.
1/24/2023		Email	USFWS North Dakota Field Office	Leonard Powell (Atwell)	Follow up on formal request for information on natural resources.
1/25/2023		Email	Leonard Powell (Atwell)	Heidi Riddle (USFWS North Dakota Field Office)	Initial response to request for information. Stated that USFWS would have comments on the project and a letter would be sent the following week.



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

January 18, 2023

Mr. Frank O'Brien,
COMSEARCH
19700 Janelia Farm Blvd.
Ashburn, VA 20147

Re: OTP Langdon Wind Project: Cavalier, ND

Dear Mr. O'Brien:

In response to your request on November 23, 2022, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the OTP Langdon Wind Project located in Cavalier County, North Dakota.

After a 45+ day period of evaluation, no *reviewing* agencies had issues with turbine placement in this area.

Commerce has completed our review of the subject wind farm proposal and found the project area is over 146 km NW of the Grand Forks, ND NEXRAD. Based upon distance and terrain this project appears to be radar neutral. No further contact with the developer is requested at this time.

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 these proposals.

Sincerely,

John R. McFall
Deputy Chief, Spectrum Services Division
Office of Spectrum Management