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April 27, 2016

Hand Delivery

Mr. Darrell Nitschke
Executive Director
NORTH DAKOTA PUBLIC
SERVICE COMMISSION
600 E. Boulevard Avenue, Dept. 408
Bismarck, ND 58505-0480

In re: Oliver Wind III, LLC
Case Nos. PU-16-122 and PU-16-123
Our File No. 35-218-029

Dear Mr. Nitschke:

Please find enclosed for filing eleven copies of the bat habitat assessment in the captioned cases.

Please let me know if you have any questions. Thank you.

Sincerely,

Wade C. Mann

WCM/lh
enc.

cc: Sara Cardwell (via email)
Mitchell D. Armstrong (via email)
Brian Schmidt (via email)
Patrick J. Ward (via email)

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Bat Habitat Assessment
Oliver Wind III, LLC
Wade Mann, Crowley Fleck, PLLPv

27 PU-16-122 Filed 04/27/2016 Pages: 36
Bat Habitat Assessment
Oliver Wind III, LLC
Wade Mann, Crowley Fleck, PLLP

Bat Habitat Assessment

Oliver III Wind Energy Center

Morton and Oliver Counties, North Dakota

Prepared for:

NextEra Energy Resources, LLC

700 Universe Blvd.

Juno Beach, Florida 33408

April 2016

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1.0 INTRODUCTION

Oliver III Wind, LLC (Oliver III), an indirect, wholly-owned subsidiary of NextEra Energy Resources, LLC is proposing to develop the Oliver III Wind Energy Center (Project) in Morton and Oliver Counties, North Dakota, located in central North Dakota approximately 13 miles northwest of Bismarck (Figure 1). The Project has a proposed nameplate capacity of approximately 100 megawatts (MW). The Project also includes a planned approximately 10-mile, 230-kilovolt (kV) overhead transmission interconnect line. Additional Project facilities include access roads, electrical collection systems and cabling, a collection substation, an operation and maintenance (O&M) building, and a construction laydown area.

Oliver III contracted Tetra Tech, Inc. (Tetra Tech) to evaluate the suitability of habitat within the Project Area for bats, with a focus on the northern long-eared bat (*Myotis septentrionalis*; hereafter NLEB). Tetra Tech evaluated the area where wind turbines are proposed (Project Area dated March 15, 2016; Figure 2) as well as a 1.5-mile buffer of the Project Area (Project Buffer; Figure 3).

The objectives of the habitat assessment are to:

- Evaluate habitat features within the proposed Project Area and Project Buffer for bats, using a desktop approach, focusing specifically on NLEB;
- Assess the likelihood of NLEB and other bat species occurring within the proposed Project Area and Project Buffer based on known distributions and habitat requirements of known bat species in the region.

In October 2013, the NLEB was proposed for listing as endangered under the federal Endangered Species Act (ESA) and in April 2015 the USFWS listed NLEB as threatened under the ESA with an interim 4d rule (USFWS 2013, USFWS 2015b). Under the interim Section 4(d) rule, take of NLEB is prohibited within the U.S. Fish and Wildlife Service (USFWS) White-Nose Syndrome (WNS) Buffer, which includes all counties affected by WNS and an additional 150-mile (241-km) buffer around these counties (USFWS 2015c). All take incidental to otherwise lawful activities is not prohibited outside of the WNS buffer designated by USFWS. The Project Area is outside of the area in which take is prohibited under the interim 4d rule. Tetra Tech has prepared a bat habitat assessment in accordance with USFWS recommendations for NLEB impact assessments (USFWS 2014b). Tetra Tech examined publically available information and habitat requirements of NLEB and other bat species that may occur in the vicinity of the Project Area, the results of which are summarized in Section 3.0. Sections are subdivided into habitat suitability for NLEB and all bat species.

Letters were sent to USFWS and North Dakota Game and Fish (NDGF) on September 9, 2011 introducing the Project and requesting information on sensitive biological resources. The USFWS commented on the Project on October 20, 2009, June 23, 2010, and again on December 21, 2011. None of these letters discuss potential impacts to bats from the Project; however, the letters pre-date the listing of NLEB. In a letter dated October 10, 2011, the NDGF recommended avoiding impacts to wetlands and recommended post-construction avian and bat

mortality monitoring. Additional letters were sent to USFWS and NDGF on November 25, 2015 and January 14, 2016 to request information on sensitive biological resources within an updated Project boundary and transmission line corridor. The NDGF responded on December 24, 2016; in this letter, the NDGF recommended avoiding impacts to wetlands and recommended post-construction avian and bat mortality monitoring and did not specifically address the NLEB. No correspondence was received from the USFWS responding to letters dated November 25, 2015 and January 14, 2016.

Background

This section describes the Project Area and includes background information on bats in the region, a summary of current information regarding bat interactions with wind energy projects, and a discussion of the legal and regulatory framework applicable to bats and wind energy.

Project Area Description

The 21,881-acre Project Area is located on privately-owned lands in central North Dakota and is approximately 13 miles northwest of Bismarck in Morton and Oliver Counties (Figure 1). The Project Area is located in the Missouri Plateau and River Breaks subregion of the Northwestern Great Plains Ecoregion (Bryce et al. 1996). Bedrock geology in the region is primarily sandstone and shale and geology within the vicinity of the Project Area is sandstone and siltstone (Bryce et al. 1996, NDGS [North Dakota Geological Survey] and NDDH [North Dakota Department of Health] 2001; Figure 4). Due to the local geology and topography, caves do not form regularly in the sandstone and siltstone of the Project Area and there no known caves within 20 miles of the Project Area (Murphy 2007).

Land use within the ecoregion is primarily dryland farming and cattle grazing. The Project Area lies over a bedrock of silt, sand, clay, sandstone, and lignite deposits (Figure 4). Coal mining in western North Dakota for lignite coal deposits is common and primarily done through surface mining although underground mines are also used (Figure 4; Murphy no date; NDPSC 2013). The topography of the region is a semi-arid rolling plain (Bryce et al. 1996). Vegetation in the region was historically mixed-grass prairie with blue grama (*Bouteloua gracilis*), little bluestem (*Schizachyrium scoparium*), prairie sandreed (*Calamovilfa longifolia*) and other associated prairie grasses (Bryce et al. 1996). Native grasslands still occur in areas of steep topography unsuitable for agriculture. The dissected topography, wooded draws, and uncultivated areas of the River Breaks region of the Missouri River provide habitat for wildlife such as deer, small mammals, and migratory birds. Riparian forests of cottonwood (*Populus deltoides*) and green ash (*Fraxinus pennsylvanica*) persist along major tributaries such as the Moreau and Cheyenne rivers, but they have largely been eliminated along the Missouri River by impoundments (Bryce et al. 1996).

The existing land use in the Project Area is primarily agriculture and cattle production. The area contains a few small wetlands that vary from shallow vegetated depressions, man-made cattle ponds, and intermittent creeks. Nelson Lake is located approximately five miles north of the Project Area. Residences and a few abandoned farmsteads are scattered throughout the

Project Area. The Project Area is mostly cattle pastures, hayfields, and agriculture. Trees and forested areas are restricted to riparian areas and windbreaks for houses and fields.

Based upon the National Land Cover Database (NLCD) information for the Project Area, the land cover is dominated by agricultural crops (56.9percent), herbaceous grassland (28.2 percent), and pastures/hayfields (8.8 percent; Figure 2; Jin et al. 2013). The topography within the Project Area is primarily rolling plains and lacks prominent landscape features (e.g. hills, valleys).

1.1 Wind Energy and Bats

Bat mortality associated with wind turbine operations has been reported at locations around the world, including wind energy facilities in the United States (Kunz et al. 2007, Arnett et al. 2008, Rydell et al. 2010, Hayes 2013). Rates of overall bat mortality from wind turbines vary by region (Arnett et al. 2008, Baerwald and Barclay 2009, Cryan 2011, Hein et al. 2013). The highest numbers of fatalities reported in the United States are from wind energy facilities in the eastern U.S., particularly those located along forested ridges in the Appalachian region where annual mortality estimates have ranged from 20.8 to 69.6 bats per turbine per year, or 14.9 to 53.3 bats per MW per year (Arnett et al. 2008, Strickland et al. 2011). However, relatively high fatality estimates for bats also have been reported at wind energy facilities in agricultural settings in the central and Midwestern U.S. (Table 1, Jain 2005, Gruver et al. 2009, Poulton 2010).

Bat mortality at wind energy facilities is caused primarily by direct collision with moving turbine blades (Horn et al. 2008). There is little information about the indirect causal factors that influence bat mortality at wind energy facilities, although several hypotheses have been proposed (Kunz et al. 2007, Arnett et al. 2008, Cryan and Barclay 2009, Rydell et al. 2010). The current leading hypotheses are that bats are attracted to turbines for several reasons including as potential roosting locations (Kunz et al. 2007), potential pairing or mating sites (Cryan and Barclay 2009), or the potential accumulation of migratory insects around turbine rotors (Rydell et al. 2010). Thus, multiple variables that may contribute to bat fatalities from wind turbines include, but are not limited to the biology of the bat species, season, region, and turbine design (Kunz et al. 2007). Regardless of the specific causes of bat fatalities, two general patterns of fatalities are consistent across nearly all wind energy facilities:

1. Migratory tree-roosting bats represent the majority of fatalities; and
2. The majority of bat fatalities occur during late summer and early fall, coinciding with the fall migratory movements of bats (Arnett et al. 2008, Cryan 2011).

Some migratory bats travel long distances at altitudes that may overlap with the height of wind turbine blades, making them more susceptible to collisions. The probability of mortality events may also increase during periods low wind speeds or low barometric pressure, which are conditions associated with increased bat activity (Arnett et al. 2008).

Tree bats, such as eastern red bats (*Lasiurus borealis*), silver-haired bats (*Lasionycteris noctivagans*), and hoary bats (*Lasiurus cinereus*), make long latitudinal migrations to warmer climates, and peaks in fatality rates appear to coincide with increasing bat activity levels

associated with the southward migration of these species (Cryan 2003, Arnett et al. 2008). *Myotis* species are not considered particularly susceptible to direct mortality from wind turbines, but individuals, mostly little brown bat (*Myotis lucifugus*), have been found during mortality searches (Arnett et al. 2008, BHE Environmental 2011, Grodsky and Drake 2011).

NLEB may be most susceptible to impacts during the summer residency period if they are present and roosting habitat is cleared during wind project construction. NLEB are also susceptible to impacts during the spring and fall periods when migrating bats are likely to be flying within the rotor swept area (RSA) and could collide with operational turbines. Although there are only 41 confirmed records of NLEB fatalities at wind energy facilities (USFWS 2015b), the USFWS considers wind projects to be a threat to the species. Under the interim Guidance, the USFWS maintained that the large decline in NLEB populations as a result of WNS may be compounded by the loss of even small numbers of the NLEB as a result of loss of habitat due to project development and collision with wind turbines. However, USFWS has also indicated there "...is no evidence suggesting effects from wind energy development in itself have led to population declines..." (USFWS 2013). Further review of current information suggests that NLEB fatalities caused by wind facilities are not contributing significantly to the species' decline and regulatory mechanisms for wind energy facilities were not included in the final 4(d) rule (USFWS 2016).

All known NLEB fatalities are from wind energy facilities located east of the Mississippi River. The greatest numbers of NLEB have been found at wind energy facilities on forested ridge tops in West Virginia, where a total of seven fatalities have been documented (Kerns and Kerlinger 2004, Young et al. 2009). NLEB mortality has also been documented in New York, Pennsylvania, and Ontario Canada (Arnett et al. 2005, Jacques Whitford 2009, Stantec 2011). Recently, WNS has caused large declines in populations of cave-hibernating species throughout eastern North America. WNS has been especially devastating to populations of species in the *Myotis* genus, including NLEB (*Myotis septentrionalis*), prompting federal protection under the ESA for this species by USFWS (USFWS 2013, USFWS 2015b).

Table 1. Regional Estimates of Mean Bat Fatalities per Megawatt at Wind Facilities in the northern Great Plains and Midwest Regions with Publicly Available Data.

Wind Facility[1]	State	Habitat	Turbine Model (turbine rotor-swept area)[2]	Estimated mean fatalities/MW/year	Bat Species Recorded as Fatalities (in order of decreasing frequency)	Source
Cedar Ridge	Wisconsin	Agricultural cropland	Unknown, 1.6MW (5,281 m^2)	30.40 (per 169 days)	hoary, silver-haired, big brown, eastern red, little brown	Poulton 2010
Blue Sky Green Field	Wisconsin	Agricultural cropland	Vestas V-82, 1.65MW (5,281 m^2)	24.57	little brown, silver-haired, big brown, hoary, eastern red, unidentified	Gruver et al. 2009
Forward Energy	Wisconsin	Agricultural cropland	Not stated	15.63	hoary, silver-haired, eastern red, unidentified, little brown, big brown	Grodsky and Drake 2011
Judith Gap (2006/2007)	Montana	Agricultural cropland	GE 1.5SLE, 1.5MW (4,657 m^2)	8.9	hoary, silver-haired, unidentified	TRC Environmental 2008
Top of Iowa (2004)	Iowa	Agricultural cropland	NEG Micon 52 (2,107.69 m^2)	7.94	hoary, little brown, eastern red, big brown, silver-haired	Jain 2005, Jain et al. 2011
Kewaunee County	Wisconsin	Agricultural cropland	Vestas 0.66MW (1,734 m^2)	6.45	eastern red bat, hoary bat	Howe et al. 2002
Top of Iowa (2003)	Iowa	Agricultural cropland	NEG Micon 52 (2,107.69 m^2)	4.94	hoary bat, little brown bat, eastern red bat, big brown bat, silver-haired bat	Jain 2005, Jain et al. 2011
Judith Gap (2009)	Montana	Agriculture and grassland	Unknown, 1.5MW (4,657 m^2)	4.8	hoary, silver-haired, *Myotis* sp., unidentified	Poulton and Erickson 2010
Ainsworth	Nebraska	Mixed grass prairie	Vestas V82 (5,281 m^2)	1.16	hoary bat, unidentified bat species, big brown bat, eastern red bat	Derby et al. 2007

[1] Facilities arranged by estimated mean fatalities/MW/year.

[2] If varying turbine models were used in the Project, the largest rotor-swept area is given.

1.2 Regulatory Framework

Although the majority of bird species in the U.S. are protected under the federal Migratory Bird Treaty Act, and selected bird species or groups of species are protected under other statutes, there are relatively few laws or regulations that protect bats. At the federal level, there are no laws or regulations specific to bats. Existing environmental laws primarily address the protection of habitat favored by bats, such as caves, and prohibit wanton destruction of wildlife. Bat species determined to be at risk are listed under the federal ESA, or at the state level.

Federal Protection

Of the 45 species of bats known to occur in the continental U.S., six unique species; gray bat (*Myotis grisescens*), Indiana bat (M. *sodalis*), Florida bonneted bat (*Eumops floridanus*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), Mexican long-nosed bat (L. *nivalis*), and NLEB, and two subspecies; Ozark big-eared bat (*Corynorhinus townsendii ingens*), and Virginia big-eared bat (*C. t. virginianus*) are currently federally listed as endangered or threatened and protected under the ESA (USFWS 2015a). Of these species, only the NLEB is known to occur in North Dakota. North Dakota is within the western edge of the range of NLEB, although many areas of the state do not support suitable habitat for the species.

Northern Long-eared Bat and *the Section 4(d) ruling*

In July 2011, the USFWS was petitioned to list the NLEB as endangered or threatened and to designate critical habitat under the ESA (USFWS 2011). On October 2, 2013 USFWS released the results of their 12-Month Finding on the 2011 petition (USFWS 2013). The USFWS concluded that listing for the NLEB was warranted, and the species was proposed for listing. The USFWS also concluded that critical habitat was not determinable for NLEB at this time. The public comment period on the proposed federal listing was originally scheduled to be closed on January 2, 2014, but on June 30, 2014 USFWS published a six-month extension (USFWS 2014a). On January 16, 2015, the USFWS proposed a rule under Section 4(d) of the Endangered Species Act for the NLEB (USFWS 2015b). On April 2, 2015, the USFWS announced that the NLEB was listed as threatened with an interim Section 4(d) rule, which was effective on May 4, 2015. The interim Section 4(d) rule underwent a 90-day public comment period that closed on July 1, 2015 to engage with stakeholders on whether additional exemptions should be included under the rule. Under the interim Section 4(d) rule, take of NLEB is prohibited within the USFWS WNS Buffer. All take incidental to otherwise lawful activities is not prohibited outside of the WNS buffer designated by USFWS (USFWS 2015b).

The final 4(d) rule released on January 14, 2016 reduces the scope of incidental take of NLEB (USFWS 2016a). The USFWS determined that White-Nose Syndrome (WNS) is the primary threat to NLEB and regulating other sources of mortality or harm, such as from habitat loss, will not effectively conserve this species.

The final 4(d) rule prohibits all *purposeful take*[1] within the range of NLEB except: removal of NLEB from human structures, defense of human health (disease monitoring), or removal of hazardous trees for the protection of human life and property. All take incidental to otherwise lawful activities is allowed outside of the WNS zone designated by USFWS. The WNS zone includes all counties affected by WNS and an additional 150-mile buffer around these counties (Figure 5; USFWS 2016b).

For areas within the WNS zone, *incidental take*[2] is prohibited only if it 1) occurs within a hibernaculum, 2) if tree removal activities occur within a quarter-mile of a known, occupied hibernaculum at any time of the year or 3) occurs within 150 feet of a known, occupied maternity roost tree from June 1 through July 31 (USFWS 2016).

Under the final 4(d) rule, incidental take by wind turbines is not prohibited. Regulatory mechanisms for wind energy facilities were not included in the final 4(d) rule because the primary factor causing the rapid population decline in NLEB is WNS and the best available information suggests that NLEB fatalities caused by wind facilities are not contributing significantly to the species' decline. However, because harm to individual bats by turbines may occur, the USFWS recommends adopting voluntary protocols for best management practices, such as limiting operations of turbines in low-wind speed conditions during the fall bat migration season, to reduce impacts to bats (USFWS 2016). The Project Area is outside of WNS zone and therefore no forms of incidental take are prohibited; however, this may change in the future if new occurrences of WNS are discovered. The USFWS database and WNS Zone Map is updated on a monthly basis[3] (Figure 5).

State Protection

The protection and regulation of bat species not listed under the federal ESA are typically at the discretion of state wildlife agencies. North Dakota does not have a state endangered or threatened species list, but the North Dakota Game and Fish has identified 100 species of conservation priority, or those in greatest need of conservation in the State (Dyke 2014).

Species are categorized into three levels according to conservation need:

- Level I – species in greatest need of conservation;

[1] "Purposeful take is when the reason for the activity or action is to conduct some form of take. For instance, conducting a research project that includes collecting and putting bands on bats is a form of purposeful take. Intentionally killing or harming bats is also purposeful take and is prohibited" (USFWS 2016c).

[2] "Incidental take is defined by the Endangered Species Act as take that is incidental to, and not the purpose of the carrying out of an otherwise lawful activity. For example, harvesting trees can kill bats that are roosting in the trees, but the purpose of the activity is not to kill bats" (USFWS 2016c).

[3] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf

- Level II – species in need of conservation, but have had support from other wildlife programs; and
- Level III – species in moderate need of conservation, but are believed to be on the edge of their range in North Dakota.

There are three bat species on the conservation priority list categorized as Level I: big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and NLEB. Big brown bat and little brown bat are common throughout the state whereas the NLEB are considered to be on the western edge of NLEB's known range and are considered rare in the state.

There are no bat species on the conservation priority list categorized as Level II.

There are three bat species on the conservation priority list categorized as Level III: western small-footed bat (*Myotis ciliolabrum)*, long-eared bat (*Myotis evotis)*, and long-legged bat (*Myotis volans*). These species are known to occur in western North Dakota but outside of the Project Area.

Voluntary Guidelines for Wind Power Projects

The USFWS has developed Land-Based Wind Energy Guidelines (USFWS 2012), a non-regulatory tiered framework for assessing risk and collecting data on wildlife for wind energy projects. These guidelines are voluntary. This bat habitat assessment is consistent with the USFWS recommendations for Tier 2 – Site Characterization in the Land-Based Wind Energy Guidelines. North Dakota has not developed state-specific siting guidelines for wind power developers and other stakeholders for the consideration of potential wind power projects located in North Dakota but defers to the USFWS guidelines (ASFWA 2010).

2.0 SPECIES EXPECTED TO OCCUR IN THE PROJECT VICINITY

Tetra Tech evaluated the potential for all bats known to occur in North Dakota that also may occur and use the Project Area, but with a focus on NLEB. Tetra Tech considered the suitability of the Project Area's habitat and habitats within a 1.5-mile buffer around the Project Area to develop the list of species expected to occur in the Project Area and vicinity. The 1.5-mile buffer distance was based upon the Northern Long-eared bat Interim Conference and Planning Guidance from the USFWS as the foraging range from roosts used to estimate home ranges for NLEB (USFWS 2014b).

Identifying if a species' constituent habitat elements for roosting and foraging occur in an area is key to determining habitat suitability (Duchamp et al. 2004). Habitat variables evaluated in this assessment included the amount of suitable foraging and roosting habitat, as well as potential migration and movement corridors in and near the Project Area. Habitat variables reviewed in the assessment included identification of the bat species known to occur in the region surrounding the Project Area and their behavioral characteristics relative to roosting, foraging and migratory activity. This information was used to derive a high, moderate, or low likelihood of occurrence in the Project Area for each species with ranges overlapping the Project Area, and specifically for the NLEB.

All Bat Species

A total of 10 bat species are known to occur in North Dakota (Table 2; Gullickson *no date*). Of these 10 species, available information about species-specific suitable habitat, known distribution ranges, and documented occurrences indicate that five species (eastern red, hoary, silver-haired, little brown, and big brown bat) are expected to have a moderate or high potential to occur within, and in the vicinity of the Project Area, and the remaining five species (NLEB, fringed, long-eared, long legged, western small-footed) are expected to have a low potential of occurrence.

Roosting colonies of big brown bat and little brown bat have a high probability of occurring within the Project Area because of their known association with edge habitats and human-made structures (Table 2). Little brown bats are thought to be the most common bat in North Dakota (Gullickson *no date*). In addition, big brown bats are known to forage in agricultural lands (Rogers et al. 2006). Both species have been documented as fatalities at wind energy projects (Arnett et al. 2008).

Eastern red bat, hoary bat, and silver-haired bat have a moderate likelihood of occurring in the Project Area, primarily during migration. These species have been the most common species found during post-construction mortality studies at operational wind energy facilities in North America (Arnett et al. 2008). The eastern red bat, hoary bat, and silver-haired bat are all associated with forested habitats and would most likely occur in small woodlots while moving through the Project Area during migration (Table 2). Each of these species is found in North Dakota from May through September (Cryan 2003, Cryan and Veilleux 2007).

The remaining species found in North Dakota (fringed bat, long-eared bat, long-legged bat, western small-footed bat, and NLEB) are expected to have a low likelihood of occurrence in the Project Area based upon each species range, known habitat associations, and occurrence of similar habitats within the Project Area.

Northern Long-eared Bat

NLEB are expected to have a low likelihood of occurrence within the Project Area and Project Buffer during the summer residency period and during migration. The species' range includes Morton and Oliver Counties (USFWS 2013, BCI 2014, USFWS 2015b).

Few data are available on NLEB in North Dakota; however, the species is believed to occur statewide in suitable habitats (Harvey et al. 2011; Gullickson *no date*). Surveys conducted in the summers of 2009, 2010, and 2011, confirmed the presence of NLEB in the Turtle Mountains (approximately 140 miles northeast of the Project), Missouri River Valley (8 miles east of the Project), and in the Badlands regions (approximately 100 miles southwest of the Project; USFWS 2013). All recorded instances of NLEB in the Dakotas have been in ecoregions (Turtle Mountains, Little Missouri Badlands, and River Breaks) with more topographic relief and trees than open prairie. The eastern portion of the Project Area is within the River Breaks Ecoregion.

Table 2. Bat Species Known to Occur and their Likelihood of Occurrence at the Oliver III Wind Energy Center, Morton and Oliver Counties, North Dakota.

Likelihood of Occurrence[1]	Common Name	Scientific Name	Habitat Association[2]	Wind-energy Fatalities
Low	Northern long-eared bat	*Myotis septentrionalis*	Forages along forested hillsides and ridges. Roosts in cavities, caves and mines, underneath bark, or in crevices of trees and snags; rarely roosting in barns. Hibernate in caves and mines.	Relatively few fatalities documented in North America (Arnett et al. 2008)
High	Big brown bat	*Eptesicus fuscus*	Habitat generalist found in deciduous forests, urban development, and agricultural croplands. Roosts in tree cavities, under loose bark, buildings, mines, bridges, caves, and crevices in cliff faces.	Relatively few fatalities documented in North America (Arnett et al. 2008).
High	Little brown bat	*Myotis lucifugus*	Found in close proximity to a water source for foraging and in close proximity to human-made structures. Roosts in tree cavities, caves and human-occupied structures.	Relatively few fatalities documented in North America (Arnett et al. 2008)
Moderate	Silver-haired bat	*Lasionycteris noctivagans*	Migratory Species. Closely associated with conifer and mixed hardwood forests; Generally found in association with riparian areas. Roosts in foliage of trees.	One of most common fatalities in North America; fatalities assumed to be migratory individuals (Johnson et al. 2002, Kunz et al. 2007)
Moderate	Eastern red bat	*Lasiurus borealis*	Migratory Species. Found in hardwood deciduous forests. Generally found in close association with riparian areas. Roosts in foliage of trees.	One of most common fatalities documented in North America; fatalities assumed to be migratory individuals (Johnson et al. 2002, Kunz et al. 2007)
Moderate	Hoary bat	*Lasiurus cinereus*	Migratory Species. Forested upland habitats, including bottomland hardwoods. Roosts in foliage of trees along the edge of clearings.	Most common fatality documented in North America; fatalities assumed to be migratory individuals (Kunz et al. 2007, Arnett et al. 2008)
Low	Fringed bat	*Myotis thysanodes*	Found in a variety of habitats. Oak and pinyon woodlands are the most commonly used. Roosts in caves, mines, and buildings.	None documented
Low	Long-eared bat	Myotis evotis	Found associated with caves and mines, and closely associated with human-made structures	None documented
Low	Long-legged bat	*Myotis volans*	Found in rugged, rocky terrain in variety of habitats. Roosts in trees, rock crevices, and buildings.	None documented
Low	Western small-footed bat	*Myotis ciliolabrum*	Found in rugged, rocky terrain in variety of habitats. Roosts in rock crevices, caves, tunnels, buildings, and underneath bark.	None documented

[1] Likelihood of Occurrence: **High** = Suitable habitat, species range overlaps with the Project Area and known occurrences within and/or near the Project Area. **Moderate** = Species known to occur in habitat similar to the Project Area, species' range overlaps with Project Area, and known occurrences near the Project Area. **Low** = Marginally suitable habitat in the Project Area, species' range does not overlap with the Project Area, no known occurrences within and/or near the Project Area, and/or known as migratory species during spring and fall migration.

[2] Sources: Gullickson *no date,* Western Bat Working Group 2005, Harvey et al. 2011, Bat Conservation International (BCI) 2014, American Society of Mammologists 2015.

3.0 HABITAT ASSESSMENT

The habitat assessment was conducted via a desktop evaluation of land cover and land uses within the Project Area and a 1.5-mile buffer (Figures 2 and 3). Identification of suitable habitats in the Project Area, and the bat species that may use these habitats, may prove helpful when designing the Project to minimize interactions between wind turbines and bats (Duchamp et al. 2004).

Habitat variables evaluated in this assessment included the amount of suitable foraging and roosting habitat, as well as potential migration and movement corridors in and near the Project Area.

Although there are still substantive information gaps on bat migration patterns across North America, there is speculation that bats migrate in a similar manner to some birds (i.e., possibly as broad front migration; Cryan 2003). Migratory bats moving through the area during migration may still be at risk of colliding with wind turbines regardless of habitat conditions. The likelihood of mortality or other impacts during migration to NLEB, and other bats, is difficult to determine based on available data.

3.1 Land Use and Land Cover

Land use and land cover types in the Project Area and Project Buffer were characterized using the National Land Cover Database in GIS (Jin et al. 2013). Habitats were compared between the Project Area and Project Buffer to understand if bats would be likely to select habitat within the Project Area in the context of the surrounding landscape. For example, if the Project Area supported a relatively higher concentration of suitable habitat areas than the Project Buffer, it is possible the site would concentrate bats in densities higher than the surrounding areas.

A comparison of the Project Area and Buffer Area demonstrates that percentages of different land uses and cover types in the Project Area are similar to those within the Buffer Area. The majority of cover within the Project Area (56.9 percent) and Buffer Area (47.7 percent) is developed agriculture (cultivated crops). The percentage of suitable bat habitat cover types (shown in bold in Table 3) was similar between the Project Area and the Project Buffer (Table 3). Suitable bat habitat (open water, emergent herbaceous wetlands, deciduous forest, shrub/scrub, mixed forest, evergreen forest, and woody wetlands) comprises 2.3 percent of the total Project Area and 4.4 percent of the Project Buffer. Based on the percentage of cover types available in the Project Area versus the Project Buffer, it is unlikely that bats would favor the Project Area disproportionately for roosting or foraging, over other areas in the Project vicinity.

Table 3. Land Use and Land Cover Present in the Project Area and Project Buffer, Morton and Oliver Counties, North Dakota.

Land Use/Land Cover Description	Acres in the Project Area	Percent of the Project Area	Acres in the Project Buffer	Percent of the Project Buffer
Cultivated Crops	12454.14	56.92	15080.85	47.73
Grassland/Herbaceous	6166.59	28.18	12697.01	40.18
Pasture/Hay	1914.03	8.75	1349.19	4.27
Developed, Open Space	811.33	3.71	994.02	3.15
Deciduous Forest	**155.62**	**0.71**	**706.47**	**2.24**
Woody Wetlands	**148.73**	**0.68**	**422.3**	**1.34**
Shrub/Scrub	**84.31**	**0.39**	**82.81**	**0.26**
Emergent Herbaceous Wetlands	**80.69**	**0.37**	**94.5**	**0.3**
Barren Land (Rock/Sand/Clay)	32.31	0.15	74.7	0.24
Open Water	**24.53**	**0.11**	**76.69**	**0.24**
Developed, Low Intensity	5.33	Less than 0.1	3.04	Less than 0.1
Evergreen Forest	**1.66**	**Less than 0.1**	**3.18**	**Less than 0.1**
Developed, High Intensity	1.53	Less than 0.1	0	0
Developed, Medium Intensity	0	0	1.16	Less than 0.1
Mixed Forest	**0**	**0**	**12.56**	**Less than 0.1**
Total	21,880.80	100	31,598.48	100

Note: Acres are within ± 0.1 acre. **Bold** text indicates habitat types that are most suitable for bat foraging and roosting habitat.

3.2 Roosting Habitat

Non-migratory bats use caves or similar habitat for winter hibernacula, and then disperse onto the landscape for the warmer seasons (typically April 15 – November 15) and shelter in "summer roosts". Similarly, migratory bats migrate north from wintering areas and use some of the same habitat features (e.g. tree cavities and bark) as non-migratory species during the summer. This section describes summer roosting habitat in the Project area. Winter hibernacula are discussed in Section 4.3. Summer roosts are important to bats because they provide shelter from the environment and adverse weather, resting places during migration or regional movements, protection from predators, and are used for social interaction and the rearing of young. Due to bats' dependence on roost structures during all stages of their life cycle; the preservation of summer roosting habitat, as well as winter hibernacula, has been identified as critical for the conservation of bats in North America (Kunz 1982, Kunz and Fenton 2003).

All Bat Species

Bats may roost in rock formations, caves, human-made structures, live trees (often in the foliage), dead trees (snags), and partially dead trees (partial snags) with cavities and loose bark.

North Dakota's species can be broadly classified as tree-roosting bats (those that roost in live trees, snags and partial snags) and species adapted to roosting in multiple habitats (generalists that roost in natural habitat, but also frequently roost in human-made structures such as barns) (Harvey et al. 2011).

Tree-roosting species (NLEB, hoary bat, silver-haired bat, and eastern red bat) prefer larger trees in early stages of decay, which are often found in older forest stands (Crampton and Barclay 1998, Barclay and Brigham 1996). In the absence of mature forest stands, tree-roosting species may roost in living trees (although eastern red bats often prefer roosting in the foliage of live trees; Kunz 1982, Harvey et al. 2011). Suitable natural roosting habitats in the Project Area are limited to individual trees, windrows, woodlots and riparian zones. These wooded locations are generally near homes, along riparian corridors, or are planted windbreaks. The availability of tree-roosting habitat in the Project Area is limited due to the small size and fragmented nature of the wooded habitat and accounts for less than 2 percent of the Project Area. Therefore, roost tree availability is almost certainly a limiting factor to the occurrence of bats in the Project Area (Carter and Menzel 2007).

In addition to trees, potential roosting locations are also available in farmstead buildings (houses, barns, etc.) and in nearby abandoned mines (Figure 4; NDPSC 2013). The suitability of these man-made structures have not been evaluated.

Northern Long-eared Bat

During the spring, summer, and early fall, NLEB roost in suitable forest habitat typically within 50 miles of wintering sites (USFWS 2013). Like other North American forest bats, reproductive NLEB females will roost colonially during the late-spring and summer maternity period (approximately May to July). Maternity colonies (averaging 30–60 individuals) are most frequently found in mature forests, with a higher abundance of standing dead trees (snags), but the species also may roost in partially live or live mature trees. Both male and female NLEB generally prefer relatively large trees in early stages of decay, which are often found in older forest stands (Crampton and Barclay 1998, Barclay and Brigham 1996). Less commonly, NLEB summer day roost sites may also include human-made structures, including variety of shelters such as buildings, behind shutters, under live tree bark, and in small tree cavities (Harvey et al. 2011). Roosts are often used for a period of 2–11 nights, but maternity colonies may be occupied for longer. Because of NLEB's preference for switching roosts, multiple suitable roosting locations in a given forested patch may be indicative of higher quality summer habitat. Summer home ranges for females are estimated to be between 47 and 425 acres (USFWS 2013).

There was no sizable interior forest habitat (wooded habitat at least 300 feet from non-forest land cover) with a total of 0.8 acres of interior forest in the Project Area and less than 1.5 acres within the Project Buffer. The majority of forests within the Project Area are associated with riparian areas rather than ridges which are preferred by NLEB (USFWS 2014b). The only potentially suitable NLEB roosting habitat in the Project Area consists of trees associated with riparian features and small woodlots or windbreaks near homesteads. Although these sites may

contain suitable roost trees, they are mostly isolated and not connected with or contiguous to other forest patches within the Project Area and consist of only 157 acres (deciduous and evergreen forests) or approximately 0.8 percent of the total Project Area. Additionally the buffer area around the Project contains 709.7 acres of forested habitat (Includes deciduous, mixed and evergreen forest) which make up approximately 2.3 percent of the total Project Buffer (Table 3). There is evidence suggesting that NLEB select forest patches with greater connectivity to other patches and larger forest patches with a closed canopy (mature forests) than those available in the Project Area (USFWS 2013).

3.3 Winter Habitat

Of the bat species with a moderate or high likelihood of occurring in the Project Area, silver-haired bat, hoary bat, and eastern red bat migrate to southern latitudes during winters. The remaining species, big brown bat, little brown bat, and NLEB, hibernate locally or regionally (typically within 200 miles of where they spend the summer). This section focuses on winter habitat for NLEB in the Project Area vicinity, and briefly touches on the suitability of winter habitat for other species as well.

Northern Long-eared Bat

NLEB do not undertake long-distance seasonal migrations between summer and winter ranges but do undertake shorter distance movements between summer roosts and winter hibernacula. These seasonal movements are generally between 35 miles and 55 miles, but may be substantially longer in some areas, perhaps as great as 168 miles (USFWS 2013). Information on habitat use during migration is limited, but individuals in transit are likely to use foraging habitats at least part of the time.

NLEB arrive at hibernacula in August or September, begin hibernation in October and November, and exit hibernacula in March or April (USFWS 2013). NLEB prefers hibernacula with large entrances such as caves and mines, as well as less traditional hibernacula including dams, dry wells, and other human-made structures. Individuals may hibernate in cracks and crevices in hibernacula walls, and as such, may be overlooked during winter surveys. Although NLEB are often found with other congeneric species (i.e. *Myotis* spp.), they generally prefer cooler temperatures and higher humidity (USFWS 2013). Hibernacula where NLEB occur may also be used by big brown bat and little brown bat, and possibly western small-footed bat (*Myotis ciliolabrum*; Brack et al. 2010).

There were no caves or other natural rock or crevice formations in the Project Area or Project Buffer that would be suitable hibernacula (Murphy 2007, NDGS and NDDH 2001). In addition to natural formations, there is one abandoned underground mine within 2-miles of the Project Area that could provide potential roosting habitat for bats (NDPSC 2013); however, the suitability of this mine for roosting bats is unknown. No known hibernacula for NLEB have been documented in North Dakota, although a thorough assessment of potential hibernacula in western North Dakota has not been completed (USFWS 2013). The closest known hibernaculum occurs in the Black Hills of Wyoming and South Dakota over 150 miles to the southwest (USFWS 2013).

3.4 Foraging Habitat

Foraging habitats are not necessarily exclusive of roosting or migrating habitat. However, there are notable preferences among species for different foraging habitats, which are often different from preferred roosting locations (Harvey et al. 2011).

All Bat Species

All bats known to occur in North Dakota are insectivorous, and feed on a variety of prey, including moths, beetles, flies, and mosquitoes (Kunz and Fenton 2003). Bats typically forage in areas with high prey concentrations (i.e. high nocturnal insect densities) in riparian areas (Waldien and Hayes 2001), over waterbodies (Henry et al. 2002, Lacki et al. 2007), and along forest edges (Hayes and Gruver 2000, Rogers et al. 2006). Non-developed and non-agricultural types of habitats (open water, forested, wetlands, and scrub shrub) provide the best foraging opportunities for bats and account for 2.6.3 percent of the Project Area. Although there are some evidence to indicate that some species, such as the big brown bat, will forage over agricultural lands (Rogers et al. 2006, BCI 2014), agricultural lands are typically the least preferred of cover types for foraging by most bat species. Within the Project Area, agricultural lands (Cultivated Crops) account for 56.9 percent of the Project Area land use.

Northern Long-eared Bat

Unlike other *Myotis* in the region that typically forage along streams and within floodplains, NLEB are adapted to gleaning and hawking for insects in the sub-canopy of deciduous and mixed forests and therefore typically forage along ridge tops and forested hillsides (Harvey et al. 2011). However, foraging may also occur in forest clearings, above roadways, and along trails or near water (USFWS 2013). Agricultural lands within the Project Area (56.9 percent of the land cover) are the least suitable locations for NLEB foraging. Suitable foraging habitat for NLEB in the Project Area includes forested areas, wind breaks, riparian corridors, and open water areas. This suitable but fragmented foraging habitat accounts for 2.3 percent of the Project Area which is a small percentage of overall land cover.

3.5 Bat Migration and Movement Characteristics

Bat migration includes seasonal movement from summer residency areas to wintering areas. Wintering areas for long-distance migrants are typically in southern latitudes (Fleming and Eby 2003). Long-distance migratory bats such as the eastern red bat, silver-haired bat, and hoary bat undertake seasonal movements greater than 62 miles and less than 1,200 miles (Cryan 2003, Cryan 2011). Wintering areas for other species include natural or man-made hibernacula (Fleming and Eby 2003). NLEB, little brown bat, and others migrate short distances from summer colonies to winter hibernacula (i.e., partial or short-distance migration) (Fleming and Eby 2003). Most species, including NLEB, are thought to move along linear landscape features that connect habitats, such as horizontal forest features, (e.g., forest edges), vertical forest features (e.g., between forest canopy structures), or riparian corridors (Hayes and Gruver 2000, Downs and Racey 2006, Furmankiewicz and Kucharska 2009). Beyond these generalities, the current understanding of bat migration is limited (Baerwald and Barclay 2009, Cryan 2011).

NLEB and other species may fly thorough the Project Area during spring and fall migration en-route to hibernacula. The Project Area contains small fragmented forested riparian corridors that bats could follow or utilize as day roosting sites, although these are not significant features from a regional perspective. The limited roosting habitat within the Project Area would be a major limiting factor for use of the Project Area by migrating bats. Therefore, bat migration through the Project Area is likely to be minimal.

4.0 NLEB HABITAT SUITABILITY CONCLUSION

The NLEB Guidance (USFWS 2014a) includes a stepwise assessment approach with specific questions intended to facilitate review of potential impacts to the species. The following questions (in bold) and responses are based on our current knowledge of the Project Area and the results of the 2015 desktop habitat assessment. Sections 4.1 – 4.5 provide information requested by USFWS for habitat assessments, as part of the NLEB interim guidance (USFWS 2014b, USFWS 2015b).

Is the project within the range of NLEB?

Yes. The Project is within the range of NLEB (Gullickson *no date*, Harvey et al. 2011, USFWS 2014a, USFWS 2015b).

Is suitable summer or winter habitat present?

The proposed Project is located in the Northern Great Plains ecoregion, which has been intensively cultivated but historically consisted of prairie habitat. In this ecoregion forested habitat is almost exclusively associated with human development (e.g. wind breaks), lakesides, and riparian areas.

Only 2.3 percent of the 21,881-acre Project Area is considered forested. Forested habitat in the Project Area (woody wetlands, evergreen forest, mixed forest, deciduous forest) are relegated to windbreaks along fields or at homesteads (mostly cottonwoods and junipers) and small woodlots that are isolated as woody wetlands within riparian areas. The majority of the forested habitats within the Project Area are scattered windbreaks around homesteads within the southeast and east-central portions of the Project Area. Large, contiguous tracks of upland forested habitat, preferred by NLEB, are not present in the Project Area.

Based on the desktop habitat assessment, the NLEB has a low likelihood to occur in the Project Area during the summer residency period (approximately May 15–August 15) because of the lack of large contiguous forests and due to the species being uncommon in the far western extent of its range which includes the Project Area. The species could occur in the Project Area during seasonal movements to hibernacula. Although we have not assessed the Project Area for potential winter hibernacula, Tetra Tech is not aware of any available data that indicate the occurrence of NLEB hibernacula in central North Dakota and no hibernacula are known in the state (USFWS 2013).

Is lethal take during migration possible?

NLEB have been found during mortality searches at wind energy facilities (e.g., Arnett et al. 2005, Jacques Whitford 2009), so lethal take is possible if NLEB migrate through the Project Area. However, the occurrence of the species in North Dakota, including potential winter hibernacula, is poorly understood and NLEB are expected to be uncommon or rare in central North Dakota (USFWS 2013). Therefore, the likelihood of NLEB occurring in the Project Area during the summer residency period is low. No clear migratory pathways, or known hibernacula are in the Project Area or vicinity; however, migration patterns are poorly understood. The likelihood of the species occurring during the migration period (spring and fall) is expected to be very low because of distance to known hibernacula and low availability of suitable foraging or roosting habitat in the Project Area and Project Buffer. All records of NLEB mortality at wind energy facilities are from eastern North American projects.

Is there an existing summer or winter occurrence record near the Project Area (e.g., within 1.5 miles of a known roost tree, 3 miles of capture location, or 5 miles of a hibernaculum)?

Tetra Tech is not aware of any existing summer or winter occurrence records within 5 miles of the Project Area.

Was the presence of NLEB documented during surveys?

Bat acoustic surveys for NLEB were initiated in July of 2015 and completed November 2015. The objective of the bat acoustic surveys was to estimate the seasonal distribution and spatial patterns of bat activity within the Project. The 2015 bat acoustic survey was conducted in accordance with NLEB Guidance from USFWS (USFWS 2014b, USFWS 2015b). Results of the acoustic surveys will be presented in a separate report.

Is this an existing or ongoing project within the range of the Indiana bat with a prior determination for Indiana bat?

No. The Project Area is outside the range of the Indiana bat.

4.1 Critical Habitat for Listed Species

At the time this report was prepared, the USFWS has not designated or proposed any critical habitat for NLEB and no bats with designated critical habitat occur within the Project Area (USFWS 2013, USFWS 2015b). If USFWS were to designate critical habitat for NLEB, designated areas would likely consist of large well-known hibernacula, similar to critical habitat designated for the Indiana bat which are not known to occur in the Project Area.

5.0 SUMMARY

There is little suitable roosting or foraging habitat in the Project Area or within the Project Buffer for the NLEB. There is slightly more suitable roosting and foraging habitat for other bat species, primarily big brown bat and little brown bat, in the Project Area and the Project Buffer. The small size and small number of wooded parcels in the Project Area and the Project Buffer likely limits the density and diversity of bats in the Project Area. Because of this lack of forested habitat within the Project Area and Project Buffer and the location of the Project Area at the edge of the species range, NLEB have a low likelihood of occurring in the Project Area. There are no known NLEB hibernacula in North Dakota and the NLEB is considered to be rare in the state (USFWS 2013, Dyke 2014).

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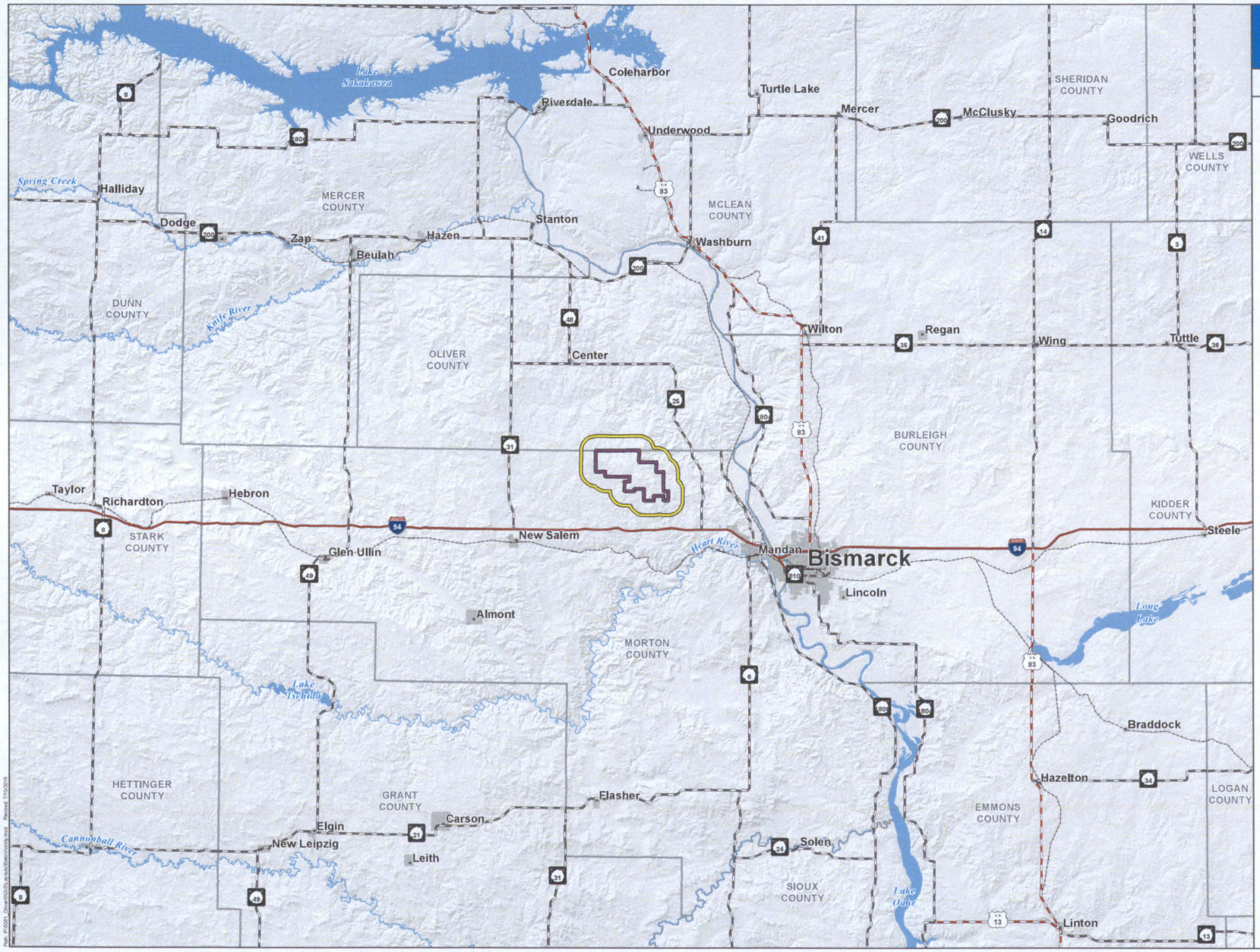
Appendix A – Figures



Oliver III Wind Energy Center

Morton & Oliver Counties, ND

Figure 1 Vicinity Map

Legend

- Project Area (5/15/2015)
- Buffer Area
- County Boundary
- Major River
- Municipal Boundary

Transportation

- Interstate Highway
- U.S. Highway
- State Highway
- Rail

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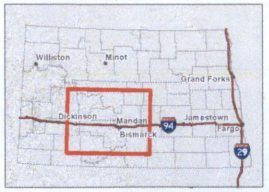
Miles

Scale is 1:300,000 when printed at 22 x 34



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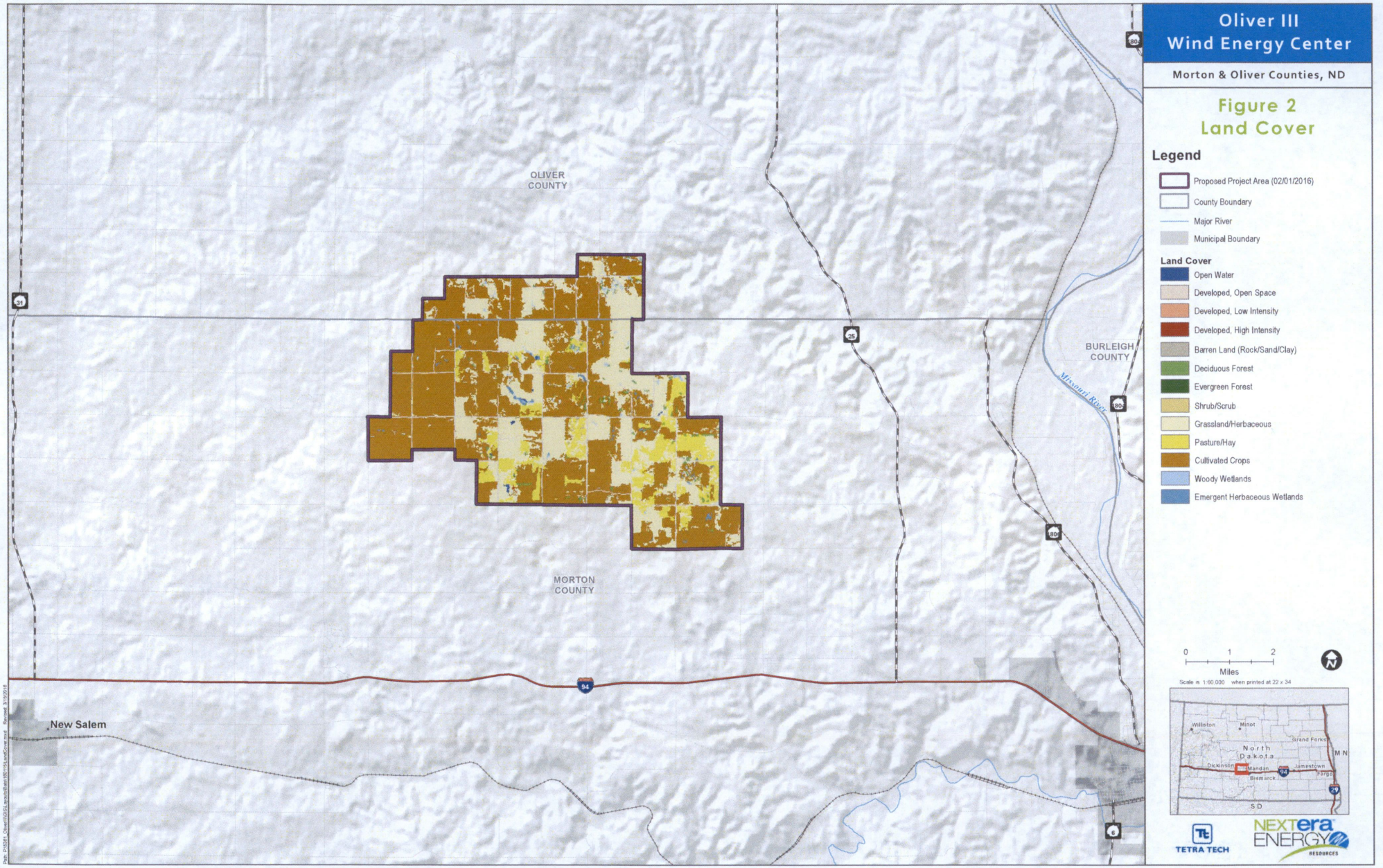
OLIVER COUNTY
MORTON COUNTY
BURLEIGH COUNTY
Missouri River
New Salem
31
25
80
94
6
Oliver III
Wind Energy Center
Morton & Oliver Counties, ND
Figure 2
Land Cover
Legend
Proposed Project Area (02/01/2016)
County Boundary
Major River
Municipal Boundary
Land Cover
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, High Intensity
Barren Land (Rock/Sand/Clay)
Deciduous Forest
Evergreen Forest
Shrub/Scrub
Grassland/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands
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Miles
Scale is 1:60,000 when printed at 22 x 34
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Grand Forks
North Dakota
MN
Dickinson
Mandan
Jamestown
Bismarck
Fargo
SD
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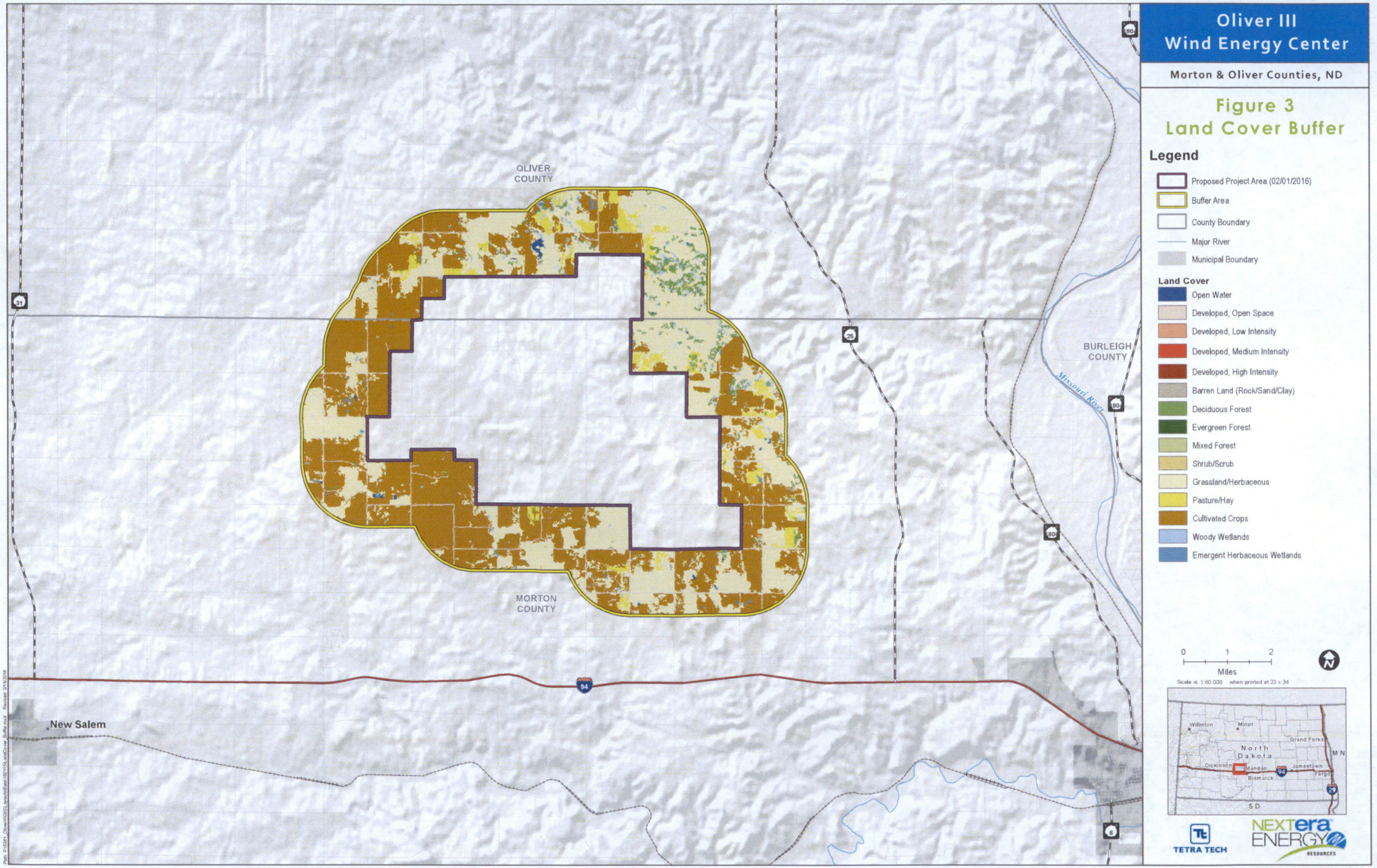
OLIVER COUNTY
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BURLEIGH COUNTY
Missouri River
New Salem
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Oliver III
Wind Energy Center
Morton & Oliver Counties, ND
Figure 3
Land Cover Buffer
Legend
Proposed Project Area (02/01/2016)
Buffer Area
County Boundary
Major River
Municipal Boundary
Land Cover
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land (Rock/Sand/Clay)
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Grassland/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands
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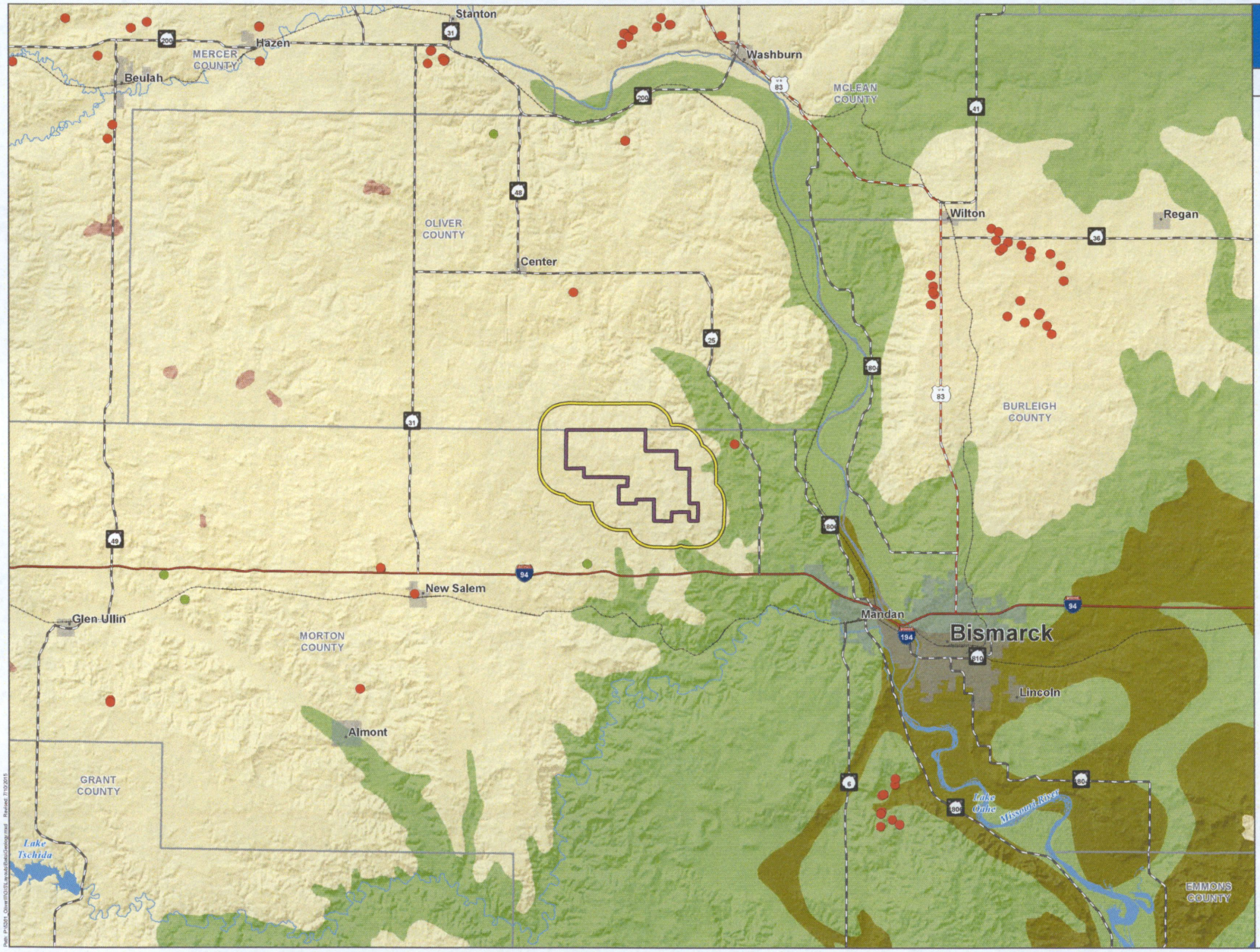


Oliver III Wind Energy Center

Morton & Oliver Counties, ND

Figure 4 Geology

Legend

- Project Area (5/15/2015)
- Buffer Area
- County Boundary
- Major River
- Municipal Boundary

Abandoned Mines

- Underground
- Underground/Surface

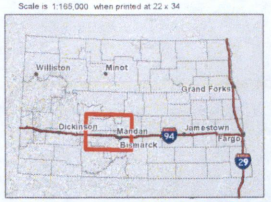
Bedrock Geology

- Micaceous Sandstone, Sand, Silt, Clay
- Sandstone or Limestone, Butte Caprock
- Silt, Sand, Clay, Sandstone, and Lignite
- Sand, Silt, Clay, Sandstone
- Shale

0 5 10

Miles

Scale is 1:165,000 when printed at 22 x 34



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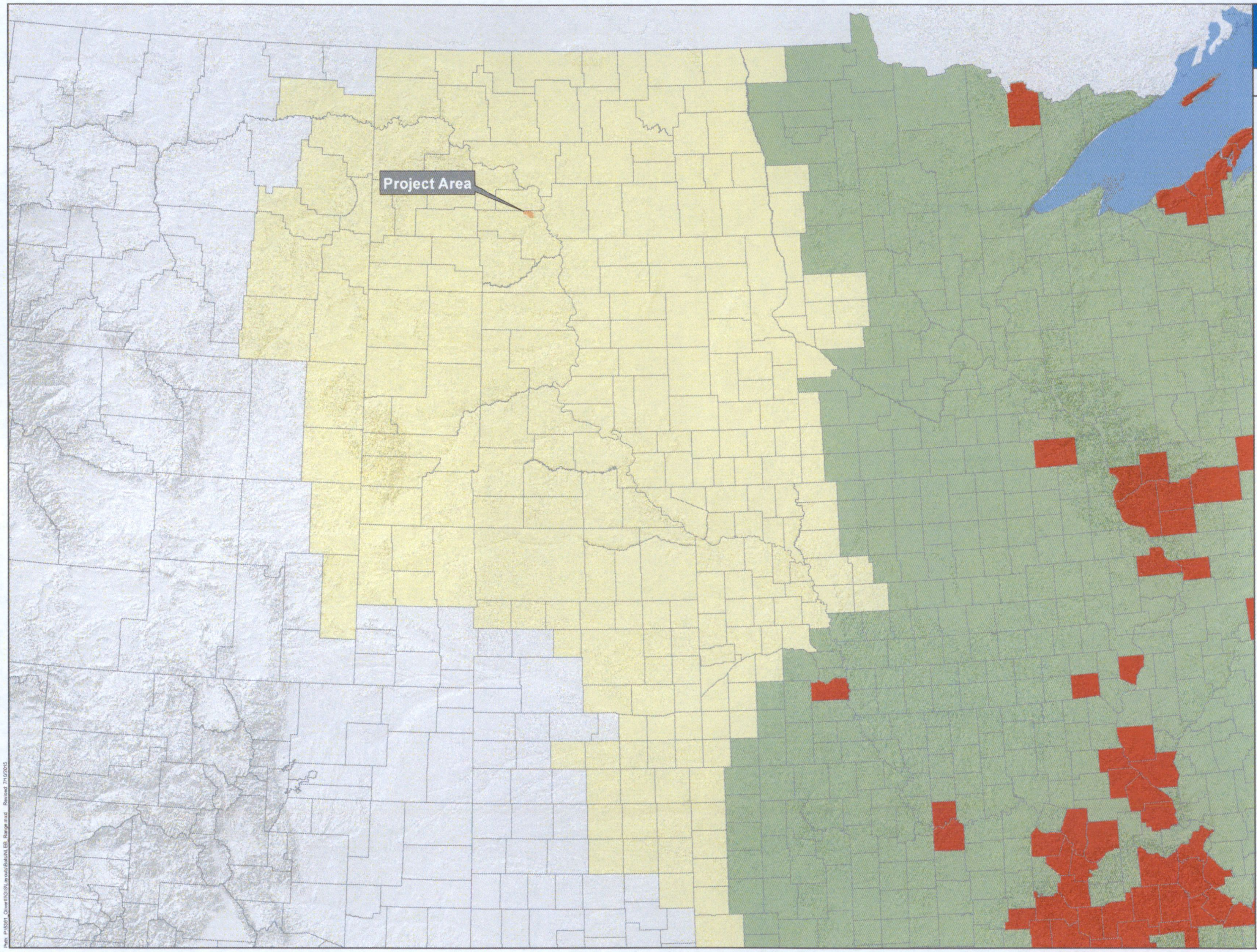

Oliver III Wind Energy Center

Morton & Oliver Counties, ND

Figure 5
Northern Long-eared Bat Range and USFWS White-nose Syndrome Buffer

Legend

- County with White-nose Syndrome Infected Hibernacula (Data as of 6/30/2015)
- USFWS White-nose Syndrome Buffer (Data as of 6/30/2015)
- Northern Long-eared Bat Range (As of 4/30/2015)
- State Boundary
- County Boundary

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