STATE OF MINNESOTA
BEFORE THE
PUBLIC UTILITIES COMMISSION

Beverly J. Heydinger	Chair
David C. Boyd	Commissioner
Nancy Lange	Commissioner
J. Dennis O'Brien	Commissioner
Betsy L. Wergin	Commissioner

In the Matter of the Site Permit Application for a 200 MW Large Wind Energy Conversion System for the Odell Wind Farm in Cottonwood, Jackson, Martin and Watonwan Counties

Docket No. IP6914-WS-13-843

COMMENTS

I. INTRODUCTION.

Odell Wind Farm, LLC ("Odell") appreciates this opportunity to provide comments on issues that should be considered in developing a draft site permit for Odell's proposed 200 MW large wind energy conversion system in Cottonwood, Jackson, Martin and Watonwan Counties, Minnesota (the "Project"). These comments provide the results of Odell's Tier 3 Wildlife Assessment and additional detail regarding the post-construction avian and bat fatality monitoring that Odell will implement as part of its Avian and Bat Protection Plan ("ABPP") as requested by the Commission and the Minnesota Department of Commerce, Energy Environmental Review and Analysis ("EERA") Staff as part of the application completeness review process.[1] In addition, these comments discuss specific permit language that Odell requests be included in the draft site permit for the Project.

[1] Commission Order Finding Application Complete and Referring Matter to the Office of Administrative Hearings, Docket No. IP-6914/WS-13-843 (November 7, 2013), at 2.

II. WILDLIFE ASSESSMENT AND FIELD STUDIES TIER 3 REPORT

Prior to submitting its site permit application, Odell retained Applied Ecological Services, Inc. ("AES") to assess the potential impacts of the Project on wildlife in the area surrounding the Project. These wildlife assessment and field studies were designed to comply with federal, state, and local requirements and guidance for wind energy development and reflect input Odell received from U.S. Fish and Wildlife Service ("USFWS") and the Minnesota Department of Natural Resources ("MDNR"). Odell's site permit application contained an interim report summarizing the results of Odell's Tiers 1 and 2 efforts and reported on data from its Tier 3 studies collected as of the time of the application.[2]

Odell's Tier 3 studies used standard field methods for studying migratory small birds (e.g., passerines), migrating large birds (e.g., raptors and waterfowl), breeding birds, and bats. These methods were acceptable to federal and state agency staff and are generally considered standard in the wind industry. Field surveys began in April 2013 and ended in November 2013. Attachment A contains the Odell Wind Farm: Wildlife Assessment & Field Studies Tier 3 Report describing the methods and results of Odell's Tier 3 studies, inclusive of results collected at the time of Odell's site permit application and those results collected after the time of application through November 2013.

As described in more detail in Attachment A, the results of the Tier 3 studies continue to indicate that the Odell Wind Farm is expected to present an overall low risk to avian and bat species. Based on the Tier 3 results, Odell identified the following issues that warrant further consideration and/or post-construction monitoring:

- **Migratory Bats**. Bat acoustic monitoring identified four species of bats at the site: Big Brown Bat (*Eptesicus fuscus*), Hoary Bat (*Lasiurus cinereus*), Eastern Red Bat (*Lasiurus*

[2] *See*, Odell's Site Permit Application, Appendix F (Sept. 24, 2013).

borealis), and Little Brown Bat (*Myotis lucifugus*). The Hoary Bat and Eastern Red Bed are migratory forest bats which have experienced large numbers of fatalities at other wind energy facilities. Overall bat activity at the site was low (1.6 calls per detector-night) and slightly higher during the fall migratory period (3.6 calls per detector-night). No bats in the region are currently protected under the federal Endangered Species Act. Two species detected, Big Brown Bat and Little Brown Bat, are listed as state special concern. Unidentified high-frequency bats were most likely Eastern Red Bats based on automated and visual call analysis and the confirmed numbers of this species at the site. Odell did not identify any Northern Long-Eared bats during its Tier 3 studies.

- **Migratory Passerine Birds**. The spring and fall migrations are typically the period of greatest risk of avian fatalities at wind energy developments, with passerines constituting a large percentage of total fatalities and migratory passerines comprising a large percentage of passerine fatality (NRCNA 2007, Westwood Professional Services 2013). Migratory passerine diversity and abundance at the site during the spring migration was typical of Midwestern agricultural sites, and, therefore, passerine fatalities are expected to be similar in number to those reported at other Midwestern wind energy developments sited primarily in agricultural lands (i.e., 0.4-11.8 birds per turbine per year; Stantec Consulting Services, Inc. 2012). Although it is likely that some level of passerine fatalities will occur, fatality rates of migratory passerine birds are expected to be typical of Midwestern cropland, and no population-level effects are expected (Arnold and Zink 2011, Westwood Professional Services 2013). Turbines have been sited in cropland habitat not conducive to passerine migration stopovers.

Odell met with representatives from USFWS, MDNR, Commission Staff and EERA on December 16, 2013 to review its Tier 3 report and discuss any questions agency staff had concerning the results of Odell's Tier 3 surveys. Attachment A reflects the comments received from the agencies at that meeting.

III. POST-CONSTRUCTION FATALITY MONITORING PROTOCOLS

During the December 16, 2013 meeting between Odell and the wildlife and permitting agencies, MDNR provided Odell with its most recent draft post-construction fatality monitoring protocols for low risk sites. MDNR Staff suggested certain modifications to those protocols, largely related to the number of turbines searched, to reflect the 200 MW size of the Odell Project. Odell understands that the protocols provide the option of implementing either full plot survey protocols or road and pad survey protocols as follows:

Summary of Low-Risk Protocol – Full Plot Surveys

1. Minimum of 1 search day per week with a minimum of 3 days of separation between searches.
2. Minimum of 1 field season of monitoring. If high fatalities are occurring a second year of monitoring may be recommended.
3. Monitoring is conducted from March 15 – November 15.
4. Minimum number of turbines searched is 15 – 20.
5. Search area of 80 m (160 m per rectangular side) in all cardinal directions from the base of the turbine.
6. Searcher efficiency trials use a minimum of 75 placed carcasses.
7. Scavenger removal trials use a minimum of 50.
8. Search time minimum of 1-2 hours.
9. Minimum of 2 fatality estimators used.

Summary of Road and Pad Protocols

1. Minimum of 5 full plot searches, as described above, are necessary.
2. Minimum of 50 road and pad searches.
3. Low-Risk is 1 search per week.
4. Low-Risk sites monitoring is conducted for a minimum of one field season with potential for a second season if high fatalities are occurring.
5. Field season is March 15 to November 15.
6. Search area of 80 m (160 m per rectangular side) in all cardinal directions from the base of the turbine for full search plots or 80 m from the turbine base for the road and pad component.
7. Searcher efficiency trials use a minimum of 100 carcasses placed.
8. Scavenger removal trials use a minimum of 50 carcasses placed.
9. Searcher and scavenger removal trials are conducted in a manner to differentiate between full search plots and road and pads.
10. Minimum of 2 agreed upon fatality estimates used.

Odell is committed to implementing one of the options for the protocols as described above, with the understanding that the agencies may make minor changes to these protocols as they finalize their coordinated agency guidance document. Odell will contract with a third party trained biologist to conduct the surveys.

IV. DRAFT SITE PERMIT CONDITIONS

Odell reviewed the template site permit EERA Staff provided at the December 9, 2013 public information meeting for the Project held in Windom, Minnesota. During its review, Odell identified several places where the template permit could be clarified or where it differed from language the Commission recently approved for the Black Oak, Getty and Paynesville Wind farms, all projects also developed by Geronimo Energy, LLC.

Odell offers the following suggested changes to the language in the template permit to help clarify certain permit conditions and to provide consistency with other recently-issued permits for projects Geronimo Energy has developed.

A. Complaint Procedures

In order to clarify when complaint reporting procedures must be developed and provided to landowners, Odell recommends moving the requirement to send landowners a copy of the procedures from Section 5.2 (Permit Distribution to Local Governments and Residents) to Section 5.8 (Complaints). Odell suggests the following specific changes:

> **Section 5.2 Permit Distribution to Local Governments and Residents**
> …In no case shall the landowner receive this site permit ~~and complaint procedure, developed pursuant to Section 5.8,~~ less than five (5) days prior to the start of construction on their property.
>
> **Section 5.8 Complaints**
> At least 14 days prior to the pre-construction meeting, the Permittee shall file with the Commission the company's procedures to be used to receive and respond to complaints. <u>The Permittee shall provide a copy of the complaint procedures to landowners within the Project Boundary no later than five (5) days prior to the start of construction.</u> The Permittee shall report to the Commission all complaints

received concerning any art of the Project in accordance with the procedures provided in Attachments [x] and [y] of this permit.

Moving this reference to the complaint procedures will ensure that the complaint procedures are properly filed with and vetted by the Commission and EERA prior to mailing them to the landowners. In addition, it will avoid any confusion as to whether the complaint procedures must be provided within 30 days of permit issuance, as currently suggested by the language in Section 5.2.

B. Immediate Incident Reports

At the December 16, 2013 meeting between Odell and the wildlife and permitting agencies, representatives of Odell raised the issue of whether Section 6.7.3 Immediate Incident Reports could be amended to ensure these reports provide timely and useful information to the agency without being overly burdensome or ambiguous to comply with. The meeting participants agreed that improvements are warranted, but the meeting did not allow sufficient time to fully resolve the issue. Therefore, Odell provides the following suggested changes for consideration, to facilitate further discussion and record development of the issue:

> **Section 6.7.3 Immediate Incident Reports**
>
> The Permittee shall notify the Commission, USFWS and DNR within twenty-four (24) hours of the discovery of any of the following:
>
> (a) five or more dead or injured ~~non-protected~~ avian or bat ~~species~~ individuals within a ~~reporting~~ five-day period;
> (b) one or more dead or injured ~~migratory~~ federally- or state-listed threatened or endangered avian or bat species, including those species proposed for federal or state threatened or endangered listing; or
> (c) one or more dead or injured ~~state threatened, endangered or species of special concern;~~
> ~~(d) one or more dead or injured federally listed species; or~~
> ~~(e) one or more~~ bald eagles.

C. Public Designation of Certain Data

Odell suggests that the language in Sections 6.8 and 6.9 related to public designation of certain energy production and wind resource data be revised to reflect changes made by the Commission in the Black Oak[3], Getty[4] and Paynesville[5] site permits. Specifically, Odell requests that the final sentence of each condition be revised to remove the phrase "shall be considered public." Information such as annual energy production, project capacity factors, along with operational, performance and other information may properly fall within the definition of "trade secret information" under the Data Practices Act and, therefore, may rightfully be designated to the Commission as non-public information. When this issue came before the Commission in the Getty, Black Oak, and Paynesville, the Commission found that the language in Section 11.7 of the Site Permit sufficiently covered the issue of trade secret designations. It provides that the permitted party has the right to seek the protection afforded by the law and bears the burden of satisfying any applicable requirements in place at the time it seeks to protect the information. Accordingly, Odell proposes the following changes to Sections 6.8 and 6.9 of the Site Permit.

6.8 PROJECT ENERGY PRODUCTION

> The Permittee shall by February 1st following each complete or partial year of Project operation file a report to the Commission on the monthly energy production of the Project including:
>
> (a) The installed nameplate capacity of the permitted Project;
>
> (b) The total monthly energy generated by the Project in MW hours;

[3] *See* Findings of Fact, Conclusions of Law and Order Issuing a Site Permit to Black Oak Wind, LLC for the Black Oak Wind Farm. Docket No. IP-6853/WS-10-1240 at 11

[4] *See* Findings of Fact, Conclusions of Law and Order Issuing a Site Permit to Getty Wind Company, LLC for the Getty Wind Project. Docket No. IP-6866/WS-11-831at 11

[5] *See* Order Amending Site Permit. Docket No. IP-6830/WS-10-49 at 11 and 12

(c) The monthly capacity factor of the Project;
(d) Yearly energy production and capacity factor for the Project;

(e) The operational status of the Project and any major outages, major repairs, or turbine performance improvements occurring in the previous year; and

(f) Any other information reasonably requested by the Commission.

This information shall be ~~considered public and must be submitted~~ filed electronically.

6.9 WIND RESOURCE USE

The Permittee shall, by February 1st following each complete or partial calendar year of operation, file with the Commission the average monthly and average annual wind speed collected at one permanent meteorological tower during the preceding year or partial year of operation. This information shall be ~~considered public and must be submitted~~ filed electronically.

V. CONCLUSION.

With these comments, Odell has provided both the Wildlife Assessment & Field Studies Tier 3 Report and the post-construction fatality monitoring protocols requested by the Commission and EERA. In addition to this information, Odell respectfully requests that EERA consider the site permit condition language described in Section IV above. Including these suggested changes to the draft site permit will help ensure consistency among recently issued permits for projects developed by Geronimo and reduce ambiguities Odell identified in the template permit provided at the December 9, 2013 public information meeting for the Project.

Dated: December 27, 2013

Respectfully submitted,

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Odell Wind Farm: Wildlife Assessment & Field Studies Tier 3 Report

COTTONWOOD, JACKSON, MARTIN, AND WATONWAN COUNTIES, MINNESOTA

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EXECUTIVE SUMMARY

Odell Wind Farm, LLC (Odell) retained Applied Ecological Services, Inc. (AES) to assess the potential impacts on wildlife in a 54 square-mile evaluation area for a proposed wind energy development project in Cottonwood, Jackson, Watonwan, and Martin Counties in southwestern Minnesota. The actual project boundary being permitted by the MN PUC is smaller than 54 square miles. For convenience, the evaluation area will be called the Odell site in this report.

The site is located in the Prairie Parkland Province and the Minnesota River Prairie subsection. While historically the surrounding landscape consisted of generally wet prairie with scattered oak openings, oak barrens, and river bottom forest, today 90% of the site is cropland. Remaining natural habitats are highly fragmented and generally associated with the region's water features. Consequently, wildlife species that required large habitats have been replaced by wildlife species adapted to agriculture and development.

This study was designed to comply with federal, state, and local requirements and guidance for wind energy development. These include the U.S. and Minnesota Endangered Species Acts, the Bald and Golden Eagle Protection Act (BGEPA), and the Migratory Bird Treaty Act (MBTA). In addition, the 2012 U.S. Fish and Wildlife Service (USFWS) wind turbine guidelines were consulted. Communications with the USFWS and the Minnesota Department of Natural Resources (MNDNR) identified potential species of concern at the project site.

Standard field methods for studying migratory small birds (e.g., passerines), migrating large birds (e.g., raptors and waterfowl), breeding birds, and migrating bats were used. These methods were acceptable to federal and state agency staff and are generally considered standard in the wind industry. Field surveys began in April 2013 and ended in November 2013. This report covers Tier 1 and Tier 2 research for the site, as well as all Tier 3 surveys conducted in 2013.

The following topics are potential risks to wildlife that may require further consideration in project design and/or post-construction monitoring:

Migratory Bats. Bat acoustic monitoring identified four species of bats at the site: Big Brown Bat *(Eptesicus fuscus)*, Hoary Bat (*Lasiurus cinereus)*, Eastern Red Bat (*Lasiurus borealis*), and Little Brown Bat (*Myotis lucifugus*).. The Hoary Bat and Eastern Red Bed are migratory forest bats which have experienced large numbers of fatalitiesat other wind energy facilities. Overall bat activity at the site was low (1.6 calls per detector-night) and slightly higher during the fall migratory period (3.6 calls per detector-night). No bats in the region are currently protected under the federal Endangered Species Act. Two species detected, Big Brown Bat and Little Brown Bat, are listed as state special concern. Unidentified high-frequency bats, were most likely Eastern Red Bats based on automated and visual call analysis and the confirmed numbers of this species at the site Odell is aware of factors that minimize impacts to migratory bat populations, including non-operation of turbines on nights of high temperatures and low wind speeds during migration, and will implement them to the degree that conditions warrant. Should fatalities exceed typical rates of bats killed per year at other wind farms in the region (see Table 21), Odell will consult with wildlife agencies on whether further study is warranted.

Migratory Passerine Birds. The spring and fall migrations are typically the period of the greatest risk of avian fatalities at wind energy developments, with passerines constituting a large percentage of total fatalities, and migratory passerines comprising a large percentage of passerine fatalities (NRCNA 2007, Westwood Professional Services 2013). Migratory passerine diversity and abundance at the site during the spring migration was typical of Midwestern agricultural sites, and therefore passerine fatalities are expected to be similar in number to those reported at other Midwestern wind energy developments sited primarily in agricultural lands (i.e., 0.4-11.8 birds per turbine per year; Stantec Consulting Services, Inc. 2012). Although it is likely that some level of passerine fatalities will occur, fatality rates of migratory passerine birds are expected to be typical of Midwestern cropland, and no population-level effects are expected (Arnold and Zink 2011, Westwood Professional Services 2013, Zimmerling et al. 2013). Turbines have been sited in cropland habitat not conducive to passerine migration stopovers. Should fatalities exceed typical rates of birds killed per year at other wind farms in the region (see Table 9), Odell will consult with wildlife agencies on whether further study is warranted.

The following topics have been identified as issues that do not warrant further consideration:

Prairie Bush Clover and Poweshiek Skipperling. The federal and state threatened Prairie Bush Clover (*Lespedeza leptostachya*) and the federal candidate/state endangered Poweshiek Skipperling (*Oarisma Poweshiek*) are considered in range in the counties surrounding the site. There are no known records for either species within the site. These species are both dependent upon prairie remnant habitat, and potential impacts can be avoided by siting turbines away from prairie remnants. Turbines have been sited in cropland habitat, and 97% of turbines have been sited at least 400 m from large grassland patches of 50 acres of more.

Minnesota County Biological Survey Sites of Moderate Significance. There is a prairie wetland complex in the northeastern portion of the site that is identified as having high biological significance. This location has known records for the state special concern Phlox Moth (*Schinia indiana)* and the state threatened Sullivant's Milkweed (*Asclepias sullivantii*). There are four additional sites of moderate significance, and one site considered below statewide significance. Turbines have been sited at least 400 m away from these sites of biological significance.e

Phlox Moth and Sullivant's Milkweed. Phlox Moth is listed as state special concern and Sullivant's Milkweed is federal and state threatened. Records for both of these species are known from a high quality prairie remnant in the northeastern corner of the site. Additional prairie remnants occur in the site and could contain these or other rare prairie features. Impacts to these species are not expected, if impacts to prairie remnants are avoided during construction and operations. Turbines have been sited in cropland habitat, and 97% of turbines have been sited at least 400 m from large grassland patches of 50 acres of more.

Henslow's Sparrow. The state endangered Henslow's Sparrow (*Ammodramus henslowii)* was documented in 2007 at the southern end of the Bennett WMA along the site's northern boundary. Direct impacts to the Henslow's Sparrow is likely to be low because its flight behavior is not likely to involve flights in the rotor swept area. However, habitat displacement effects on this species due to turbines are not known. This species could be present in the site's larger grasslands. A buffer of large grassland habitat patches would likely reduce the potential for direct and indirect impacts. No turbines have been sited in grassland habitat. Ninety-seven percent of turbines have been sited at least 400 m from large grassland patches of 50 acres or more, which largely avoids potential Henslow's Sparrow habitat.

Breeding Bird Collision. Habitat cover at the Odell site is 91.4% cropland, 4.7% developed, and 3.0% grassland, with small amounts of barren land, upland forest, emergent wetland and open water. Sensitive bird species, which are experiencing population declines in the region, represent 44% of the bird species at the site. In general, cropland tended to have fewer sensitive and native bird species than grasslands and riparian/grassland areas. The complex vegetation structure of grasslands and riparian areas may contribute to the trend toward higher sensitive and native bird richness and abundance in these grassland and riparian habitats.

Given that bird species composition in cropland at the Odell site is similar to that in other Midwestern wind energy projects, the expected fatality rates of native and sensitive species is likely to be similar. The most abundant species in cropland were Red-winged Blackbird, Common Grackle, Brown-headed Cowbird, Killdeer, American Goldfinch, and American Robin. These species comprised 56% of all individuals observed in the site's cropland, and none of them are classified as sensitive by AES. Ninety-seven percent of turbines have been sited at least 400 m from large grassland patches of 50 acres or more, which largely avoids potential habitat for sensitive species.

Waterfowl and Waterbird Collision. Southwestern Minnesota is known for high levels of waterfowl activity, particularly during migration. Activity at the site was high, particularly in spring along the site's western and northern boundaries. Large mixed flocks of geese and ducks were observed moving in these areas. Collision risk is low for these species (NRCNA 2007) because observations indicate that waterfowl and waterbirds can see and avoid turbines (e.g., Madsen and Boertmann 2008). Ninety-six percent of turbines have been sited at least 200 m from wetlands, which largely avoids waterfowl habitat. Additionally, no turbines were sited in the northeast and northwest corners of the site, where waterfowl activity at the site is greatest.

Trumpeter Swan, Franklin's Gull, American White Pelican. Three birds with state status were observed during the spring surveys. Trumpeter Swan (*Cygnus buccinator*), Franklin's Gull *(Leucophaeus pipixcan*) and American White Pelican (*Pelecanus erythrorhynchos*) are state special concern species. Trumpeter's Swan was observed near a wetland on the site's western boundary. Franklin's Gull was observed in significant numbers throughout the site during the second visit in the spring raptor and large bird survey. Two American White Pelican flocks were observed crossing the site during the spring raptor and large bird surveys. Collision risk for all of these species is relatively low as they are likely to be able to see and avoid turbines, and waterfowl/waterbird fatalities have been low for most wind facilities (NRCNA 2007, Westwood Professional Services 2013). Ninety-six percent of turbines have been sited at least 200 m from wetlands, which largely avoids potential habitat for these species.

Regionally Sensitive Species (SGCN Bird Species). Sixteen Minnesota River Prairie Species of Greatest Conservation Need (SGCN) bird species were observed at the site. These are in addition to the three SGCN species with state status described above. SGCN species are considered vulnerable, declining or rare. None of these species was common at the site. Bobolink (*Dolichonyx oryzivorus*) and Northern Harrier (*Circus cyaneus*) were the most frequently observed species. Northern Harrier typically has low reported numbers of fatalities at wind facilities likely due to its low-altitude flight behavior (Smallwood et al. 2009). Relative abundance of Bobolink was greatest in grassland habitat. All other SGCN species were either absent from or rarely observed in cropland habitat. No turbines have been sited in grassland habitat. Ninety-seven percent of turbines have been sited at least 400 m from large grassland patches of 50 acres or more, which largely avoids potential habitat for these species.

Northern Long-eared Bat. The USFWS Service has proposed endangered status for the Northern Long-eared Bat. This species has experienced steep population declines as a result of white nose syndrome. Northern Long-eared Bat typically breeds in large forest patches. As this habitat is not present at the site, presence during the breeding season is unlikely; however, it is possible that the bat could be present at the site during the spring and fall migratory periods. No Northern Long-eared Bat calls were recorded at the site in 2013. The developer is aware of factors that minimize impacts to migratory bat populations, including non-operation of turbines on nights of high temperatures and low wind speeds during migration. If Northern Long-eared Bat becomes federally listed, the implications for the Odell site should be discussed with the USFWS. A decision on listing is expected in early 2014.

Grassland Bird and Waterfowl Habitat Displacement. Savannah Sparrow (*Passerculus sandwichensis*), Horned Lark , Vesper Sparrow (*Pooecetes gramineus*), Bobolink, Western Meadowlark (*Sturnella neglecta)*, Upland Sandpiper, Northern Harrier, and other grassland species constitute a group of birds that has experienced a long term population decline in the eastern United States (Sauer et al. 2008). These species are not protected under state or federal endangered species laws. Grasslands at the site are concentrated along the site's riparian corridors. In addition there are three moderate-sized grasslands in the northeastern corner of the site. Habitat displacement—resulting in lower breeding density and fewer individuals near wind turbines—is a concern for grassland birds, and grassland habitat should be avoided when siting turbines. No turbines have been sited in grassland habitat. Nearly all turbines were sited at least 400m from large grassland patches (97% of turbines) and 200m from wetlands (95% of turbines). This largely avoids habitat displacement issues for grassland birds and waterfowl.

Waterfowl utilize the site for foraging during the spring migration. In some studies waterfowl have been shown to avoid foraging near turbines. However, habituation to the presence of turbines through time is possible, and large acres of agricultural fields for foraging remain outside of the proposed wind facility.

Bald Eagle. The Bald Eagle (*Haliaeetus leucocephalus*) is protected under the BGEPA and MBTA. There is one known nest within ten miles of the site. This nest is located approximately 3.5 miles west of the site along the Des Moines River. This nest was confirmed occupied on April 29, 2013; however, since that time no activity has been observed at the nest. No other Bald Eagle nests have been identified within the site or within two miles of the site boundary, and no other known nests are known to the USFWS or MNDNR.

Bald Eagles associated with this nest are likely to forage along the Des Moines River and associated nearby bodies of water.

Nesting and foraging habitat for Bald Eagles at the site is typically poor with few areas with mature trees and open water. While it is possible that Bald Eagles may establish additional nesting territories within ten miles of the site at some point in the future, it is unlikely that Bald Eagle will nest within the site itself due to the poor potential habitat at the site. During the spring surveys three observations of Bald Eagles were made, and one additional Bald Eagle was observed in the fall. Nonetheless, Bald Eagle collisions with turbines are predicted to be extremely unlikely. Odell is aware of recommendations for avoiding eagle impacts and will follow them accordingly. Although no additional study is required from a risk perspective, additional Bald Eagle surveys are being conducted in order to better understand and adequately discuss BGEPA permitting with the USFWS.

Raptor Collision. There are no known raptor migration routes near the site. Raptors were observed in low numbers during the spring migration at rates much lower than at significant migration sites (Ritter et al. 2012). Raptor activity was primarily of three species, Northern Harrier (41%), Red-tailed Hawk (*Buteo jamaicensis*) (28%) and Turkey Vulture (*Cathartes aura*) (16%). Due to the low activity level compared to known raptor migration routes, it is likely that this site is not on a raptor migration route and that raptor fatalities during migration and in the breeding season will be minimal.

ACKNOWLEDGMENTS

Several individuals warrant our thanks for their contributions to this study. Margaret Rheude (Twin Cities Field Office, USFWS), and Kevin Mixon (MNDNR) reviewed site data, and provided guidance on survey methods. Lisa Joyal provided the review of Natural Heritage Information Systems data. The team also thanks landowners who allowed access to their property for bat acoustic monitoring. Allison Harwood (WSB) and Ry Thompson (AES) assisted with field work.

1. INTRODUCTION

Odell Wind Farm, LLC (Odell) retained Applied Ecological Services, Inc. (AES) to assess the potential impacts on wildlife in a 54 square mile evaluation area for a proposed wind energy development project in Cottonwood, Jackson, Watonwan, and Martin Counties in southwestern Minnesota (Map Exhibit 1). The actual project boundary being considered by the MN PUC in its site permitting process is smaller than 54 square miles. For convenience in this report, the evaluation area will be called the Odell site, or site.

The purpose of these surveys is to assess potential biological impacts from the proposed wind facility and to provide data to identify opportunities for wind turbine siting that would reduce potential biological impacts from the proposed Odell project. As part of this process, AES followed U.S. Fish and Wildlife Service (USFWS) land-based wind energy guidelines (USFWS 2012a) and conducted Tier 1 and Tier 2 site characterization studies, which included analyzing available data in the literature and soliciting information from expert sources. Where warranted, AES began conducting USFWS Tier 3 field studies in 2013 to obtain additional data. This report summarizes the results of the Tier 1 and Tier 2 site characterization studies as well as all Tier 3 surveys conducted at the site. The Tier 3 surveys conducted include spring and fall raptor and large bird migration surveys, passerine spring and fall migration and breeding surveys, and spring and fall migration and summer bat acoustic monitoring. This report updates the interim report and summarizes methods and results from the Tiers 2 and 3 biological surveys and discusses the implications of these surveys for the development of the wind energy site. An interim report dated September 24, 2013 summarizing the results of these Tier 3 Surveys completed through the spring of 2013 was submitted to the Minnesota Public Utilities Commission in conjunction with Odell's submission of a Site Permit Application for a Large Wind Energy Conversion System ("Site Permit Application") for Docket IP6914/WS-13-843.

1.1 Project Description

The site is located in cropland between several existing wind facilities to the south and east of the site. AES focused its field surveys and data requests on the site and a study area that included a 2-mile buffer of the site.

Design specifications for the wind turbines have not been completed. Turbines may be 1-2 MW, with tower hub heights of approximately 80-112m and rotors of 35-60m in length. The rotor-swept area (RSA) will likely begin 30-62m from the ground and extend to a height of 115-172m above the ground.

1.2 Wildlife and Habitat Near the Odell Site

The Odell site is located in the Prairie Parkland Province in the Minnesota River Prairie subsection (MNDNR 2006). Prior to agricultural clearing, the Odell site and the surrounding landscape were covered in generally wet prairie with oak openings and barrens on fire-protected uplands as well as river bottom forest along protected waterways (Marschner 1974). The most recent glacial period left the region pocked with small wetlands and kettle lakes.

Today approximately 90% of the former natural lands support agriculture. Remaining natural lands are highly fragmented and generally associated with the region's water features. Near the site, these water features include the Des Moines River 4-5 miles west of the site, the judicial ditch just north of the site, and the South Fork of the Watonwan River which flows through the site. Small remnant prairies occur in the area along railroad right-of-ways and in a few scattered isolated patches. Within the cropland complex, small natural patches include grasslands along drainage ditches, fence rows, and woodlots and wind breaks associated with farmsteads.

Many of the larger remaining natural areas are protected through ownership or easement. Protected areas near the site include Kilen Woods State Park six miles to the southwest along the Des Moines River; Banks Wildlife Management Area (WMA) immediately west of the site; Bennett WMA, Regehr WMA, and Sulem Lake WMA located north of the site; Fish Lake, Thompson State Wildlife Refuge, and Laurs Lake WMA located west of the site; and Fossum WMA located east of the site. Along many of the riparian corridors land is protected as grassland as part of the Reinvest in Minnesota (RIM) program (Map Exhibit 1).

A small fraction of the area is developed. Windom, located approximately 3 miles west of the site, is the largest nearby community. Mountain Lake and Bingham Lake are located to the north. Bergen is located near the site's southwest corner. Other development is found at individual farmsteads. Land cover at the site follows these general patterns, and a more detailed discussion of land cover at the site can be found in section 2.2.

In the early 1800s, the county's abundant wildlife included large herds of Bison (*Bison bison*) and American Elk (*Cervus canadensis*). The numerous wetlands provided habitat for large numbers of waterfowl and waterbirds, including Trumpeter Swan (*Cygnus buccinator*), Canada Goose (*Branta canadensis*), Mallard (*Anas platyrhynchos*), Northern Pintail (*Anas acuta*), Canvasback (*Aythya valisineria*), Blue-winged Teal (*Anas discors*), Gadwall (*Anas strepera*), Redhead (*Aythya americana*), Northern Shoveler (*Anas clypeata*), Wilson's Snipe (*Gallinago delicate*), American Bittern (*Botaurus lentiginosus*), Sora (*Porzana carolina*), Virginia Rail (*Rallus limicola*), and Western Grebe (*Aechmophorus occidentalis*). In upland grassland, birds such as Marbled Godwit (*Limosa fedoa*), Upland Sandpiper (*Bartramia longicauda*), Bobolink (*Dolichonyx oryzivorus*), Western Meadowlark (*Sturnella neglecta*), and Greater Prairie-Chicken (*Tympanuchus cupido*) thrived (MNDNR 2006).

With the plowing of the prairie and the draining of wetlands, the large herds of ungulates have been eliminated and many of the other formerly conspicuous wildlife are now rare. There are 116 Species in Greatest Conservation Need (SGCN) that are known or predicted to occur in the subsection, which represent 40% of the SGCN species identified for the state (MNDNR 2006). These are species that are rare, declining, or vulnerable or dependent upon habitats that are rare, declining, or vulnerable. Habitat loss and degradation is a problem for nearly 90% of SGCN identified for the subsection (MNDNR 2006). In order to persist, these rare species generally require expansive habitat, many large habitat patches near each other, or high quality habitat. While large habitat patches and high quality habitat are generally lacking from the site, protected areas around the site do provide potential habitat for some of these SGCN species.

However, in general the wildlife encountered near the Odell site is adapted to agriculture and development. Commonly encountered wildlife species include White-tailed Deer (*Odocoileus virginanus*), Raccoon (*Procyon lotor*), Striped Skunk (*Mephitis mephitis*), Mallard (*Anas platyrhynchos*), Canada Goose (*Branta canadensis*), Red-winged Blackbird (*Agelaius phoeniceus*), Common Grackle (*Quiscalus quisculua*), American Crow (*Corvus brachyrhynchos*), and American Robin (*Turdus migratorius*) in addition to the introduced House Sparrow (*Passer domesticus*), House Finch (*Carpodacus mexicanus*), Rock Pigeon (*Columa livia*), Ring-necked Pheasant (*Phasianus colchicus*), and European Starling (*Sturnus vulgaris*). The agricultural landscape and developments of the region have determined the type of wildlife present, supporting chiefly those that can adapt to intensive human land use.

1.3 Agency Consultation

Construction and operation of wind energy facilities will likely cause some impacts to legally protected wildlife or habitat during construction and operation. Therefore, consultation with state and federal wildlife agencies is scheduled early in the development of a wind energy project. These agencies may exercise flexibility with corporations that have demonstrated transparency and good faith efforts to reduce and minimize impacts from wind energy projects. In addition, the agencies may be willing to reconsider their own recommendations if well-documented data are presented to suggest those recommendations should be modified.

Natural Heritage Information System (NHIS) review and records of rare species have been obtained several times during the development of this project. On September 30, 2008, Geronimo Wind Energy requested NHIS review for the North Star Wind Farm. This project encompassed a similar boundary to the Odell Wind Farm. A response was received on November 17, 2008. On June 11, 2009 Geronimo Wind Energy requested NHIS review for the Odell wind project. The boundary has expanded since the date of this request. A response was received on August 26, 2009. Most recently, on April 8, 2013 AES requested a NHIS review for the current site boundary. A response to this request was received on June 24, 2013. Results of these requests are discussed in section 2.3.1 below.

Additional communications with the Minnesota Department of Natural Resources (MNDNR) have included a letter dated October 28, 2009 from Kevin Mixon in which the MNDNR provided a preliminary review of the Odell project, and a conference call on April 28, 2013 with Mr. Mixon to review proposed wildlife surveys. A comment letter was received from Mr. Mixon on June 24, 2013. In this letter Mr. Mixon stated that initial assessment suggests the site is a low risk site, but that wildlife survey data will need to be reviewed prior to assessing the potential for risks at the site.

Existing data on Bald Eagle nest locations was requested from the USFWS on March 28, 2013, and a response was received on May 16, 2013. A teleconference occurred on May 13, 2013 with Margaret Rheude (USFWS) to discuss potential impacts to Bald Eagles at the site and proposed survey methods. Margaret Rheude responded with eagle recommendations via e-mail on May 16, 2013.

Copies of communications can be found in Appendix 1.

2. TIER 2 – SITE CHARACTERIZATION

2.1 Known Species of Concern

The site has the potential to support known species of concern. These species are two plants listed as state threatened, a bird listed as state threatened (Table 1), and birds protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

2.1.1 Natural Features Inventory Data

The Minnesota NHIS database request (Table 1, Appendix 1) in 2008 reported records for Sullivant's Milkweed and Prairie Bush Clover near the site. The records for Sullivant's Milkweed and Prairie Bush Clover were associated with railroad prairies approximately 2 miles northwest of the site. In 2009 the NHIS search identified records for Phlox Moth and Sullivant's Milkweed associated with a mesic prairie remnant in the northeastern corner of the site. A search also identified Phlox Moth and Sullivant's Milkweed records from the mesic prairie remnant. One new species for the area—Henslow's Sparrow—was identified in 2007 in a grassland at the south end of Bennett WMA along the site's northern boundary (Appendix 1).

Impacts to the plant and insect species listed above can be avoided if appropriate setbacks from native plant communities are avoided. Odell, in its Site Permit Application, has committed to avoid native prairie remnants, to the extent practicable. Potential impacts to Henslow's Sparrow are discussed below.

Table 1. Species of concern identified by NHIS data requests

Scientific Name	Common Name	Federal Status[1]	MN State Status[2]	State Rank[3]	Global Rank[4]	Habitat	Likelihood of Presence in the Site[4,5]
Bird							
Ammodramus henslowii	Henslow's Sparrow		SE	S1B	G4	grassland	possible
Invertebrate Animal							
Schinia indiana	Phlox Moth		SPC	S3	G2G4	grassland	present
Vascular Plant							
Asclepias sullivantii	Sullivant's Milkweed		ST	S2	G5	grassland	present
Lespedeza leptostachya	Prairie Bush Clover	FT	ST	S2	G3	grassland	possible

[1] FT – Federally threatened;

[2] SE – State endangered; ST– state threatened; SPC – state special concern

[3] S1 =Critically imperiled in Minnesota because of extreme rarity or due to some factor(s) making it especially vulnerable to extirpation from the state. S2 = Imperiled in Minnesota because of rarity or due to some factor(s) making it very vulnerable to extirpation from the state. S3 = Vulnerable in Minnesota because of rare or uncommon occurrence, found in a restricted range, or some other factors making it vulnerable to extirpation. B indicates breeding status.

[4] G2 – Imperiled; G3 – Rare or Uncommon; G4 – Widespread but with Long-term Concern; G5 – Widespread and Abundant
[5] Inferred presences on site based upon habitat and range.
[6] Possible - habitat likely present, in breeding or migration range of species

Henslow's Sparrow. There is a 2007 record of a Henslow's Sparrow during the breeding season at the southern edge of Bennett WMA along the site's northern boundary. Henslow's Sparrow is state endangered. Henslow's Sparrow breeds in grasslands, including fallow fields, pastures, hayfields, and meadows with scattered shrubs. It typically requires large grassland habitats of 100 to 250 acres or larger for nesting (Herkert 1994), and is typically found in damp lowland locations. It has shown a preference for areas with widely scattered shrubs, tall and dense grass cover, and dense standing dead vegetation (Currier 2001). Changes in agricultural land use from hayfields and pasture to specialized crops have been largely responsible for the reduction of available Henslow's Sparrow habitat.

The majority of the site is cropland habitat without significant grasslands. Larger grasslands in and near the site are associated with Banks and Bennett WMAs along the site's northern border, two grassland locations in the northeastern portion of the site, and along the South Fork of Watonwan Creek. If the species were present, typical flight heights are well below the RSA, and therefore direct impacts are unlikely. Habitat displacement caused by tall structures, such as wind turbines, is known in grassland bird species, although it has not been documented in Henslow's Sparrow.

No specific Tier 3 studies were considered warranted for these species, although Tier 3 avian surveys were conducted at the site and no Henslow's sparrow were documented in these surveys.

2.1.2 Federally-Listed Species Assumed Present in Cottonwood, Jackson, Watonwan, and Martin Counties by USFWS

The USFWS considers the Poweshiek Skipperling (*Oarisma Poweshiek*) and the Prairie Bush Clover (*Lespedeza leptostachya*) to be within possible range at the site. The Poweshiek Skipperling is a federal candidate species and Minnesota endangered species that is found in native prairie remnants, and the Prairie Bush Clover is a federal and state threatened species typically found in dry prairie sites.

Impacts to these plant and insect species can be avoided if native plant communities are avoided. Odell has committed to avoiding impacts to native prairie remnants, to the extent practicable. No specific Tier 3 surveys were considered warranted for these species.

2.1.3 Bald Eagle

In 2007, the Bald Eagle was delisted from its federally threatened status in the lower 48 states, but it is still federally protected under the Bald and Golden Eagle Protection Act (BGEPA). It was removed from the Minnesota state list in August 2013.

A stick nest survey of the site and a two mile buffer was conducted from public roads on May 2-3, 2013. During this visit four adult Bald Eagles were observed in the vicinity of Fish Lake approximately one mile west of the site. Records of Bald Eagle nests within 10 miles of the site were requested from the USFWS, and the only known nest reported within 10 miles of the site is the Des Moines River nest (Appendix 1). No other stick nests were observed during these surveys.

The existing Bald Eagle nest is approximately 3.5 miles west of the site along the Des Moines River. The nest was confirmed as occupied on April 29, 2013; however, since that date no activity has been observed during repeat visits. Observations of the nest were made on May 13-15 and June 25-26 for a total of 6 hours. No other Bald Eagle nests have been identified within the site or within two miles of the site boundary.

Bald Eagles associate with distinct geographic areas and landscape features, including nest sites, foraging areas, communal roost sites, migration corridors, and migration stopover sites (USFWS 2013). They are typically found in close proximity to water bodies, both natural and manmade, due to the presence of fish. They prefer to nest, perch, and roost in old-growth or mature stands of trees, and they usually select a nesting tree that is the tallest among those in its vicinity, to provide visibility. Nesting trees are usually situated near a water body that supports fish, their main preferred prey.

In Minnesota, Bald Eagles typically arrive at their nesting territories between mid-February and mid-March. Nesting pairs are usually faithful to previous nesting sites. Most adult and immature Bald Eagles begin their southward migration by October-November, but many Bald Eagles remain and overwinter in Minnesota.

Existing data suggest that wind energy facilities are not a significant cause of fatalities for Bald Eagle. Through 2012, there were six known fatalities of Bald Eagles at wind facilities in North America (Allison 2012, Pagel et al. 2013). Based on USFWS Region 3 Bald Eagle population numbers and trends, the USFWS has determined that 244 individual Bald Eagles can be taken each year without compromising the long-term sustainability of the population (USFWS 2009b). This is likely a conservative estimate, given that the methodology allows for loss of only half the maximum sustainable yield as calculated by Millsap and Allen (2006). The increase in post-construction monitoring occurring at wind energy facilities across the country will provide important data for better understanding the threat of wind energy facilities to Bald Eagles and will promote improved avoidance, minimization, and mitigation measures.

The Bald Eagle population continues to increase in the lower 48 states, including Minnesota. Some 631 new territories were established in Minnesota between 2001 and 2006 (USFWS 2012b). This species appears to be occupying locations that in the past may have been considered less than optimal. Because the population is expanding, it is possible that in the future Bald Eagle nests may be located within ten miles of the site. However, it is unlikely that they would nest in the site due to the lack of open water and mature tree stands.

During all Tier 3 bird surveys and at incidental times between surveys, observers searched for and noted all occurrences of Bald Eagles at the site. Bald eagle activity at the site is likely to be minimal as concluded from approximately 145 hours of surveys at the site from April through November 2013 (see sections 3.1.3 and 3.3.2 for survey results).

2.2 Protected and Sensitive Lands

The Odell site does not contain protected or sensitive lands, but such lands are present within a mile of the boundary of the site (Map Exhibit 1 & 2, Appendix 1). Banks and Bennett WMAs are at the northwest corner the site. In the northeast corner of the site is Sulem Lake WMA. These WMAs contain native plant communities, including open water and wetlands, which are used by waterfowl and waterbirds. Fish Lake and Thompson State Wildlife Refuge are at the site's western edge. Additionally, Regehr WMA is at the site's northeast corner. An approximately 80-acre county parcel occurs within the site's northeast corner. Nearby, a RIM easement is within one mile of the site's boundary, but not within the site. These constitute the protected lands in and near the Odell site.

The Minnesota County Biological Survey (MCBS) has completed a survey of this area for native plant communities. One dry hill prairie of moderate biodiversity significance was identified in the center of the site along the South Fork of Watonwan Creek. Several significant areas are located outside but near the Odell site. A mesic prairie at the northeast corner of the Odell site was mapped as a site of high biodiversity significance. It contains several rare native plant communities, including mesic prairie, wet prairie, prairie mixed cattail marsh, seepage meadow/carr and southern basin wet meadow/carr. Native plant communities of moderate biodiversity significance were also identified at Banks and Bennett WMAs near the northeast corner of the site. Communities here include dry hill prairie, prairie wetland complex, mesic prairie, and prairie mixed cattail marsh. A dry hill prairie of moderate biodiversity significance also occurs on the site's northern border. Finally, an area just below the threshold for statewide significance occurs near the northeast corner of the site, situated along the judicial ditch just south of Sulem Lake WMA. The locations of these native plant communities were confirmed during a site visit on April 2-3, 2013.

2.3 Plant Communities of Concern

The Minnesota NHIS database request (Appendix 1) in 2008 reported records of five native plant community locations (Map Exhibit 1 & 2, Table 2). Three of the four known prairie locations (a dry hill prairie and a mesic prairie) were railroad prairies in the general vicinity. The fourth known prairie location is a mesic prairie located in the northeastern portion of the site. The final identified native plant community is a Basswood-Bur Oak (Green Ash) forest located a half mile outside the site's northern boundary. In 2013, the NHIS search identified records for the above mentioned mesic prairie located in the northeastern portion of the site and the Basswood-Bur Oak forest located a half mile outside the site's northern boundary.

Odell, in its Site Permit Application, has committed to avoid impacts to native communities, to the extent practicable.

Table 2. Plant communities of concern identified by NHIS data requests

Scientific Name	Qualifier	State Rank[1]	Global Rank[2]	Likelihood of Presence in the Evaluation Area[3,4]
Dry Hill Prairie (2 occurrences)	Southern	S2	GNR	present
Mesic Prairie (2 occurrences)	Southern	S2	GNR	present
Native Plant Community (Basswood-Bur Oak Forest)	Undetermined Class	SNR	GNR	low

[1] S2 = Imperiled in Minnesota because of rarity or due to some factor(s) making it very vulnerable to extirpation from the state.
SNR = Rank not yet assessed.
[2] GNR – Not Ranked
[3] Inferred presences on site based upon habitat and range.
[4] Low – habitat unlikely, at edge of range.

2.4 Congregation Areas

No congregation areas for birds or bats have been identified inside the site. Waterfowl and waterbird congregation areas exist in protected areas outside the site. Those protected areas are described in Section 2.3 Protected and Sensitive Lands.

2.5 Species of Habitat Fragmentation Concern

No species of habitat fragmentation concern have been identified as potentially present within the site.

2.6 Bird and Bat Site Use and Fatality Risk

Bird and bat use of the site and associated fatality risk were evaluated by mapping land cover to identify habitats used by birds and bats and by conducting a literature review of potential impacts to birds and bats from wind energy projects.

2.6.1 Habitat Cover Mapping Methods

Habitat cover mapping is used for a habitat-by-habitat assessment of landscape impacts and risk associated with the installation of the proposed project. The distribution and abundance of bird and bat species are correlated during the breeding and winter season, and to some extent during the spring and fall migration period, with the spatial distribution and amount of habitat. Land cover is used to represent habitat.

A land cover map was created to define and visualize the locations where different bird and bat habitats were present. Base data were from the National Land Cover Database (NLCD) raster dataset developed in 2001 by the US Geological Survey, based on LANDSAT images from March 1997-Sept 2001. This coverage was developed for the U.S. Department of Agriculture at a cell size of 30 x 30m. The raster NLCD coverage was clipped to the site. Each NLCD land cover type was assigned to an AES habitat cover type for use in avian field surveys (Table 3, Map Exhibit 2).

The NLCD mapping of permanent grassland that could serve as long-standing wildlife habitat was inaccurate as determined by AES field checks. Consequently, in 2013 Odell re-mapped permanent grasslands in the Project Area. Odell mapped grassland polygons based on remote analysis of 2010 National Ag Imagery Program aerial photographs and field-verified grasslands in April 2013. Permanent grasslands included CRP lands, RIM lands, hay meadows, and pastures. Small linear areas of grassland in stream corridors, ditches, and rights-of-ways were not mapped. Therefore, the refined land cover mapping combined NLCD land cover data with Odell's field-verified grasslands. Areas identified in the NLCD land cover data and aerial photographs as grassland and pasture were field-verified and mapped by Odell. Aside from grasslands, 2013 field observations at the Odell site confirmed that the NLCD land cover had not changed significantly from 2001 when the NLCD data were developed.

Table 3. AES habitat cover type descriptions

AES Habitat Cover Type	Description
Developed	Residential, commercial, industrial, and other developed land, including developed green space (e.g., golf course, city park).
Cropland	Regularly cultivated land. Pasture, hay meadow, and fallow field are grasslands.
Barren Land	Land with sparse to no vegetation (e.g., mines, landfills, construction sites, sparsely vegetated shores).
Grassland	Grass and herbaceous plants cover ≥90% of the ground in uplands; includes pasture, hay meadow and fallow field.
Upland Shrub-Scrub	Shrubs and scrubby or mature trees cover 10-50% of the ground. Includes brushland and savanna with trees and shrubs.
Upland Forest	Trees cover ≥50% of the ground.
Forested Wetland	A wetland or lowland flooded area with 50-100% tree cover.
Shrub-Scrub Wetland	A wetland with 10-50% cover by shrubs, scrubby and mature trees. Includes savanna with trees and shrubs.
Emergent Wetland	A wetland with ≥90% cover of herbaceous plants.
Open Water	Water with sparse to no vegetation cover; rivers, streams, lakes, ponds.

2.6.2 Habitat Cover Mapping Results and Discussion

The proposed Odell site lies in rural southwest, Minnesota, and like most of this agricultural region habitat at the site is 91% cropland (Table 4, Map Exhibit 2). Historically the site was covered in generally wet prairie (Marschner 1974). Almost all of these prairie communities have been replaced by agriculture, and only scattered prairie remnants remain in the region.

The MCBS identified two native prairies within the site. In the northeastern corner of the site there is a 70-acre mesic/wet prairie complex. Along the South Fork of the Watonwan River there is a 120-acre dry hill prairie. When these prairie patches are combined with other non-native grasslands, grassland habitat comprises 3% of the site. The larger non-native grasslands at the site are protected with RIM easements.

Natural habitats at the site are concentrated along the riparian corridors of the South Fork of the Watonwan River in the center of the site, the North Fork of Elm Creek in the southern part of the site, and the Cedar Run in the southeastern corner of the site. These habitats consist primarily of grassland (3.0%) and emergent wetland (0.5%) with scattered shrub-scrub and small patches of forested habitat (0.2%). Natural habitats are also concentrated along the northern boundary of the site in the Bennett and Banks WMAs. The National Wetland Inventory shows additional wetlands not identified by the NLCD data. Most of these are small scattered wetlands located in cropland habitat.

Only 4.7% of the site is developed, consisting primarily of roads, farmsteads, and home sites, with concentrations in Windom (four miles west) and Mountain Lake (two miles north). Most of the farmsteads have windbreaks and woodlots with mature trees.

Table 4. Habitat cover types at the Odell site

Land Classification (combined NLCD data)	Area (acres)	Percent of Total
Developed	1,634.4	4.7
Cropland	31,626.9	91.4
Barren Land	12.0	0.03
Grassland	1,028.2	3.0
Upland Forest	60.3	0.2
Emergent Wetland	177.4	0.5
Open Water	52.8	0.2
Total	**34,591.9**	**100.0**

Due to the availability of pre- and post-construction data at the nearby Lakefield site, it will be useful to compare the Odell site to the Lakefield site, approximately 10 miles southwest of Odell. In general the habitat cover at the site was similar to that found at the Lakefield Wind Project. The Lakefield project, built in 2011, has a land cover comprised of 88.8% cropland, 6.6% developed, and 4.6% natural habitats (grassland, wetland, woodland/shrub-scrub) (Westwood Professional Services 2013). The Lakefield project is similarly surrounded by protected grassland, wetland, and open water habitats including Toe, Bootleg, Summers, Husen, and Dead Horse WMAs (Westwood Professional Services 2013).

The Lakefield site, however, contains more acres of wetland and grassland habitat than the Odell site: 4.2% percent of Lakefield is wetland and grassland, while 1.7% of Odell is in these habitats. Within 3 miles of the sites, 3.6% of Odell is in wetland and grassland, while at Lakefield 5.4% of the area is. The amount of protected lands in each respective area is also different. The acreage of protected lands in and within three miles of the Lakefield site is over twice that in and within three miles of the Odell site. Additionally, the northern edge of the Lakefield site is adjacent to the Heron Lake complex, one of the largest wetlands in southwest Minnesota. By contrast, there is no major wetland or other natural feature as large as the Heron Lake complex in the immediate vicinity of the Odell site.

2.6.3 Species Protected by the Migratory Bird Treaty Act

As explained in Section 1.3, the Migratory Bird Treaty Act of 1918 (MBTA, 16 USC §§703-712) assigns legal authority to the USFWS to prevent the taking[1] of migratory birds. These include over 800 species of raptors, diurnal migrants, and passerine migratory birds.

The mean fatality rate at several wind energy facilities in the Upper Midwest is 2.06-2.22 birds of all species per turbine per year (CEIWEP 2007). According to CEIWEP (2007), this number ranges from 0.63 to 7.70 birds per turbine per year for the entire United States. Zimmerling et al. (2013) identified both a higher mean (8.2) and greater range (0 to 26.9) for birds killed per turbine per year at 43 wind energy facilities in Canada, incorporating correction factors for such variables as scavenger removal, searcher efficiency, and carcasses that fell beyond the search radius. The authors estimated that these numbers amounted to less that 0.2% of

[1] Taking is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or any attempt to carry out these activities." Take does not include habitat destruction or alteration, as long as there is not a direct taking of birds, nests, eggs, or parts thereof.

the population of any species in the study and noted that population level effects resulting from collision with turbines were unlikely (Zimmerling et al. 2013).

Research indicates that factors that increase the risk of birds colliding with wind turbines are complex, and fatalities cannot reliably be predicted from local bird abundance and flight height measurements. Several published and unpublished studies in Europe and the United States have suggested that bird behavior in the vicinity of turbines is a stronger predictor of collision risk than bird abundance (e.g., Barrios and Rodriguez 2004, de Lucas et al. 2008, Smallwood et al. 2009). These studies also noted that environmental factors play a role (e.g., foraging habitat, migratory routes and uplift areas for raptors). Depending on the type of environmental factor (e.g., uplift areas), collision risk and tower height may be correlated (Barrios and Rodriguez 2004). Bird behavior that increases collision risk may include territorial chases, mating displays, soaring in thermals, and stooping after prey. These "risky" behaviors in the vicinity of wind turbines may be reflected in actual fatality rates as measured at existing wind projects. In the Upper Midwest, the species that appear to be most at risk from collisions with turbines are those that regularly fly in the RSA such as Horned Lark and European Starling.

Habitat is also likely to be an important predictor of collision risk. Bird abundance is correlated with habitat type. Habitats containing more individuals of high risk species, due to their behavior, are predicted to have higher impacts from turbines located in or near them. A commonly used measure of risk, flight height, has been shown to be generally uncorrelated with risk (Johnson et al. 2000a). The flight heights of individual species, however, can help explain the specific behavior and timing of the behavior that puts a species at risk.

There is also a strong seasonality to avian fatalities. The majority of avian collisions take place during the spring and fall migratory periods. In general, breeding birds experience few collisions with wind turbines. For instance, at Buffalo Ridge, Minnesota, Osborn et al. (1998) found that 70-75% of breeding birds flew below 21m elevation (below the turbine blade height).

A proactive approach to minimizing impacts to birds protected under the MBTA is strongly encouraged through the USFWS voluntary Land-based Wind Energy Guidelines (LBWEGS). With this understanding, we provide an overview of all bird guilds potentially present at or near the project location whose potential impact could result in legal action through the MBTA if enforced. Within these guilds we highlight species which are ranked as Species of Greatest Conservation Need (SGCN) in the Minnesota River Prairie subsection (MNDNR 2006) since these species are currently considered vulnerable, declining, or rare. SGCN include all species with federal and/or state protection status.

Passerine (Songbirds). Minnesota recognizes 30 passerine species as Species of Greatest Conservation Need (SGCN) in the Minnesota River Prairie subsection. Many of these species are grassland nesting birds (e.g. Henslow's Sparrow, Grasshopper Sparrow, Bobolink, Dickcissel, Field Sparrow, Eastern Meadowlark) or associated with the region's open wetlands (e.g. Marsh Wren, Sedge Wren, Swamp Sparrow). Habitat for these species is present at the site in the larger grasslands as well as the grassland and wetland habitats associated with the site's riparian corridors. The site also has shrub-scrub and woodland habitat along these corridors that could provide breeding habitat for additional SGCN species, (e.g., Black-billed Cuckoo, Least Flycatcher, Willow Flycatcher, Red-headed Woodpecker, Rose-breasted Grosbeak, Brown Thrasher). The site is lacking habitat for SGCN forest birds (e.g. Veery, Ovenbird), but some of these species might utilize the natural habitats associated with the site's riparian corridors as stopover habitat during migration.

On average in the U.S., 74% of all bird fatalities at wind energy facilities are passerines (NRCNA 2007). Erickson et al. (2001) estimated that half of passerine bird fatalities consists of long-distance migrants, including warblers. These numbers may be an underestimate due to the difficulty of locating small birds in post-construction fatality studies (CEIWEP 2007).

Long-distance migrants typically fly at night at elevations of several thousand feet, well above the RSA (Kerlinger 1995). Erickson et al. (2001) provisionally estimated that 34-60% of passerine fatalities is that of night migrants; they appear most vulnerable during inclement weather when visibility is reduced and birds are forced to fly at lower elevations. During inclement weather the number of birds killed is unlikely to be high in any single event because long-distance migrants typically move in broad fronts across the landscape (Kingsley and Whittam 2003; NRCNA 2007), and large, dense flocks are unlikely to fly through wind energy facilities (NWCC 2004).

To some extent, migrating birds are selective about which habitats they use. Long-distance migrants tend to utilize forest and brushy habitat during stopovers rather than open agricultural land (Kerlinger 1995). Migrants have also been observed focusing their feeding in structurally complex habitats, such as forests with a shrubby understory or brushy areas (Kerlinger 1995). The majority of the site is in cropland with scattered grasslands and associated shrub-scrub habitats along riparian corridors. Wooded habitat occurs in small patches along these riparian corridors and in windbreaks associated with farmsteads. Natural habitats at the site are concentrated along the South Fork of the Watonwan River in the center of the site and the Cedar Run in the southeastern corner of the site. There is also a corridor of natural habitats associated with a series of wetlands along the site's northern border. The agricultural land in the proposed site is less likely to attract migrating passerines, especially long-distance migrants.

Raptors. Most raptors are protected by the federal MBTA, and several are state listed species in Minnesota (e.g. Burrowing Owl, endangered; Peregrine Falcon, special concern; Short-eared Owl, special concern; Red-shouldered Hawk, special concern). A total of five raptors are on the SGCN list for the Minnesota River Prairie subsection: Short-eared Owl, Swainson's Hawk, Northern Harrier, Bald Eagle, and Burrowing Owl.

There are no known concentrated raptor migration routes near the site, although there is likely to be a broad front migration through the region (USFWS 2006a and 2006b). There are no topographic features at or near the site that would concentrate raptor activity. There are known raptor migration routes along the western edge of Minnesota (approximately 70 miles west of the site) and along the Minnesota River (approximately 45 miles northeast of the site). The nearest hawk watch sites along these raptor migration routes are near Council Bluffs, Iowa on the Missouri River (10 years of data) and Mankato, Minnesota on the Minnesota River (3 years of data). Compared to other sites, these sites have lower passage rates of 25.0 and 41.7 raptors per hour, respectively (Orsag et al. 2012, Heins 2012). In contrast, migration areas such as the Duluth Hawk Watch near Lake Superior may see several thousand birds per day, with an average passage rate of 135 individuals/hour during fall migration (20 years of data; Ritter et al. 2012).

At the Minnesota River hawk watch site, 14 species have been recorded: Broad-winged Hawk (62% of observations), Turkey Vulture (12%), Red-tailed Hawk (9%), Bald Eagle (5%), and Sharp-shinned Hawk (5%); Osprey, Northern Harrier, Cooper's Hawk, Red-shouldered Hawk, Rough-legged Hawk, American Kestrel, Merlin, Peregrine Falcon, and Swainson's Hawk were observed in lesser numbers (Heins 2012).

In general, hawks and owls appear to have moderate to low collision risk from wind turbines depending on location (Johnson et al. 2000a, de Lucas et al. 2004). Previous studies have documented species-specific behavioral responses to wind turbines by raptors (Garvin et al. 2011, Martinez-Abrain et al. 2012). De Lucas et al. (2004) found that raptors appear to avoid wind turbines and increase their soaring height on approach. However, the large number of Golden Eagles killed at the wind facility in Altamont Pass, California (Smallwood and Thelander 2008), along with the relatively low reproductive rate of most raptor species, have raised concerns about the potential for impacts and thus concerns persist in the general public.

Buteos, eagles, and vultures use updrafts and thermals to soar during migration and reach high altitudes before gliding over water (Kerlinger 1995). By contrast, accipiters, falcons, harriers, and similar birds can use updrafts, but often use powered flight at lower elevations, allowing them greater maneuverability in flight. Consequently, the greatest risk to raptors may occur with those that soar. Moreover, because they avoid a water crossing until they reach a considerable altitude, soaring raptors concentrate along shorelines where they use off-shore breezes (from water to land) to increase their altitude (Kerlinger 1995).

Updraft areas occur throughout the site over agricultural land and other land covers that warm early in the day. There is a strong tendency for raptors to move with favorable winds, especially soaring raptors (Kerlinger 1995). Southerly winds are most favorable in spring, and conversely northerly winds are favorable in fall. However, raptor fatalities are most likely to occur where migrating raptors become concentrated—

including shorelines, ridgelines, and mountain chains—or where food is plentiful and soaring is facilitated by local wind patterns, such as at Altamont Pass, California. There are no topographical features that would concentrate raptors at the Odell site.

Although raptors that soar in migration may generally be at greater risk than powered-flight raptors when they are flying within 200m of the ground, powered-flight raptors may experience high fatality rates at other times of the year, such as the breeding season. For example, Smallwood et al. (2009) found high fatality rates for American Kestrel at the Altamont Wind Energy Facility in California.

Waterfowl (Ducks, Geese, etc.) and Waterbirds (Gulls, Shorebirds, and Wading Birds). Southwestern Minnesota has a significant dabbling duck (e.g. Northern Shoveler, Mallard) migration (Lincoln et al. 1998), and diving ducks (e.g. Lesser Scaup, Bufflehead) also migrate through the region. Although the site itself has few areas of open water, wetlands and open water habitats are located near the site. Many of these are protected as WMAs by the MNDNR or the USFWS (Map Exhibit 1).

Wetlands are concentrated on the northern border of the site, along the Des Moines River west of the site, and along a drainage corridor east of the site (Map Exhibit 2). Migrating waterfowl and waterbirds are likely to stop at small and seasonal ponds inside the site as well as in agricultural fields to feed (particularly if they are temporarily flooded). They are also likely to fly across the site as they move between the surrounding wetlands.

Eight waterfowl species (Western Grebe, Northern Pintail, Trumpeter Swan, Common Moorhen, Common Loon, American White Pelican, Red-necked Grebe, and Eared Grebe) are listed as SGCN in the Minnesota River Prairie subsection. Of these, all have the potential to fly though the site, stopover in migration, or feed in flooded crop fields or other temporary wetlands. Possible breeding habitat is limited to two small open water wetlands, one on the western site boundary and one near the southern site boundary. Waterfowl species observed on or near the site during the May 2-3 site visit included Canada Goose, Mallard, Northern Shoveler, Gadwall, Blue-winged Teal, Wood Duck, American Widgeon, Lesser Scaup, Greater White-fronted Goose, Redhead, Ring-necked Duck, American Coot, Hooded Merganser, Common Merganser, and Canvasback.

Franklin's Gull—a species of special concern in Minnesota—is often observed in southwest Minnesota during migration. See discussion of this species in section 3.3.2 below. There are two SGCN tern species, Forster's and Black, in the Minnesota River Prairie subsection. These occur sparsely in the southwest portion of the state, but typically remain close to large water bodies and are thus unlikely to utilize the cropland habitat at the site.

Fifteen shorebird species are SGCN in the Minnesota River Prairie subsection. Most of these species are migrants in the area. A few (e.g. Upland Sandpiper, Marbled Godwit, Hudsonian Godwit, Whimbrel) require large grassland habitats for breeding. Of these, only Upland Sandpiper is in breeding range and has the potential to breed on or near the site due to the quality and size of the grassland habitat present. Other species may be present during migration. Other SGCN waterbirds for the Minnesota River Prairie subsection include American Bittern, Least Bittern, Black-crowned Night-Heron and Virginia Rail. These species could be present in wetland habitats in or near the site.

Few waterfowl and waterbirds have been killed at wind energy facilities (CIEWEP 2007). This may be due to avoidance behavior or effective siting of wind energy facilities in order to avoid waterfowl and waterbird concentration areas. Typical migratory flight of waterfowl is much higher than the RSA of wind turbines (Kerlinger 1995), and many waterbirds appear to be exceptionally adept at avoiding wind turbines. For example, based on fatality rates at four wind farms, avoidance rates in Canada Geese have been estimated at 99.9% (Fernley et al. 2006, Pendlebury 2006). This behavioral pattern has been documented by researchers in the field (e.g., Madsen and Boertmann 2008) as well as by AES staff. Migrating waterfowl and waterbirds may however be vulnerable when: a) ascending or descending from water bodies, b) feeding in and near wind energy projects, c) flying in inclement weather, d) flying in early morning and late evening if visibility is poor, or e) turbines are near or between roosting and feeding sites.

In summary it is predicted that avian fatalities at the Odell site will be similar in number to those found at other wind facilities in Midwestern cropland. Fatalities are likely to consist primarily of passerine species, with limited risk to raptors, waterfowl, and waterbirds. Fatalities are likely to be greatest during the spring and fall migratory periods, particularly on nights with low visibility or weather conditions that cause birds to fly at lower elevations. Fatalities are likely to be greatest for species flying at night or species with flight behaviors that put them at risk of collision. Tier 3 avian surveys were recommended to provide site-specific data regarding avian migration and breeding activity at the site prior to construction and operation of the project so that these general conclusions can be re-assessed in light of fatality monitoring at the site (see section 3 below).

2.6.4 Non-Listed Bat Species

Impacts to bat species are of continued concern to biologists and wildlife agencies due to sustained fatalities of bats from white nose syndrome (WNS) and a select few wind farms where significant numbers of bat fatalities have been recorded (Arnett et al. 2008, Rydell et al. 2010). However, current modifications to siting procedures (Santos et al. 2013) and operational procedures (Arnett et al. 2011) have documented reductions in bat fatalities at wind farms in recent years. Improvements to statistical modeling and fatality estimates further advance the validity of studies at wind farms (Peron et al. 2013).

Most wind energy projects have not documented large bat kills, but a few sites have exhibited a larger number of fatalities that has raised overall concern. For example, in West Virginia an estimated 1,364-1,980 bats were killed in a six-week period in 2004 (Kerns and Kerlinger 2004). Jain et al. (2011) estimated fatality rates of 3.64 – 9.17 bats per turbine per year (BTY) at a wind farm in cropland in north-central Iowa. A recent wind energy project in Jackson County, Minnesota (situated in approximately 90% cropland) used statistical estimation methods described by Strickland et al. 2011 to estimate fatalities at 29.80 BTY (Westwood Professional Services 2013). These results are significantly higher than previous Midwestern cropland wind farm project bat fatality estimates, which are 0.01 – 10.2 BTY (Arnett et al. 2008, Gruver 2008a). Specifically, three Minnesota wind farms—Buffalo Wind I, II, & III—were determined to have corrected BTY of 0.07, 2.01, and 2.06, respectively (Barclay, Baerwald, and Gruver 2007). Variation in fatality rates at sites in similar habitat types can be a function of many different variables, including turbine siting, bat migration corridor routes, wind and weather patterns, and other known and unknown factors.

Since bats in the temperate zone give birth to one or two young each year, the biological and cumulative significance of the reported fatalities for species with low birth rates is unclear (O'Shea and Bogan 2003), but presumed significant in concert with WNS fatalities (WNS is not currently documented in Minnesota). Of 45 bat species in the continental U.S., six already are federally endangered and 20 are at risk. All cave-hibernating bats in the Eastern U.S. are declining due to WNS, a fungal disease that has eliminated 95% of populations where it occurs in the Northeast and Midwest (Bat Conservation International 2009). As of mid-May 2013, WNS is documented in 22 US states and 5 Canadian Provinces (Bat Conservation International 2013). WNS was most recently (winter 2012-2013) discovered in hibernacula primarily south and west of Appalachian sites (but also a few additional sites in Canada and New England), impacting bat populations at hibernation areas in Kentucky, Tennessee, Missouri, and Illinois along northwesterly transmission pathways. The nearest confirmed case of WNS to the project location is in bat hibernation areas of north-central Illinois, where it is killing Little Brown Bat (*Myotis lucifugus*) and Northern Long-eared Bat (*Myotis septentrionalis*) (Illinois Department of Natural Resources 2013). However, the disease is currently suspected in bat hibernation areas in eastern Iowa as well as southeastern and northeastern Minnesota (USGS 2013).

As a result of WNS, the USFWS was petitioned to protect the Northern Long-eared Bat, Eastern Small-footed Bat (*Myotis leibii*, not in range at the site), and Little Brown Bat by emergency listing under the Endangered Species Act (Bat Conservation International 2011). The USFWS had published a 90-day finding for Northern Long-eared Bat indicating that there is substantial scientific evidence for listing, and in September 2013 proposed that Northern Long-eared Bat be listed as endangered. Additionally, the state of Minnesota listed Big Brown Bat and Little Brown Bat as special concern with the August 2013 revision of the state list (MNDNR 2013b). The low reproductive rate, potential for a high number of fatalities, and large proportion of at-risk species has elevated concern for bats among biologists and regulatory agency staff throughout North America.

Three tree-roosting bat species, Hoary Bat (*Lasiurus cinereus*), Eastern Red Bat (*Lasiurus borealis*), and Silver-haired Bat (*Lasionycteris noctivagans*), comprise the majority of all bat fatalities related to wind farms in North America (Cryan 2011). Johnson (2005) identified eleven species experiencing fatalities at wind energy projects and calculated that over 80% of individuals were Hoary, Eastern Red, and Silver-haired Bats. All three species are known to occur in Minnesota near the site. These migratory species travel up to 1,200 miles in spring and fall and spend summers in the northern U.S. and Canada (Kurta 1995, Cryan 2003).

Four other bat species known to occur in Minnesota—Big Brown Bat (*Eptesicus fuscus*), Little Brown Bat, Tri-colored Bat (*Perimyotis subflavus*), and Northern Long-eared Bat—have low reported impacts at wind energy projects. These and other species not found in Minnesota represent approximately 20% of all reported fatalities (Arnett et al. 2008), although fatality rates have been higher at a few facilities (Gruver et al. 2009). Because these species are widely distributed in Minnesota, it is possible that they may occur at or near the site.

Half of all reported bat collisions occurred from August 16-31 and one-fourth from September 1-15, presumably corresponding with the peak of fall bat migration (Johnson 2005, Arnett et al. 2008, Westwood Professional Services 2013). Most of the other collisions occurred July 16-August 16 and September 16-October 15. There are much fewer fatalities during the April-May spring bat migration for unknown reasons (Zinn and Baker 1979, Cryan 2003, Cryan 2008). Rydell et al. (2010) found similar guilds and seasons for impacts at European wind farms.

Fatalities are often associated with passing weather fronts and nights with low wind speed when bats appear to migrate (Arnett et al. 2008). Fatalities are also associated with the preferred migration altitude of a given species. For example, the Hoary Bat is found most often above 30m (Arnett et al. 2007, AES observations), within the RSA, rather than at lower elevations. Hoary Bat accordingly accounts for 50% of known bat fatalities in North America (Cryan 2011).

Cryan and Barclay (2009) hypothesized that particular mating behaviors (aerial copulation, resource defense polygyny, and lekking) may contribute to bat fatalities at wind farms since they are correlated with attraction to the tallest trees in a given area, and these behaviors are prevalent in the tree bat species which are most impacted by turbines. However, no formal experiments have been completed to prove this theory. Other theories correlate bat fatalities at wind farms to migrating insects (Rydell et al. 2010). Despite these hypotheses, a consistent pattern between bat habitat and fatalities has not been established (Arnett et al. 2008, Santos et al. 2013). Models have been developed to attempt to correlate ecological conditions of the surrounding landscape for estimating fatality rates per species at proposed turbine locations based upon distance to certain landscape features (Santos et al. 2013). Certain combinations of particular distances to forest, slopes, and open water tend to yield consistently high fatality rates for one or more bat species. These "mortality niches" have allowed for enhanced prediction of potential collision risk areas and thereby aid in both environmental assessments and turbine siting exercises (Santos et al. 2013). While this approach is helpful for some species-specific assessments, a paucity of critical behavioral and spatial use information needed to apply these models exists for many species and geographic regions. Results of previous studies suggest that turbines placed in cropland are likely to pose less risk to bats compared to turbines placed in or near forests, rivers, lakeshores, and ridgelines because bats appear to follow edges and linear features, including forest edges and treelines (Hall 1962, Furlonger et al. 1987, Verboom and Huitema 1997, Murray and Kurta 2004, Arnett 2005, Johnson 2005, Larkin 2006, Cryan and Veilleux 2007, Kurta et al. 2007).

Infrared imagery shows that bats often investigate wind turbine towers, pass them multiple times, and land on stationary blades (Horn et al. 2008, Cryan and Barclay 2009). Physical avoidance responses to spinning blades by bats in close proximity to turbines are limited. Grodsky et al. (2011) explains, "The maximum range at which bats can echolocate is 20 m (Neuweiler 2000); given a turbine blade rotation speed of 75 m/s, bats have approximately 0.25 s to react to spinning turbine blades before being struck…Thus, it is unlikely that bats can adjust their flight direction before entering airspace occupied by spinning turbine blades." This suggests that the turbine siting process is critical for minimizing bat fatalities, since avoidance measures afforded by some bat species are less available.

Due to the likely passage of migratory tree bat species at the site, a Tier 3 acoustic monitoring study was recommended as a result of the Tier 2 review (see section 4 below).

2.7 Potential for Significant Adverse Impacts

The review of existing information indicates that wind energy development at the Odell site is unlikely to create significant adverse impacts. Significant impacts include those of large intensity, large geographic scope, and long duration. The risk of significant impacts could be further diminished by reducing the footprint of the Odell wind energy facility. The site does not contain but rather is near protected and sensitive areas, including areas of statewide biodiversity significance and waterfowl and waterbird concentration areas during migration. Considering buffers for these protected and sensitive areas will reduce the impact of the Odell project on the most important locations for birds in the vicinity. Odell, in its Site Permit Application, has committed to avoid impacts to native habitats whenever practicable. Avoidance of impacts to native habitats is likely to reduce the impact of the Odell project on birds in the areas.

The Odell site is about 10 miles northeast of the Lakefield site, where bat fatalities appear to be above the average number for agricultural lands in the Midwest. Due to their proximity and similar proportion of land cover classes, bat fatality rates at the Odell site may also be above average. Thus, the Odell project should explore ways to reduce potential fatalities of bats. Lakefield and Odell differ, however, in the amount of wetland, grassland, and protected lands, with the former having more. In addition, the northern edge of Lakefield is adjacent to Heron Lake, a significant wetland complex, while Odell lacks such a significant natural feature. At Lakefield a greater number of bat calls were recorded at this location compared to the southern end of the site (Rodriguez 2011). These differences may result in different numbers of bat fatalities, with Odell perhaps having lower rates than Lakefield.

3. TIER 3 – AVIAN FIELD STUDIES

3.1 Field Methods

AES designed the Tier 3 surveys to describe the distribution and abundance of species in and near the proposed Odell site in order to understand the relative risk of collision and habitat displacement among habitat types and to enable decisions to use or avoid different areas in the site. Since wind turbines will most likely be sited in cropland, the analysis focused on cropland habitats relative to other habitats in or near the site. Surveys conducted are listed in Table 5. Approximately 145 hours of surveys were conducted in 2013.

Table 5. Completed point count survey effort at the Odell site

Survey Type/Season	Survey Dates	# of Points	# of Counts per Point	Minutes per Count	Total Survey Hours	Survey Hours
Raptor and Large Bird/Early Spring Migration	April 3-6, 2013	30	1	60	30.0	7:00am to 7:30pm
Raptor and Large Bird/ Spring Migration	April 23-26, 2013	30	1	60	30.0	7:00am to 7:30pm
Passerine/Spring Migration	May 14 – 16, 2013	25	2	10	8.3	6:30am to 11:00am; 5:00pm to 8:45pm
Passerine/Breeding	June 25 – 27, 2013	25	2	10	8.3	5:00am to 10:00am
Passerine/Fall Migration	September 4, 5, 13, 2013	25	2	10	8.3	7:00am to 8:00pm
Raptor and Large Bird/Fall Migration	October 8 – 12, 2013	30	1	60	30.0	7:15am to 7:00pm
Raptor and Large Bird/Late Fall Migration	November 4-7, 2013	30	1	60	30.0	7:00am to 5:15pm
Total	-		-	-	**144.9**	-

3.1.1 Passerine Surveys

Point count surveys were designed to assess passerine species abundance and richness at the site during spring and fall migration as well as during the breeding season (Table 5). The passerine migration periods are designed to coincide with the beginning of the passage of long-distance migrants through the region, but short-distance migrants are also represented. The breeding survey was timed to occur at the peak nesting time for long-distance migrants, with short-distance migrants and resident birds present but at later stages of nesting.

Twenty-five points were located in cropland, grassland, and riparian/grassland habitats, and each was sampled twice each season (Table 6, Map Exhibits 1 & 2). There are two main riparian systems associated with the site. A judicial ditch runs along the site's northern border that has a series of grassland, shrub-scrub, and open water habitats. A series of WMAs and grasslands with RIM easements are associated with these natural habitats (Map Exhibit 1). The second riparian corridor is associated with the South Fork of the Watonwan River in the center of the site. The County Biological Survey has identified a prairie remnant along portions of the river. Some of the grasslands in this stretch were active pasture. A third minor riparian corridor associated with the North Fork of Elm Creek begins in the southern portion of the site. Points were located along these corridors. Grassland comprised a minimum of 30% of the habitat at all but one point. This point (212) was primarily cropland; however, due to its location along the South Fork of the Watonwan River, activity at this point was similar to that of the other riparian/grassland points. It is important to note that the 30% grassland composition at survey points is substantially greater than the grassland composition of the overall site (i.e. 3%). Using points in habitats that are limited in overall composition should enhance detection of grassland dependent species, but may be a conservative depiction of species occurring in the cropland habitats where project infrastructure is planned.

In the northeastern portion of the site there are three moderate-sized grasslands (90-140 acres). One of these grasslands (at point 207) is a mesic prairie. The other two grasslands are planted with native warm season grasses. Points were located along the public right-of-way near these grasslands. Cropland habitat dominated 40-60% of the habitat at these points. The remaining points were associated with cropland habitat. This habitat included grassed ditches, smaller grassed waterways, and farmsteads as well as their associated woodlots and shelterbelts. Point 221 in the southwest portion of the site has a larger percentage of grassland than other cropland points and is associated with the headwaters of the Cedar Run River; however, it was classified with the cropland points due to the preponderance of cropland habitat in the area and surveyed richness and abundance that were similar to the other cropland points.

Table 6. Number of passerine survey points by habitat and season (2013)

Habitat	Spring Migration (N)	Breeding (N)	Fall Migration (N)	Total (N)
Cropland	11	11	11	**33**
Grassland	3	3	3	**9**
Riparian/Grassland	11	11	11	**33**
Total	**25**	**25**	**25**	**75**

N=number of survey points; the number of 10-minute surveys was twice the number of points each season, or 150 point counts total.

Point counts lasted for ten minutes. Data recorded included: all birds seen and heard in an unlimited radius of the survey point, numbers of individuals, behavior, distance and direction from the observer, and weather conditions. The flight origin direction, flight direction from the survey point, and the flight height were also recorded. Estimates of flight heights were based on comparisons with known heights of existing objects (e.g., silos, power poles, towers, trees, buildings). Survey data were entered into an Access database for storage and analysis.

Survey times vary with season. In spring, passerine migration surveys begin near dawn and last until noon or until a noticeable drop in bird activity. In the breeding season, surveys are conducted from near dawn to approximately 10 a.m. During fall migration, surveys are conducted between dawn and dusk. Start locations are rotated and survey routes are varied to control for time-of-day bias. Point counts are not performed in steady rain, fog, or sustained winds over 25mph.

3.1.2 Raptor and Large Bird Surveys

Raptor and large bird migration point count surveys were conducted twice at 30 locations in both spring and fall 2013 (Table 5). These surveys were designed to assess species richness and abundance during the period when raptors and other large birds are migrating in significant numbers. Two 60-minute surveys were conducted at each point during both spring and fall migration for a total of four hours at each point. Sixty survey hours were conducted each season for a total of 120 hours over the entire year. The 30 survey points provided distant, unobstructed views that allowed visual observations at 2-3 miles distance (Map Exhibits 1 & 2). Point locations were distributed throughout the site.

The surveys were timed to coincide with the spring and fall migration of raptors and waterfowl. Surveys were conducted between dawn and dusk. Survey times varied between surveys. Data collection followed the passerine survey methods above, except that surveys were conducted for 60 minutes at each point and only raptor, waterfowl, waterbirds, and other large non-passerine birds were recorded during these surveys.

3.1.3 Bald Eagle Field Methods

Observations for eagles were made during and between all avian surveys, including passerine surveys and raptor and large bird surveys (Table 5). Spring and fall raptor and large bird migration surveys lasted 60 minutes each, while spring and fall passerine migration and breeding surveys lasted 10 minutes each. Thus, a total of 144.9 hours of eagle observation was included in these surveys. Any incidental observations made between surveys were also recorded. Recording of eagle observations was the same as for other species, except that the eagle flight path was also included. Surveys for Bald Eagle will continue through the winter and results will be reported in an addendum to this report.]

3.2 Data Analysis

Data analysis focused on differentiating among habitat types in terms of the richness and abundance of all native and sensitive bird species. Understanding the relative contribution of the wind energy project to avian fatality risk in different habitats facilitates the micrositing of turbines.

3.2.1 Identification of Sensitive Bird Species

Among the bird species observed at the Odell site, some have no legal protection under the MBTA (e.g., European Starling, House Sparrow), some are protected but in no danger of becoming rare (e.g., American Robin, American Crow), and some are both protected and have a high risk of becoming limited in distribution or abundance due to existing environmental factors (e.g., endangered or special concern species, declining species).

Some factors that place a species at risk include a limited distribution or small population size, habitat loss and fragmentation in the species' main range, and historical or ongoing habitat degradation. AES terms these high-risk birds as "sensitive species." Sensitive species may be most sensitive to impacts from wind energy development because other existing factors unrelated to wind energy development are already present. In our monitoring and analyses, AES biologists used native species as a broad indicator of wind facility impacts and sensitive species as a specific indicator of potential effects to already at-risk species. Sensitive species vary by ecological region based on the abundance and population trends of each species.

Sensitive species are similar to species of concern as defined in USFWS recommendations (2012a); however, the AES-defined sensitive species emphasize the conservation significance of a species in terms of potential risks. For example, Mourning Dove is protected by the MBTA and some state game laws, but its population is large and at low risk from wind energy development. Consequently, it is a species of concern to the USFWS, but not a sensitive species in our analysis.

Bird species at the Odell site were identified as sensitive if they met at least one of the following conditions:

- Endangered, threatened, candidate, or special concern on federal and state lists;
- Birds of Conservation Concern for Region 11, Prairie Potholes (USFWS 2008b);
- Minnesota SGCN species for the Coteau Moraines and Minnesota River Prairie subsections;
- Critically endangered, endangered, vulnerable, or near threatened in IUCN Red Book;
- Significantly declining in United States Geological Survey (USGS) Breeding Bird Survey (BBS) data in region 40 Black Prairie and USFWS region 3 (Sauer et al. 2008); or
- Known from scientific literature to require large habitat blocks (i.e., area-sensitive species).

BBS declining birds were derived from 1980-2007 bird trend data by ecoregion. The Odell site is located in the Black Prairie (BBS Region 40). All native birds in this region that were significantly declining and had a relative abundance of <5 birds per route were considered sensitive. A species seen <5 times on a 25-mile BBS route is an uncommon species; those with >5 per BBS route were common (e.g., Red-winged Blackbird, Cedar Waxwing, American Robin, Barn Swallow). The significance of a decline depended on the quality of the data and involved the number of routes on which a bird was observed, number of times it was observed, and number of years in which it was observed. BBS presents trend significance with a 3-tiered Regional Credibility Measure. For the BBS declining bird analysis, a trend was considered significant if the variance in the decline due to sampling error was less than the decline measured in the field. The least credible trends required a decline >5% annually to be significant; the moderately credible trends required a decline >3% to be considered significant; and the most credible trends were considered significant regardless of the level of decline. Additionally, we included native birds that were significantly declining in USFWS Region 3 but not significantly increasing in the Black Prairie and that had a relative abundance <5 birds per route in the Black Prairie.

3.2.2 Statistical Analysis

Data were analyzed to answer pertinent questions about wind turbine siting. Did the number of species (richness) or individual birds (abundance) vary by habitat; specifically, did cropland (where turbines will be located) have fewer birds and species than grassland or riparian habitats? Did sensitive bird species differ from the rest of the native bird species in their distribution and abundance, and what do the differences indicate about risk associated with the different habitats and settings?

Habitats were compared on the basis of mean number of species (richness) and mean number of individual birds (abundance). These were calculated separately for native and sensitive bird species as well as for each season and all seasons combined. Combining all seasons in a single analysis simplifies the comparison of habitats, even if seasonal differences in richness and abundance are present between certain habitats.

Avian count data often are non-normal in distribution and require non-parametric statistical tests. For this reason, a Shapiro-Wilk normality test was performed on all data sets to determine normality. For all seasons combined, the data were not normally distributed. Therefore a Kruskal-Wallis ranked ANOVA was employed to detect differences in richness and abundance among habitats and seasons. Pair-wise differences between habitats and seasons were identified using the Kolmogorov-Smirnov method.

Data collected during the spring and fall migration period for raptors, waterfowl, and waterbirds were analyzed by calculating and comparing the mean number of birds per hour.

3.3 Native and Sensitive Bird Species Results and Discussion

During 2013 surveys, AES observed 86 different species of birds in or near the Odell site (Appendix 2). Four of the observed species, European Starling, House Sparrow, Ring-necked Pheasant, and Rock Pigeon, were introduced from Europe and Asia. House Finch was introduced from the western United States. (See Appendix 2 for scientific names for bird species mentioned in this section). These first four introduced species are not protected by federal or state law. While the House Finch is protected by the MBTA, it and the other introduced species are not of conservation concern and will not be discussed further.

Of the 81 native bird species seen in surveys, 35 species (43%) were classified as sensitive by criteria described above (Appendix 2). These species have the greatest need for conservation action given their population status and trends as well as their habitat requirements. Sensitive species and the group of all native species are treated separately in the analysis below.

3.3.1 Passerine Native Bird Species Collision Risk

The key question related to collision risk at the Odell site is whether the richness and abundance of native bird species varies between habitats, and particularly how the natural habitats associated with the site's riparian corridors influence richness and abundance in comparison to cropland. Grassland habitats not closely associated with the riparian habitats were also surveyed.

The most frequently encountered birds (>1 individual/point count) in the Odell site were those that are common in agricultural regions: Red-winged Blackbird, Common Grackle, Cliff Swallow, Tree Swallow, American Robin, and American Goldfinch. These species comprised 52% of all individuals observed. Appendix 2 provides detailed data on the relative abundance of individual bird species by habitat.

Seasonal and Habitat Differences. Mean species richness and abundance varied significantly with season ($p < 0.05$). The breeding season exhibited the greatest mean species richness, although richness in this season did not differ significantly from the spring season ($p > 0.05$; Table 7). Richness in both the spring and breeding seasons were significantly higher than in the fall season. Mean abundance did not differ significantly between any two seasons, although as in the richness data the greatest abundance was seen in the breeding season and least in the fall season (Table 8).

Riparian/grassland habitat had significantly higher species richness than cropland habitat. Mean species richness in grassland was between that of riparian/grassland and cropland, but this difference was not significant in either direction (Table 7). Abundance also varied significantly with habitat. Riparian/grassland habitat exhibited the greatest mean abundance, over twice that of cropland habitat, and the difference was significant. Mean abundance in grassland habitat was between the two habitats, but this difference was not significant in either direction (Table 8). Grassland appears intermediate in the richness and abundance of native species compared to the richer riparian/grassland habitat and poorer cropland.

Table 7. Mean richness of native bird species per point by habitat and season

Survey Season	Cropland (11 pts)	Grassland (3 pts)	Riparian/Grassland (11 pts)	All Habitats (25 pts)
Spring Passerine	5.09	6.17	6.91	6.02[a]
Breeding Bird	5.18	6.50	7.27	6.26[a]
Fall Passerine	1.95	3.17	3.27	2.68
All Survey Seasons	**4.08[a]**	**5.28[ab]**	**5.82[b]**	**4.99**

For the "All Habitat" column, there is no statistical difference between seasons if the numbers have the same letter.
For the "All Survey Seasons" row, there is no statistical difference between habitats if the numbers have the same letter.

Table 8. Mean abundance of native birds per point by habitat and season

Survey Season	Cropland (11 pts)	Grassland (3 pts)	Riparian/Grassland (11 pts)	All Habitats (25 pts)
Spring Passerine	15.95	27.17	35.86	26.06[a]
Breeding Bird	19.32	38.67	39.09	30.34[a]
Fall Passerine	7.32	14.17	14.45	11.28[a]
All Survey Seasons	**14.20[a]**	**26.67[ab]**	**29.80[b]**	**22.56**

For the "All Habitat" column, there is no statistical difference between seasons if the numbers have the same letter.
For the "All Survey Seasons" row, there is no statistical difference between habitats if the numbers have the same letter.

Cropland Versus Other Habitats. The lower species richness and abundance in cropland was probably due to the simpler vegetation structure compared to riparian/grassland habitat. Cropland vegetation consists of one species of crop plant growing at a uniform density and height. Other habitats in cropland are limited to small patches of generally poor quality, including grass ditches, scattered tree lines, and small woodlots associated with farmsteads or patches of shrubland. The riparian/grassland points had more structurally complex habitats, with multiple layers of vegetation and patches of different vegetation heights and plant stem diameters and densities. These habitats included nearby flowing water or open water wetlands, grasslands, small patches of shrub-scrub, or young (and infrequently mature) trees—which together provide habitat for a wider variety of species.

The most frequently encountered native bird species observed in Odell's croplands were Red-winged Blackbird, Common Grackle, Brown-headed Cowbird, Killdeer, American Goldfinch, and American Robin. These species comprised 56% of all individuals observed in the site's cropland. None of these species is classified as sensitive by AES. Most of these species form large flocks during spring and fall migration and/or have high nesting densities, resulting in large numbers of individuals in cropland. Less frequently encountered birds in cropland included Tree Swallow, Canada Goose, Mourning Dove, Vesper Sparrow, and Barn Swallow. Of these species, only Vesper Sparrow is classified as sensitive by AES criteria (see section 3.3.2 below).

Fatality Risk. Collision risk may largely be due to a combination of bird species' behavior and abundance in a specific habitat. The behavior of some birds which exposes them to greater risk of collision can be inferred from their higher fatality rates at wind energy facilities. In particular, birds that have flight behaviors that place them in the RSA while foraging, defending territory, or performing courtship displays are particularly at risk (Smallwood et al. 2009). Horned Lark, a species observed in 39% of our point counts, is one such species reported to have higher fatality rates than expected at some wind energy facilities (e.g., Johnson et al.

2000a, Johnson et al. 2000b, CEIWEP 2007, Stantec Consulting Group 2011). This species engages in aerial displays that may bring them into the RSA.

Impacts to passerines are likely to be greatest during peak migration in spring and fall, and to occur in lesser numbers during the breeding season and in winter. In order to indicate the level of annual fatalities at Odell, the fatality rates at several wind energy facilities in southern Minnesota and northern Iowa were examined (Table 9, Map Exhibit 3). Like Odell, these sites are located in extensive cropland, and therefore the range in their fatality rates is likely to be similar to the potential fatality rate at the Odell site. Should fatalities at the Odell site exceed this range, Odell will consult with wildlife agencies to discuss whether further study is warranted.

Table 9. Bird fatality rates at select wind energy facilities in southern Minnesota and northern Iowa. The facilities were chosen for their similarity to the Odell site.

Wind Energy Facility	County, State	Installed MW	Fatality Rate (#/MW/Yr)	Reference
Big Blue[a]	Faribault, MN	36	0.3	Big Blue Wind Farm 2013
Top of Iowa[b]	Worth, IA	80	0.6	Jain 2005
Elm Creek[b]	Jackson, MN	99	1.6	Derby et al. 2010
Lakefield[b c]	Jackson, MN	205.5	2.2/2.8	Westwood Professional Services 2013
Buffalo Ridge[b]	Lincoln, MN	132.25	3.3	Johnson et al. 2000
Barton[b]	Worth, IA	160	5.5	Derby et al. 2011

[a] Number of fatalities detected per number of turbines searched, uncorrected for searcher efficiency and carcass removal

[b] Using methods from Schoenfeld 2004

[c] Using methods from Huso et al. 2012

3.3.2 Sensitive Bird Species Collision Risk

Sensitive bird species are used to indicate habitats that warrant special attention when siting wind turbines. Of the 80 native bird species seen in AES surveys, 33 species (41%) were classified by AES as sensitive species. These species already experience problems unrelated to wind energy development, which raises concern for their conservation.

Cropland Versus Other Habitats. There were no significant differences in richness or abundance of sensitive species between habitats (Tables 10 & 11). Cropland supported the fewest sensitive species and individuals of sensitive species while riparian/grassland habitat supported the greatest.

Approximately 82% of all cropland points contained at least one of the 14 total sensitive species observed at cropland points. One species, Vesper Sparrow, was infrequently encountered in cropland (0.55 individuals/point count). Two additional species, Bobolink and Upland Sandpiper, were rarely encountered in cropland (0.17 and 0.14 individuals/point count, respectively). These three species are discussed below. The remaining 11 sensitive species were represented by very few individuals in cropland (<0.10 individuals/point count) and since the project is primarily proposed in cropland habitats these species are not considered further.

Table 10. Mean richness of sensitive bird species per point by habitat and season

Survey Season	Cropland (11 pts)	Grassland (3 pts)	Riparian/Grassland (11 pts)	All Habitats (25 pts)
Spring Passerine	0.59	0.67	1.05	0.8[ab]
Breeding Bird	1.09	1.00	1.45	1.24[a]
Fall Passerine	0.14	0.67	0.73	0.46[b]
All Survey Seasons	**0.61[a]**	**0.78[a]**	**1.08[a]**	**0.83**

For the "All Habitat" column, there is no statistical difference between seasons if the numbers have the same letter.
For the "All Survey Seasons" row, there is no statistical difference between habitats if the numbers have the same letter.

Table 11. Mean abundance of sensitive birds per point by habitat and season

Survey Season	Cropland (11 pts)	Grassland (3 pts)	Riparian/Grassland (11 pts)	All Habitats (25 pts)
Spring Passerine	0.91	1.17	2.23	1.52[a]
Breeding Bird	2.59	2.83	3.23	2.90[a]
Fall Passerine	0.23	1.17	1.23	0.78[a]
All Survey Seasons	**1.24[a]**	**1.72[a]**	**2.23[a]**	**1.73**

For the "All Habitat" column, there is no statistical difference between seasons if the numbers have the same letter.
For the "All Survey Seasons" row, there is no statistical difference between habitats if the numbers have the same letter.

Vesper Sparrow. Vesper Sparrow was observed at eight of the eleven cropland points and at one riparian/grassland point, resulting in observations of 0.25 individuals/point count overall. Vesper Sparrow is not protected by federal or state endangered and threatened species law, but it is considered an AES sensitive species because of its tendency to require large blocks of grassland and cropland habitat. The bird was present both along grassed field edges and divides and foraging in the crop fields.

Vesper Sparrow appears to have a higher than expected fatality rate at some wind farms, perhaps due to display behavior during the breeding season (Erickson et al. 2001). However, no fatalities of this species were observed at the Lakefield Wind Project (Westwood Professional Services 2013), despite pre-construction presence of the species there (Westwood Professional Services 2010). It is to be expected, therefore, that this species has a low risk of collision at the Odell site.

Upland Sandpiper. A total of eleven Upland Sandpipers were observed at four of the eleven cropland points and at one grassland point, resulting in observations of 0.07 individuals/point count overall. Upland Sandpiper is not protected by federal or state endangered species law, but it is an SGCN species in Minnesota and also an AES sensitive species. Upland Sandpiper has experienced long-term population declines throughout its breeding range in North America (Sauer et al. 2008). Additionally, the bird generally requires a large amount of prairie or other good quality grassland habitat to persist (Ribic et al. 2009).

The aerial flight behavior of this species may put it at a greater risk of fatality from wind turbines than other grassland species that fly lower to the ground (Barrios and Rodriguez 2004, de Lucas et al. 2008, Smallwood et al. 2009). However, no fatalities of this species were observed at the nearby Lakefield Wind Project (Westwood Professional Services 2013), despite pre-construction presence of the species there (Westwood Professional Services 2010). It is thus probable that this species has a low risk of collision at the Odell site.

State Endangered, Threatened and Special Concern Species. Three state special concern species (Franklin's Gull, American White Pelican, Trumpeter Swan) were observed at the site during the spring surveys. None is protected by the federal ESA.

Trumpeter Swan. Trumpeter Swan is currently listed as a special concern species by the MNDNR. Trumpeter Swan was downgraded from threatened status in August 2013 due to the success of restoration efforts which exceeded population goals. Trumpeter Swans were observed during the spring raptor and large bird surveys and the spring passerine migration survey. During the spring raptor and large bird surveys a pair was observed flying at 5m in elevation north of point 113 along the site's western boundary. During the spring passerine survey a pair was observed on the open water wetland at point 216, which is just south of the previous observation. These points are located near Fish Lake and Thompson State Wildlife Refuge.

During the breeding season, Trumpeter Swans typically select small ponds, lakes, or bays within larger lakes with extensive beds of cattails, bulrush, sedges, and/or horsetail. Coffin and Pfannmuller (1988) state that "Muskrat houses and beaver lodges are frequently used for nesting platforms." They are known to protect large territories during the nesting period and are intolerant of crowding by other species. They have been known to kill perceived competitors such as pelicans while protecting breeding territories. Trumpeter Swan nesting territories range from 6 to 150 acres in size. They utilize large, shallow wetlands 1-3 feet deep with a diverse mix of emergent vegetation and open water. Such locations support a rich variety of submergent (underwater) plants used for food, such as sago pondweed and water milfoil.

While Trumpeter Swans may be present in the open water wetlands surrounding the site, they are unlikely to be present in the site's cropland. Open water wetlands within the site are found at two locations: near point 216 and 113 on the site's western boundary, and near point 225 on the site's southern boundary. Trumpeter Swans may cross the site between wetlands, but waterfowl are generally capable of seeing and avoiding turbines (Madsen and Boertmann 2008, AES staff observations). No Trumpeter Swans or other waterfowl fatalities were found at the nearby Lakefield Wind Project in 2012 fatality surveys (Westwood Professional Services 2013). Due to these factors, risk of fatality to Trumpeter Swan at the site is likely to be low.

Franklin's Gull. Franklin's Gull is also listed as a special concern species by the State of Minnesota. It was observed in large numbers during the second site visit of the spring raptor and large bird survey. During this visit 2,833 individual Franklin's Gulls were observed at 12 different points (47.2 gulls/hour obs.). Additionally 1,271 unidentified gulls were observed that were likely Franklin's Gulls and/or Ring-billed Gulls. These gulls were observed in cropland habitats flying at heights from 5 to 60m in elevation. Of all individuals observed, the mean flight height was 20m and 81% were flying below the RSA.

This species is known to nest within large wetland complexes or lakes within the Prairie Parkland Province. Franklin's Gull is a colonial nesting species that utilizes extensive prairie marshes for breeding, where it nests over water on floating vegetation or muskrat houses. Franklin's Gull colonies are known to switch locations between years in response to changing water levels, and water level disturbances are one of the largest threats to this species. It is this sensitivity to water level changes and colony nesting behavior that resulted in the designation of this species as special concern. A large colony of Franklin's Gulls occurs at Heron Lake in Jackson County, approximately 12 miles west of the site, just 4 miles northwest of the Lakefield Wind Project. Colony locations for this species are generally known, and there are no other known locations near the site (MNDNR 2013a).

The individuals observed at the site were engaged in migration and did not appear to exhibit breeding behavior. There is a risk of fatality to this species during the spring migration, but no Franklin's Gull fatalities were observed at the Lakefield Wind Project in 2012 (Westwood Professional Services 2013), and fatality rates for waterfowl and waterbirds are typically low (NRCNA 2007, Jain 2005). For these reasons the risk of Franklin's Gull collisions at the site is considered low.

American White Pelican. American White Pelicans were observed on two occasions during the second raptor and large bird spring survey. Two flocks were observed, one containing 16 individuals and the other 40 individuals. Overall 0.93 individuals per hour were observed during the spring raptor migration. None were observed during passerine surveys. The two flocks observed were flying above the RSA at 200m and 300m, respectively.

The MNDNR currently lists American White Pelican as special concern and several studies have shown that abundance of this species has increased across its range over the past 20-25 years (Wires et al. 2001; Evans and Knopf 1993). This species is a colonial nesting bird that selects large, shallow bodies of water that are rich in fish, upon which it preys. Usually the nesting site is a flat bare island that is isolated from human disturbance (Coffin and Pfannmueller, 1988). There is a small, recently established nesting colony at Big Twin Lake in Martin County (Wires et al. 2005) approximately 3 miles southeast of the site.

Fatality risk for this species is predicted to be low. No fatalities of this species have been observed at the nearby Lakefield Wind Project (Westwood Professional Services 2013), and waterfowl and waterbirds are generally able to see and avoid turbines (Pendelbury 2006, Madsen and Boertmann 2008, AES staff observations).

Bald Eagle. Two Bald Eagles were observed during the 60 hours of spring raptor and large bird surveys, and one was observed during the 60 hours of fall raptor and large bird surveys. An unidentified raptor that may have been an eagle was also seen in the spring surveys. One observation was outside the site, and the other two were over 800m from a survey point. The unidentified raptor was within 800m of the survey point. No Bald Eagles were observed during the passerine surveys, the April site visit, or the September Bald Eagle specific surveys. All Bald Eagle specific surveys use the same point locations as the raptor and large bird surveys, are of identical duration, and record the same parameters. During the April site visit, four Bald Eagles were observed in the vicinity of Fish Lake, which is west of the site. None of the Bald Eagle observations discussed in this report qualify for use in the USFWS' quantitative risk analysis for eagles ("Eagle Risk Model"), pursuant to the USFWS Eagle Conservation Plan guidance (USFWS 2013). Bald Eagles may occasionally fly over the site, but Bald Eagle activity at the site is likely to be minimal based on the 145 hours of surveys from April through November 2013. Habitat at the site is generally of poor quality for nesting and foraging due to the lack of mature trees and open water. Eagles associated with the Des Moines River nest are likely to forage along the Des Moines River and neighboring bodies of water, and are thus less likely to forage at the site. It is possible that Bald Eagle activity at the site will increase as the regional Bald Eagle population increases; however, it is unlikely that Bald Eagles would ever nest in the site itself due to lack of appropriate nesting areas. It is possible that an eagle passing through the area may forage along the site's riparian corridors or on a road-killed carcass, but the site is not within the typical home range distance of high quality Bald Eagle habitat (Buehler 2000), where most foraging is likely to occur. As discussed above, the nearest Bald Eagle nest is 3.5 miles from the site.

Although the surveys conducted to date indicate limited eagle presence and habitat at the site, the project is a low risk to Bald Eagles and fatalities from the project are not expected. Bald Eagle specific surveys will be conducted again in December 2013, February 2014, and March 2014. Results from the December, February, and March Bald Eagle surveys will be included in a supplement to this report.

SGCN Species. Sixteen SGCN bird species without state or federal status were observed at the site during the 2013 surveys. While these species are not protected under federal or state endangered species law, they are considered vulnerable, declining, or rare, and potential impacts to these species should be considered. Of the SGCN species without state status, none were commonly observed at the site. Bobolink was infrequently encountered (0.26 individuals/point count), as was Northern Harrier (0.59 individuals/hour). These two species are discussed in more detail below. One other species, Marsh Wren, was rare at the site (0.19 individuals/point count) but absent in cropland habitat. Upland Sandpiper was rarely observed in cropland habitat (0.14 individuals/point count) and has been discussed previously. All other SGCN species were either absent from or very rarely observed in cropland habitat (<0.10 individuals/point count).

Bobolink. A total of twelve Bobolinks were observed during spring and fall passerine migration, and all were observed in either grassland or riparian/grassland habitats. During the breeding season, a total of 27 Bobolinks were observed, with eleven in cropland (0.50 individuals/point count), six in grassland (1.00 individuals/point count), and ten individuals in riparian/grassland (0.45 individuals/point count). Although total Bobolink abundance was greatest in cropland during the breeding season, the greatest relative abundance was seen in grassland. Bobolinks observed in cropland were probably transients from nearby grassland patches, as the territory size of Bobolinks can range up to a radius of 250m (Fletcher and Koford 2003). Bobolink nesting density is greatest where it can hide its nest in dense, low vegetation, such as alfalfa, fallow field, and hay meadow (Brewer et al. 1991). The species is sensitive to habitat fragmentation (Johnson and Igl 2001) and has been declining in the eastern U.S. for decades (Sauer et al. 2008). Bobolink fatalities have occurred at some wind farms, including Buffalo Ridge in southwestern Minnesota, where turbines were placed in grassland habitat (Johnson et al. 2000b). No Bobolink fatalities were observed at the Lakefield Wind Project where turbines were typically placed in cropland habitat (Westwood Professional Services 2013). It is expected that fatality and habitat displacement in this species may not occur because Odell will be siting turbines in cropland away from permanent grassland and riparian habitat where most observations of this species are made.

Northern Harrier. Northern Harrier was observed at a rate of 0.63 individuals/hour during the spring raptor and large bird surveys. It was the most frequently observed raptor at the site during this period, comprising 56% of raptor observations. It was not sighted again until the breeding passerine survey, during which a total of two birds were observed (0.24 individuals/hour). During the fall raptor and large bird surveys, it was less common and observed at a rate of 0.12 individuals/hour. All observations occurred in cropland habitat.

These raptors hunt small mammals (e.g., meadow voles, white-footed mice) in open landscapes and are often found in fallow fields, meadows, inland and coastal marshes, cultivated and uncultivated fields, sedge meadows, and prairies. Northern Harriers prefer to nest in wet meadows, but will utilize grasslands and uncultivated agricultural fields. Observed foraging flight heights of Northern Harriers at the Odell site were at or below 20m for 94% of observed flights. Two observed flights during the spring raptor and large bird surveys were at 40m, and a third during the breeding passerine survey was at 200m. Additionally, they appear to actively avoid turbines (Smallwood et al. 2009). Raptors have exhibited low fatality rates at recently constructed facilities (CEIWEP 2007, Erickson et al. 2005), and thus fatality risk to this species from direct collision is low..

In summary, sensitive bird species were infrequently encountered at the Odell site. They were most commonly observed in riparian/grassland habitat and least commonly in cropland habitat, although this trend was not significant. Of the sensitive species identified at the site, only Vesper Sparrow was commonly found in cropland. State special concern species included Trumpeter Swan, Franklin's Gull, and American White Pelican, all of which have exhibited generally low numbers of fatalities at wind facilities and are likewise predicted to have a low numbers of fatalitiesat this site. Bald Eagle is likely to have a low risk of fatality at the site due to its minimal presence; results of additional surveys through early 2014 will be presented in an addendum to this report. The natural habitats concentrated in the site's riparian corridors tended to be the most important locations for sensitive bird species. Placing turbines in cropland at a distance from riparian corridors, as described in Odell's Site Permit Application, is expected to reduce the collision and habitat displacement risk to sensitive bird species.

3.3.3 Raptor Collision Risk

There are no known raptor migration routes near the site or topographic features that are likely to concentrate raptor migration. Compared to other known raptor migration sites, observed raptor passage rates were very low during all survey periods (Table 12). On average, 0.8 individuals/hour passed surveyors from spring through fall, with the largest rate observed during the spring raptor and large bird surveys (1.1 individuals/hour).

Northern Harrier comprised 41% of observations, Red-tailed Hawk 28%, and Turkey Vulture another 16%. The remaining 15% of observations consisted of American Kestrel, Bald Eagle, Rough-legged Hawk, and unidentified hawks and raptors. Bald Eagle is protected under the BGEPA; see section 5.1.13 below. Northern Harrier is a SGCN species in the Minnesota River Prairie region (MNDNR 2006); potential impacts to this species are discussed in 3.3.2 ab

Table 12. Raptor observations by survey season

	Spring Raptor & Large Bird	Spring Passerine	Breeding Bird	Fall Passerine	Fall Raptor & Large Bird	All Surveys
Number of Species Observed	4	3	2	1	6	6
Individual Raptors	64	4	3	3	40	114
Hours of Observation	60	8.3	8.3	8.3	60	144.9
Individuals/ Hour	1.1	0.5	0.4	0.4	0.7	0.8

In contrast, major migration areas such as the Duluth Hawk Watch near Lake Superior may see several thousand birds per day, with an average passage rate of 135 individuals/hour during fall migration (over 20 years of data; Ritter et al. 2012). Hawk migration through southwestern Minnesota is generally in a broad front due to the lack of geographic constraints to migration. There are a few migration routes along river corridors, but the nearest hawk watch sites only collect fall data because the spring migration is not concentrated enough to warrant data collection. The closest hawk watch sites are at Council Bluffs, Iowa on the Missouri River (10 years of data, 190 miles southwest of the site) and Mankato, Minnesota on the Minnesota River (3 years of data, 45 miles northeast of the site). These sites have generally low passage rates of 25.0 and 41.7 individuals/hour, respectively (Orsag et al. 2012; Heins 2012). Those passage rates are approximately 25-40 times greater than that observed at the Odell site during the spring raptor and large bird surveys.

Besides their local abundance, the flight behavior of raptors is helpful in discussing collision risk. Raptors that often use powered flight in migration—including American Kestrel, Cooper's Hawk, Northern Harrier, and Sharp-shinned Hawk—may differ in level of risk than consistently soaring raptors such as buteos, eagles, and vultures. Powered-flight raptors may be more maneuverable when not soaring, whereas soaring raptors that usually depend on updrafts of warmed air ("thermals") and on offshore winds may be less able to avoid turbines. Across all survey periods, powered-flight raptors comprised 49% of observations and soaring raptors 51%; nearly all these soaring raptors were Turkey Vultures or Red-tailed Hawks. Outside the peak migration period, however, some powered-flight raptors do experience high fatality rates (e.g., Smallwood et al. 2009).

In summary, there are no known raptor migration routes near the site and no topographic features that would concentrate raptor migratory activity. Data discussed above indicate that raptors observed at the site during spring and fall migration occurred at much lower numbers than those observed at major migration sites. Soaring raptors, which might have a greater collision risk during migration than powered-flight raptors, were primarily of two common species, Turkey Vulture and Red-tailed Hawk. Due to the generally low raptor use of the site, it is unlikely that the Odell site is part of a raptor migration route. The overall risk to raptors at the Odell site is therefore expected to be low.

3.3.4 Waterfowl and Waterbird Collision Risk

Southwestern Minnesota experiences a significant dabbling duck (e.g. Northern Shoveler, Mallard) migration (Lincoln et al. 1998). Diving ducks (e.g. Lesser Scaup, Bufflehead) also migrate through the region. Although the site itself has few areas of open water, it is surrounded by wetlands and open water habitats. Many of these are protected as WMAs (Waterfowl Production Areas) by the MNDNR and USFWS, respectively (Map Exhibit 1). Wetlands are particularly concentrated on the northern border of the site, along the Des Moines River west of the site, and along a drainage corridor east of the site (Map Exhibit 2).

Waterfowl and waterbird activity was high during the April raptor and large bird surveys (Table 13). On average 307.3 individual waterfowl and waterbirds were observed per hour in April. During the spring passerine migration survey, waterfowl and waterbird activity was much lower, with a rate of 22.3 individuals/hour. Waterfowl and waterbird activity was found to be relatively low during the passerine breeding and fall migration surveys, with rates of 10.1 and 7.1 individuals/hour, respectively. Activity during the fall raptor and large bird surveys was well below that seen during the spring raptor and large bird surveys, with a rate of 11.4 individuals/hour (all but one of these individuals were Canada Geese). Waterfowl activity was concentrated in the northeastern portion of the site where large flocks of geese and ducks flew between wetlands and foraged in agricultural fields (Map Exhibit 4).

Table 13. Waterfowl and waterbird observations by survey season

	Spring Raptor & Large Bird	Spring Passerine	Breeding Bird	Fall Passerine	Fall Raptor & Large Bird	All Surveys
Number of Species Observed	13	11	6	5	2	17
Individual Waterfowl and Waterbirds	18,435	185	84	59	681	19,444
Hours of Observation	60	8.3	8.3	8.3	60	144.9
Waterfowl and Waterbirds/ Hour	307.3	22.3	10.1	7.1	11.4	134.2

Particularly during the spring raptor and large bird surveys, large numbers of ducks and geese were observed flying together, often at significant distances from the survey point. It was not possible to identify and count individual species in these flocks; however, most of the birds were probably Canada Geese, Mallards, and Northern Shovelers, based on observations at the site and on incidental observations at wetlands around the site. These birds were recorded as unidentified waterfowl or unidentified ducks. Across all survey periods, unidentified waterfowl and unidentified ducks comprised 35% and 12%, respectively, of waterfowl and waterbird observations. Large flocks of mixed gulls, likely Ring-billed and Franklin's Gulls, were also observed during spring and fall raptor and large bird surveys, and comprised 7% of waterfowl and waterbird observations.

Of the identified waterfowl and waterbirds, Canada Goose was the most common species, accounting for 56% of all observations. During the second raptor and large bird spring survey (April 23-26), Franklin's Gulls were migrating through the site in large numbers, accounting for 31% of all identified waterfowl and waterbirds (see discussion above). The remaining 13% of observations consisted of the following species (in order of decreasing total abundance): Mallard, Double-crested Cormorant, Ring-billed Gull, American White Pelican, Snow Goose, Greater White-fronted Goose, Northern Shoveler, American Coot, Blue-winged Teal, Wood Duck, Trumpeter Swan, Pied-billed Grebe, Great Blue Heron, Northern Pintail, and Green Heron. Observations away from the wetlands, primarily in cropland, documented primarily Canada Goose, Franklin's Gull, and Ring-billed Gull.

Few waterfowl and waterbirds have been killed at wind energy facilities (NRCNA 2007). For example, at the Top of Iowa site large numbers of Canada Geese were present, but no Canada Goose fatalities were observed (Jain 2005). Likewise no waterfowl or waterbird fatalities were observed at the nearby Lakefield Wind Project (Westwood Professional Services 2013). This may be due to waterfowl avoidance behavior or to effective siting of turbines in order to avoid waterfowl and waterbird concentration areas. Typical migratory flights of waterfowl are much higher than the RSA of wind turbines (Kerlinger 1995), and many waterbirds appear exceptionally adept at avoiding wind turbines. This avoidance behavior in flight has been observed at wind energy projects by some researchers (e.g., Madsen and Boertmann 2008) as well as AES staff. Migrating waterfowl and waterbirds may however be vulnerable when: a) ascending or descending from water bodies, b) feeding in and near wind energy projects, c) flying in inclement weather, d) flying in early morning and late evening if visibility is poor, or e) turbines are near or between roosting and feeding sites.

In summary, high numbers of waterfowl and waterbirds were observed at the site during spring migration. The remainder of surveys documented waterfowl and waterbird activity as moderate to low. When the data for all seasons were combined, Canada Goose was the most common species, followed by Franklin's Gull. Mallard, Double-crested Cormorant, and Ring-billed Gull were also observed in good abundance. Waterfowl activity was concentrated in and near protected wetlands in the northwestern portion of the site. Because data and field observations suggest that waterfowl and waterbirds are able to see and avoid turbines, the risk to these species is expected to be low in the majority of the site. The greatest risks will occur in the northwestern portion of the site near protected wetlands and during inclement weather when visibility is poor.

3.3.5 Habitat Displacement Risk

Grassland Birds. Habitat displacement—i.e., breeding at a reduced density due to environmental factors—has been documented in birds (Mabey and Paul 2007; Committee on Environmental Impacts of Wind-Energy Projects (CEIWEP) 2007). Bird species most at risk of habitat displacement are sensitive to the size of habitat patches or to intrusions into their habitat by human activities and infrastructure. These are generally called area-sensitive species (Ribic et al. 2009).

Area sensitivity is a complicated phenomenon. In addition to the size of grassland patches, the landscape pattern of habitats around patches—including the presence of trees and tall objects—is important (Ribic et al. 2009). Species that are area-sensitive are thought to also be sensitive to the proximity of non-grassland habitat such as forest, although this sensitivity varies geographically (Ribic et al. 2009).

Species known to be sensitive to both habitat displacement and area effects are included in the AES sensitive species list. Prior studies to detect habitat effects caused by wind turbines have focused on grassland, steppe, and shrubland birds since these have been shown in other studies to be more sensitive to habitat displacement than forest or wetland birds and also appear to be experiencing greater declines in North America than forest birds (Leddy et al. 1999, Herkert et al. 2003, CEIWEP 2007, Mabey and Paul 2007). Possible mechanisms for avoidance behavior include the perception by grassland birds that turbines are vertical tree-like structures to be avoided in addition to visual disturbance by moving blades. Others have documented displacement of grassland birds due to traffic noise (e.g., Forman et al. 2002), but it is not known if noise levels from wind turbines is perceived by birds to be similar to noise levels from traffic.

Birds present at the site and typically considered area-sensitive grassland species include Northern Harrier, Upland Sandpiper, Horned Lark, Savannah Sparrow, Vesper Sparrow, Grasshopper Sparrow, Bobolink, and Western Meadowlark. Bobolink and Savannah Sparrow have been shown to experience displacement in grassland and similar habitat when turbines are in the habitat or nearby. One study in Minnesota found that the nesting densities of these two species, together with Red-winged Blackbird and Sedge Wren, were four times lower within 80m of wind turbines than when 180m from turbines (Leddy et al. 1999). Johnson et al. (2000a) also documented reduced grassland bird densities within 100m of turbines at the same southwest Minnesota wind energy facility (Buffalo Ridge) as did Leddy et al. (1999). It has been pointed out that habitat displacement studies are few and sometimes report contradictory or inconclusive results (Mabey and Paul 2007, CEIWEP 2007).

Habituation is the tendency of individuals to increase their use of areas where a human intrusion into the habitat had previously reduced their density. The Buffalo Ridge study (Johnson et al. 2000a), where habitat displacement was demonstrated for some species, did not directly assess habituation, and habituation may have complicated the results. This study used a BACI experimental design (Before/After Control/Impact), although time since construction may have influenced densities of the grassland bird species that exhibited habitat displacement. During this 4-year (1996-1999) study some randomized sampling points fell within the 73-turbine Phase 1 at 2-6 years after construction, some points in the 73-turbine Phase 2 at 1-2 years after construction, and some in the 138-turbine Phase 3 at 1 year after construction. The sampling points span a range of time since construction, from 1-6 years, and full habituation to the turbines may not have occurred if it does occur at all in these species. If habituation to wind turbines does occur in these species, then sampling points placed in locations where turbines were recently erected at Buffalo Ridge may have had a lower density in the study than locations where turbines were built several years before sampling occurred.

Grassland habitat in and near the Odell site is concentrated along the site's riparian corridors, the judicial ditch north of the site, South Fork Watonwan River in the center of the site, North Fork Elm Creek in the southern part of the site, and Cedar Run in the southeastern corner of the site. There are also three moderate-sized grasslands (90-140acres) located in or near the northeastern portion of the site.

As described above, area-sensitive grassland birds tend not to use small habitat patches (Ribic et al. 2009). Of the eight area-sensitive grassland birds at the site, Horned Lark, Vesper Sparrow, Upland Sandpiper, and Northern Harrier were consistently found to be area-sensitive, while Bobolink, Western Meadowlark, Savannah Sparrow, and Grasshopper Sparrow were area sensitive in some studies and not others (Warner 1994, Herkert 1995, Johnson and Igl 2001, Ribic et al. 2009). Several studies have demonstrated that forest edges and even solitary trees can affect the density of grassland birds (e.g., Renfrew and Ribic 2008). In the first of these studies, Johnson and Temple (1990) documented that several species had lower nesting density and higher rates of predation near forests. Thus, the grassland birds at the Odell site that may exhibit displacement behavior in the presence of wind turbines may be absent from the smaller grasslands with greater tree encroachment. These species are more likely to be present in the larger grasslands at the site.

In summary, the more or less permanent grasslands and pastures in the Odell site are possibly important to already at-risk grassland bird species. Wind development may reduce breeding densities of these species through habitat displacement. Large and clustered grassland habitats have been avoided by Odell when siting its turbines.

Waterfowl and Waterbirds in Agricultural Foraging Habitat. Waterfowl (primarily Canada Goose) use agricultural fields during migration to put on the weight necessary to complete their journey (Petrie and Wilcox 2003). Because most waterfowl avoid trees and other tall objects, wind turbines potentially may cause swans, waterfowl, and waterbirds to not use some areas where they have foraged in the past. Displacement from foraging habitat was observed in Pink-footed Geese at a wind energy facility (Larsen and Madsen 2000). In subsequent years the geese began using portions of the wind energy project, reducing the original displacement distance by 50-60% (Madsen and Boertmann 2008). This suggests that habituation to turbines is indeed possible in waterfowl.

Most waterfowl foraging is expected to occur near the protected open water wetlands along the site's northern and western boundaries where the greatest waterfowl activity was observed during spring migration. However, habituation to turbines may occur, reducing the impact of wind development over time. In addition, thousands of acres of cropland remain outside the site, providing further agricultural foraging opportunities in the vicinity.

4. TIER 3 – BAT FIELD STUDIES

4.1 Acoustic Monitoring Methods

Bat activity data were collected using full spectrum acoustic monitoring and data logging platforms (Song Meter SM2Bat+, Wildlife Acoustics, Inc., Concord, MA, USA). The Song Meter SM2Bat+ records full spectrum bat echolocation calls over time to compact flash cards (CF cards). One detector with two microphones was deployed on each of three met towers for the 2013 season. One SMX-US microphone was mounted at 3m and a second microphone was mounted at 55m above ground level (see Appendix 3 for photos). While equipment at the first tower was deployed on April 29, equipment at the remaining two towers was not deployed until June 5 due to logistical constraints.

Three met towers were located in or near the proposed site in the agricultural landscape (Table 14, Map Exhibit 1 & 2). Met Tower 1 (Tower 1) is located on the northwest corner of 400th Street and 550th Avenue in an extensive cornfield just outside the site. Met Tower 2 (Tower 2) is located on the southwest corner of 420th Street and 590th Avenue, in a small CRP grassland surrounded by crop fields. Met Tower 3 (Tower 3) is located in the northwest corner of 430th Street and 550th Avenue, just south of Tower 1, in a cornfield.

Each microphone was positioned at a slight downward angle to reduce condensation and/or water damage to the microphone. All microphones were positioned opposite the prevailing wind direction, and connected with an extension cable to the platform/recording system, which was housed at ground level in a weatherproof box. The detectors were powered by a 12V battery and recharged daily by a 10W solar panel attached to the tower at ground level. The detectors were programmed to record calls from sunset to sunrise each day.

Table 14. Bat acoustic monitoring set-up and dates

Tower	Sensor Elevation	Deployment Date	Removal Date
Tower 1	3 meters	April 29, 2013	November 15, 2013
Tower 1	55 meters	April 29, 2013	November 15, 2013
Tower 2	3 meters	June 5, 2013	November 15, 2013
Tower 2	55 meters	June 5, 2013	November 15, 2013
Tower 3	3 meters	June 5, 2013	November 15, 2013
Tower 3	55 meters	June 5, 2013	November 15, 2013

Bat acoustic monitoring data were downloaded as necessary to ensure no loss of data. Each data file was downloaded and processed using computer software (*Kaleidoscope*, Wildlife Acoustics) and spot-checked manually to ensure accuracy. Identification of species uncommonly encountered (e.g., *Myotis*) were confirmed by visually inspecting the call file. Once the data were downloaded, they were transferred for later analysis to a folder with the site name, tower number, monitoring height, and date of download. Each data card was given a specific number which correlated to the monitoring location.

Data from detectors were downloaded and processed throughout the sampling period. Prior to summary and analysis, all irrelevant noise was eliminated from the data. The clean bat calls were placed in previously labeled bat call files with monitoring location, monitoring height, and date of download. AES defined a bat call as a series of ≥2 echolocation calls with duration of ≥10 ms (Hayes 1997, Thomas 1988, Weller 2007). Each call file was visually inspected to determine whether it was a bat pass. Bat passes were then identified to species if possible, comparing minimum frequency and call shape to a library of vocal signatures (O'Farrell et al. 1999). *Myotis* were identified to genus level due to the inherent difficulty in distinguishing *Myotis* species. Unidentifiable calls were labeled as being produced by high (≥35 kHz) or low (<35 kHz) frequency echolocating bats, based on their minimum frequency (see Appendix 4 for voucher calls).

4.2 Acoustic Monitoring Results and Discussion

4.2.1 Bat Species Detected

Acoustic monitoring detected four species of bats (Big Brown, Hoary, Eastern Red, and Little Brown), and two unidentified groups of bats (high and low echolocation frequencies) (Table 15).

Unidentified low-frequency bats may have included Hoary, Big Brown, and Silver-haired Bats, although the known bats at the site make it likely that Silver-haired Bat, if present, was rare. The unidentified high-frequency bats likely included Eastern Red Bat, although additional Little Brown Bats may also have been present.. The most common *Myotis* species in cropland settings is thought to be Little Brown Bat, as it is more general in its habitat preferences than other *Myotis* species and tends to forage along water, in cropland and over woodlots, rather than in the interior of woodlots. In contrast, Northern Long-eared Bat typically forages in or just above forests, but could possibly occur at the site in migration. Forested breeding habitat for this species is absent from the site and therefore if any additional *Myotis* that were present in the unidentified bat calls were likely to be Little Brown Bats.

Table 15. Bat species detected at the Odell Wind site

Subfamily	Scientific Name	Common Name	Feeding Habitat	Roosting Habitat	Detection Period
Vespertilioninae	*Eptesicus fuscus*	Big Brown Bat	Meadows, over water, trees, backyards	Buildings or trees	4/29/13-10/27/13
Vespertilioninae	*Lasiurus cinereus*	Hoary Bat	Clearings, fields, over streams	Trees	4/29/13-10/26/13
Vespertilioninae	*Lasiurus borealis*	Eastern Red Bat	Trees, clearings, over water	Trees	4/29/13-10/13/13
Myotinae	*Myotis lucifugus .*	Little Brown Bat	Trees, cropland, woodlands, often near water	Buildings or trees	6/10/13-6/15/13

4.2.2 Bat Activity Level Indicated by Calls

From April 29, 2013 to November 15, 2013 a total of 1,774 bat calls in 201 nights of recording were recorded. The mean number of calls per detector-night for the high and low microphones combined was 1.6 (Table 16). During the peak bat migration period of July 15- September 15, calls per detector-night was higher.

Table 16. Bat activity & species composition at Odell (all towers, 55m & 3m combined)

Species	Total Calls	Mean Calls Per Detector-Night	% All Calls
Low Frequency Call Group			
Hoary Bat[a]	426	0.4	24.0
Big Brown Bat	422	0.4	23.8
Unknown <35 kHz[b]	395	0.4	22.3
High Frequency Call Group			
Eastern Red Bat[a]	329	0.3	18.6
Unknown >35 kHz[c]	200	0.2	11.3
Little Brown Bat	2	0.0	0.1
Total Calls	**1,774**	**1.6**	**100.0**

[a]Migratory tree bat species
[b]Likely Hoary and Big Brown Bats, with perhaps Silver-haired Bat as a rare occurrence
[c]Likely Eastern Red Bat, with perhaps Little Brown Bat as a rare occurrence

Bat activity was greatest at Met Tower 1, northwest of the site, with a mean number of calls per detector-night of 2.6 (Table 17). Tower 3, inside the northwest corner of the site, was 2.5 miles south of Tower 1. Tower 2, which had the lowest level of bat activity, was located near the center of the site. While all Towers were located in cropland, Tower 1 and 3 were within 1.5 miles of a significant watercourse with a concentration of natural habitat in Bennett WMA. By contrast, Tower 2 was not near significant natural habitat or water bodies.

Although Met Tower 1 began recording data over a month earlier than the other two towers, mean calls per detector-night can nonetheless be directly compared among all towers because the total number of calls per tower was averaged over the number of detector-nights at each tower. This resulted in a total of 402 detector-nights (201 nights multiplied by the two microphones at different heights) at Tower 1, and 326 (163 * 2) each at Towers 2 and 3. The resulting calls per detector-night at each tower were then averaged to arrive at the site-wide mean calls per detector-night.

Table 17. Total bat calls and species composition at Odell, per tower

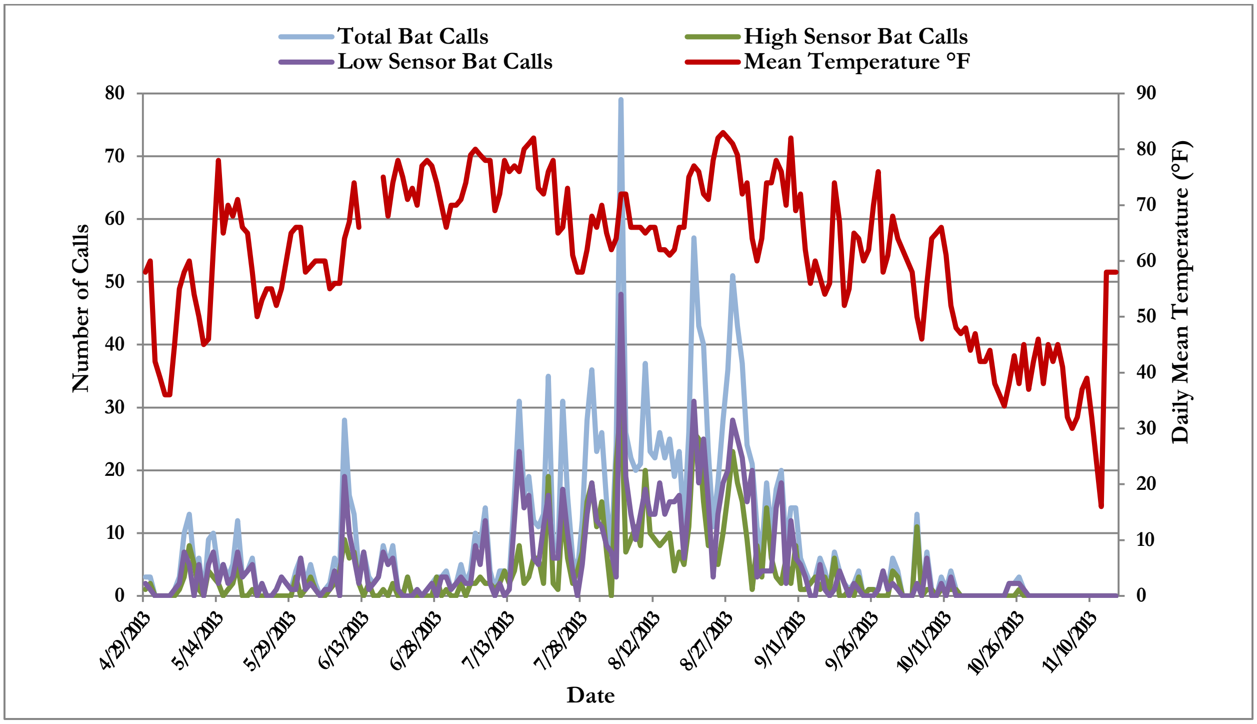
Species	Met Tower 1[a]	Met Tower 2[b]	Met Tower 3[b]	All Towers
Low Frequency Call Group				
Hoary Bat	255	42	129	426
Big Brown Bat	267	113	42	422
Unknown <35 kHz	272	63	60	395
High Frequency Call Group				
Eastern Red Bat	154	107	68	329
Unknown >35 kHz	108	78	14	200
Little Brown Bat	1	1	0	2
Total Calls	1,057	404	313	1,774
Mean Calls Per Detector-Night	2.6	1.2	1.0	1.6
Migration Period – Total Calls[c]	814	319	221	1354
Migration Period – Mean Calls Per Detector-Night[c]	6.5	2.5	1.8	3.6

[a] Tower 1 had a total of 402 detector-nights
[b] Towers 2 and 3 each had a total of 326 detector-nights
[c] Peak bat migration period is July 15-September 15

4.2.3 Seasonal Pattern of Bat Activity

Bat activity was variable over the study period but greatest during the fall migratory period (July 15 – September 15; Figure 1), with a peak of 79 bat calls detected on August 5. Over three-fourths (76.3%) of all calls recorded in 2013 occurred during this period. The highest individual peaks in bat activity corresponded with higher temperatures, although passage of weather fronts complicated this simple pattern. Acoustic monitoring studies at other wind facilities reported similar variation in bat activity with temperature (e.g., Fielder 2004, Redell et al. 2006, Reynolds 2006). Erickson and West (2002) reported that both regional patterns of climatic conditions as well as local weather conditions could be used to predict bat activity. Bats are known to be less active in periods of rain, low temperatures, and strong winds (Eckert 1982, Erickson and West 2002). Many of these relationships may be related to variation in insect activity with weather patterns. For example, strong winds can influence insect abundance and activity, which in turn can influence bat activity. The timing of high bat activity with bat fatality levels also has been previously reported (e.g., Fiedler 2004, Johnson et al. 2004, Jain 2005) and suggests that temporal patterns of activity may prove useful for predicting the timing of fatality events (Redell et al. 2006).

Figure 1. Nightly bat activity at the Odell site, April 29 – November 15, 2013



4.2.4 Differences in Activity Among Bat Species and Elevations

Hoary Bat was the most frequently recorded bat (24.0% of calls) (Table 18). Big Brown Bat (23.8% of calls) and Eastern Red Bat (18.6% of calls) were also common at the site. Little Brown Bat was extremely rare at the site (0.1% of calls). The remaining calls were unidentifiable: 11.3% were in the high frequency call group and 22.3% were in the low frequency call group.

Bat activity typically is greater at low elevations (<5m) than at the high elevation of the RSA (e.g. Redell et al. 2006, Arnett et al. 2006). This pattern of activity was observed at Odell with 59.2% of calls at 3m and 40.8% of calls at 55m (Table 19). This pattern may be caused by greater insect abundance at lower elevations, more advantageous feeding conditions for bats at lower elevations, or a combination of these and other factors such as surrounding topography, vegetation, and water features as well as the resultant local wind patterns.

At the high elevation Hoary Bat was the most common species (46.0% of calls at 55m) (Table 18). More Hoary Bat calls were recorded at the high elevation than at the low elevation, as is frequently reported for this species (e.g. Baerwald and Barclay 2009). Eastern Red Bat was also present at the high elevation (18.2% of calls at 55m) but was present in slightly greater numbers at the low elevation. Big Brown Bats were recorded at the high elevation in low numbers (7.2% of calls at 55m). No Little Brown Bats were recorded at the 55m elevation.

At the low elevation Big Brown Bat was the most common species (35.2% of calls at 3m) (Table 18). Eastern Red Bat was also common at this elevation (18.8% of calls at 3m). Hoary Bats were less common at this elevation (8.9% of calls at 3m), and Little Brown Bats were present but extremely rare here (0.2% of calls at 3m).

High-frequency bats (e.g. Little Brown Bat, Eastern Red Bat) are thought to be more active at low elevations than high elevations (Arnett et al. 2007). This is presumably due to their smaller body sizes and higher energy requirements compared to the larger low-frequency bats. In order to conserve energy, high-frequency bats are theorized to forage closer to ground level where insects are more plentiful and wind speed is lower. Activity at the low elevation represented 63.3% of high frequency calls (Table 19).

Table 18. Bat activity species composition at Odell, April 29-November 15, 2013

Species	Elevation	Total	Mean Calls Per Detector-Night	% All Calls at Elevation
Low Frequency Call Group				
Big Brown Bat	55m	52	0.1	7.2
Big Brown Bat	3m	370	0.7	35.2
Hoary Bat*	55m	333	0.6	46.0
Hoary Bat*	3m	93	0.2	8.9
Unknown <35 kHz	55m	144	0.3	19.9
Unknown <35 kHz	3m	251	0.4	23.9
High Frequency Call Group				
Eastern Red Bat*	55m	132	0.3	18.2
Eastern Red Bat*	3m	197	0.4	18.8
Little Brown Bat	55m	0	0.0	0.0
Little Brown Bat	3m	2	0.0	0.2
Unknown >35 kHz	55m	63	0.1	8.7
Unknown >35 kHz	3m	137	0.2	13.0
All Call Groups, All Calls				
Total Calls		1,774	1.6	100.0
Total Calls at 55m	55m	724	1.4	40.8
Total Calls at 3m	3m	1,050	1.9	59.2

*Migratory tree bat species

Table 19. Summary of bat activity at Odell, April 29-November 15, 2013

Group	Elevation	Total	Calls Per Detector-Night	% of All Calls at Each Elevation	% of Each Group's Calls at Each Elevation
Low Frequency Calls	55m	529	1.0	73.1	42.6
Low Frequency Calls	3m	714	1.3	68.0	57.4
High Frequency Calls	55m	195	0.4	26.9	36.7
High Frequency Calls	3m	336	0.6	32.0	63.3
Low & High Frequency Calls	55m	724	1.4	100.0	40.8
Low & High Frequency Calls	3m	1,050	1.9	100.0	59.2
Total Calls - Both Elevations		**1,774**	**1.6**	**100.0**	**100.0**

Overall, species composition indicated by call activity at the proposed Odell site included 42.6% migratory tree bats (Hoary and Eastern Red Bats). However, the percent of migratory tree bats varied by elevation. At the 55m elevation, migratory tree bats comprised nearly two-thirds of all calls (64.2%). At the 3m elevation, migratory tree bats comprised close to one-fourth of all calls (27.6%). The high percentage of migratory tree bat calls at the 55m elevation was due to the presence of the migratory forest-dwelling Hoary Bat.

4.3 Bat Collision Risk

Bats known to be susceptible to fatality from wind energy projects occur at the site from the spring through fall. While the level of activity at the Odell site is based on a longer monitoring period than most studies, during the peak bat migration period the mean number of calls per detector-night at the site was on the low end (1.6 overall, 3.6 during peak migration) of the range of bat activity reported at other Midwestern wind energy development sites (2.1-34.9 calls/detector night) (Table 20). A strong correlation between pre-construction calls per detector-night and post-construction fatalities has yet to be established.

Table 20. Comparison of Odell bat activity to other Midwestern wind energy projects

Project Name, Location	Survey Dates	Bat Activity (Calls per Detector-Night)	Reference
Top of Iowa IA	Sep 4-Oct 9, 2003 May 26-Sep 24, 2004	34.9	Gruver 2008a
Butler Ridge Wind Farm WI	Jul 19-Sep 30, 2005	23.0	Redell et al. 2006
Lakefield Wind Project MN[a]	Apr 1-Oct 31, 2011	7.5 (45m) 11.8 (5m)	Rodriguez 2011, Westwood Professional Services 2013
Fowler Ridge Wind Farm, IN	Apr 13 – May 15, 2010; Aug 1 – Oct 15, 2010	1.34 (Spring) 8.12 (Fall)	Good et al. 2011
Blue Sky Green Field WI	Jul 24-Oct 29, 2007	7.7[b]	Gruver 2008b, Gruver et al. 2009
Glacier Hills WI	Aug 16-Oct 29, 2007	5.7	Gruver 2008a
Lincoln WI	Jul 1999 – Jul 2001	Unknown	Howe et al. 2002
Odell MN	**Apr 29 – Nov 15, 2013** **Jul 15 – Sep 15, 2013**	**1.6** **3.6 (Migration)**	**This study**
Buffalo Ridge MN	Jun 15-Sep 1, 2000-2001	2.1	Gruver 2008a

[a] Average of both north and south recorders
[b] Although an average of 7.7 calls per night were recorded at ground level across all met tower locations, the reference location at the edge of a woodlot near a trail and stream recorded 97% of all calls in the study

Impacts to bats are likely to be greatest during the peak migration (July 15-September 15), when the mean number of calls per detector-night at the Odell site was higher than at other times during the year. Low wind speeds and the passage of weather fronts are often associated with nights of peak bat migration. In order to indicate the level of annual fatalities at Odell, the fatality rates at several wind energy facilities in southern Minnesota and northern Iowa were examined (Table 21, Map Exhibit 3). Like Odell, these sites are located in extensive cropland, and therefore the range in their fatality rates is likely to be similar to the potential fatality rate at the Odell site. Should fatalities at the Odell site exceed this range, Odell will consult with wildlife agencies to discuss whether further study is warranted.

Table 21. Bat fatality rates at select wind energy facilities in southern Minnesota and northern Iowa. The facilities were chosen for their similarity to the Odell site.

Wind Energy Facility	County, State	Installed MW	Fatality Rate (#/MW/Yr)	Reference
Big Blue[a]	Faribault, MN	36	1.3	Big Blue Wind Farm 2013
Elm Creek[b]	Jackson, MN	99	1.5	Derby et al. 2010
Barton[b]	Worth, IA	160	1.9	Derby et al. 2011
Buffalo Ridge[b]	Lincoln, MN	132.25	2.0	Johnson et al. 2000
Crystal Lake[b]	Hancock and Winnebago, IA	350	7.4	Chodachek 2013
Top of Iowa[b]	Worth, IA	80	8.7	Jain 2005
Buffalo Ridge/Lake Benton[b]	Lincoln, MN	210.75	11.2	Johnson et al. 2004
Lakefield[b c]	Jackson, MN	205.5	15.9/19.9	Westwood Professional Services 2013

[a] Number of fatalities detected per number of turbines searched, uncorrected for searcher efficiency and carcass removal

[b] Using methods from Schoenfeld 2004

[c] Using methods from Huso et al. 2012

5. Summary of Results of Tier 1, 2 & 3 Analysis

Issues discussed in this report are listed below as either issues that may require further consideration or issues that do not warrant further consideration (Table 22). Best management practices are recommended by the USFWS (2012a) (Appendix 5). Additionally, Odell has committed to avoidance and minimization of these potential impacts using site-specific recommendations derived from literature and the 2013 surveys, as described below

Table 22. Issues of Concern

Issues That May Require Further Consideration	Regulatory Framework
Migratory Bats	None for species detected
Migratory Passerine Birds	MBTA
Issues That Do Not Warrant Further Consideration	**Regulatory Framework**
Prairie Bush Clover (federal and state threatened) and Poweshiek Skipperling (federal candidate, state endangered)	Federal and State Endangered Species Acts
Minnesota County Biological Survey Sites of Moderate Significance	None
Phlox Moth (state special concern), Sullivant's Milkweed (state threatened)	State Endangered Species Act
Henslow's Sparrow (state endangered)	State Endangered Species Act, MBTA
Breeding Bird Collision	MBTA
Waterfowl and Waterbird Collision	MBTA
Trumpeter Swan (state special concern), Franklin's Gull (state special concern), American White Pelican (state special concern)	State Endangered Species Act, MBTA
Regionally Sensitive Species (SGCN Bird Species)	MBTA
Northern Long-eared Bat (federal candidate)	Federal and State Endangered Species Acts
Grassland Bird and Waterfowl Habitat Displacement	None
Bald Eagle	BGEPA, MBTA
Raptor Collision	MBTA

5.1 Issues That May Require Further Consideration

5.1.1 Migratory Bats

Migratory tree bats that have experienced fatalities at other wind energy sites were present at the site in low numbers and in higher but still low numbers in the peak fall bat migration. There were no bat species present at the site that are currently protected under the federal ESA. Two species detected, Big Brown Bat and Little Brown Bat, are listed as state special concern. Unidentified high-frequency bats were most likely Eastern Red Bats based on automated and visual call analysis and the confirmed numbers of this species at the site. Bat activity at the Odell site was at the low end of that reported from other wind energy projects in the northern mid-continent. Four species of bats (Big Brown, Eastern Red, Hoary, and Little Brown) were identified during acoustic monitoring. Two of these are migratory tree bats (Hoary and Eastern Red Bat). Fatalities for these species are sometimes in proportion to the pre-construction abundance indicated by bat call activity. It is likely that fatalities will occur at the Odell site, and that fatality rates will be similar to other wind energy projects in agricultural regions of the Midwest with low bat activity. Hoary and Eastern Red Bats may experience the greatest number of fatalities.

Risk of fatality at the Odell site is likely to be greatest on nights during the July 15-September 15 period which correspond to the passage of the largest numbers of migratory tree bats and an increase in the abundance of Big Brown Bats. Due to changing weather conditions, each night carries a different level of risk. During the periods of peak passage, weather conditions that are most conducive to high fatality rates occur with warm temperatures (>50F) and low wind speeds (<6.5m/s) (Baerwald et al. 2009, Arnett et al. 2010, Good et al. 2011, Cryan and Brown 2007). In addition, risk is higher on the first night following the passage of a low pressure system when the prevailing wind shifts from a southerly to a northerly direction (Cryan and Brown 2007, Good et al. 2011). Odell is aware of factors that minimize impacts to migratory bat populations, including non-operation of turbines on nights of high temperatures and low wind speeds during the peak bat migration, and will implement them to the degree that conditions warrant. Should fatalities exceed typical rates of bats killed per year at other wind farms in the region (see Table 21), Odell will consult with wildlife agencies to discuss whether further study is warranted.

5.1.2 Migratory Passerine Birds

Passerine bird fatalities during spring and fall migration are typically the greatest source of bird fatalities at wind energy facilities. Migratory passerine use of the site was typical of Midwestern agricultural habitats, and fatality risk to these species is predicted to be similar to that at other Midwestern wind energy developments. Although it is likely that some level of passerine fatalities will occur, fatality rates of passerine birds are expected to be typical of Midwestern cropland, and no population-level effects are expected (Arnold and Zink 2011, Westwood Professional Services 2013, Zimmerling et al. 2013). Odell has sited turbines in cropland habitat not conducive to passerine migration stopovers. Should fatalities exceed typical rates of birds killed per year at other wind farms in the region (see Table 9), Odell will consult with wildlife agencies to discuss whether further study is warranted.

5.2 Issues That Do Not Warrant Further Consideration

5.2.1 Prairie Bush Clover (federal and state threatened) and Poweshiek Skipperling (federal candidate, state endangered)

Prairie Bush Clover and Poweshiek Skipperling are possibly present in some of the project's counties. These species are both found in remnant prairie habitat. Turbines have been sited in cropland habitat, and 97% of turbines have been sited at least 400 m from large grassland patches of 50 acres of more.

5.2.2 Minnesota County Biological Survey Sites of Moderate Significance

The Minnesota County Biological Survey has identified six significant sites within the project. One is a prairie wetland complex in the northeastern portion of the site that is considered of high significance. Four are considered of moderate significance, and one is considered below the standard of statewide significance. Turbines have been sited at least 400 m away from these sites biological significance.

5.2.3 Phlox Moth and Sullivant's Milkweed

Records of the state special concern Phlox Moth and state threatened Sullivant's Milkweed occur at a prairie in the northeastern portion of the site. Additional prairie remnants occur in the site and could contain these or other rare prairie features. No turbines have been sited in grassland habitat. Turbines have been sited in cropland habitat, and 97% of turbines have been sited at least 400 m from large grassland patches of 50 acres of more.

5.2.4 Henslow's Sparrow

A record exists for Henslow's Sparrow on the southern edge of the Bennett WMA. This species could also be present in the larger grasslands at the site. Based on flight behavior collision fatalities for this species are likely to be minimal. Habitat displacement effects for this species are unknown. No turbines have been sited in grassland habitat. Ninety-seven percent of turbines have been sited at least 400 m from large grassland patches of 50 acres or more, which largely avoids potential Henslow's Sparrow habitat.

5.2.5 Breeding Bird Collision

In southwest Minnesota, there are few at-risk bird species likely to be present in cropland where turbines will be placed. In the breeding season, sensitive bird species were infrequently encountered at the site, particularly in cropland. In cropland, where most wind turbines will be placed, post-construction fatalities are expected to be similar in number to fatalities at other Midwestern wind energy facilities. Ninety-seven percent of turbines have been sited at least 400 m from large grassland patches of 50 acres or more, which largely avoids potential habitat for sensitive species.

5.2.6 Waterfowl and Waterbird Collision

Southwestern Minnesota is known for significant activity during the waterfowl migration, and activity at the site was high during the April migratory period. Activity was particularly high along the site's western and eastern boundaries where open water wetlands are concentrated. Canada Goose, Franklin's Gull, Mallard, Double-crested Cormorant, and Ring-billed Gull were commonly observed species. Collision risk is minimal for waterfowl and waterbird species because studies and observations indicate that waterfowl and waterbirds can see and avoid turbines during flight. Ninety-six percent of turbines have been sited at least 200 m from wetlands, which largely avoids waterfowl habitat. Additionally, no turbines have been sited in the northeast and northwest corners of the site where waterfowl activity is greatest.

5.2.7 Trumpeter Swan (state special concern), Franklin's Gull (state special concern), American White Pelican (state special concern)

Three birds regulated under the Minnesota Endangered Species Act were observed at the site during the spring migratory period. Trumpeter Swan was observed near a wetland on the site's western boundary. Franklin's Gull was observed in significant numbers throughout the site during one week of spring migration. American White Pelican flocks were occasionally observed crossing the site during spring migration. Collision risk for all of these species is minimal as they are likely able to see and avoid turbines, and waterfowl/waterbird fatalities have been low in number at most wind facilities. Ninety-six percent of turbines have been sited at least 200 m from wetlands, which largely avoids potential habitat for these species.

5.2.8 Regionally Sensitive Species (SGCN Bird Species)

Sixteen Minnesota River Prairie ecoregional SGCN species without state or federal status were observed during 2013 surveys. These are in addition to the three species with state status discussed above. These species are considered vulnerable, declining, or rare. None was common at the site. Bobolink and Northern Harrier were the most frequently observed species. Northern Harrier typically has had low numbers of fatalities at wind facilities likely due to its flight behavior, which is usually observed to be below 20m. Bobolink was observed in grassland habitat at the site. No turbines have been sited in grassland habitat. Ninety-seven percent of turbines have been sited at least 400 m from large grassland patches of 50 acres or more, which largely avoids potential habitat for these species.

5.2.9 Northern Long-eared Bat

Northern Long-eared Bat has been proposed for listing under the ESA. This species is experiencing steep population declines due to White Nose Syndrome. This species is known to occur throughout Minnesota, although it prefers forested habitat. Due to lack of significant forest habitat it is unlikely to breed at the site, although it could possibly be a rare migrant at the site during migration. No Northern Long-eared Bat calls were recorded at the site in 2013. The developer is aware of factors that minimize impacts to migratory bat populations, including non-operation of turbines on nights of high temperatures and low wind speeds during the peak bat migration. If Northern Long-eared Bat is listed, the listing could be effective in 2014 and require coordination with the USFWS. Coordination would establish potential impacts of the project and identify appropriate actions to address impacts.

5.2.10 Grassland Bird and Waterfowl Habitat Displacement

Some grassland bird species (e.g., Bobolink, Savannah Sparrow) appear to avoid wind turbines, reducing their nesting density within 200m of turbines and potentially affecting local populations (Johnson et al. 2000a). Forman et al. (2002) detected a reduction in grassland breeding bird density at up to 400m due to highway noise; whether noise from wind turbines has a similar effect is not known. Grassland habitat in and near the Odell site is concentrated along the site's riparian corridors, the judicial ditch north of the site, South Fork Watonwan River in the center of the site, North Fork Elm Creek in the southern part of the site, and Cedar Run in the southeastern corner of the site. There are also three moderate-sized grasslands (90-140 acres) located in or near the northeastern portion of the site. These locations have a greater potential to provide habitat for grassland birds than small grasslands. While habitat displacement during the breeding season is a possibility, suitable grassland is limited at this site.

Waterfowl use agricultural fields in and near the site during migration. Waterfowl have been observed to avoid foraging near wind turbines, although habituation to the presence of wind turbines has been observed. Due to the likelihood of habituation, and the availability of agricultural land for foraging outside of the wind facility, impacts to waterfowl habitat are likely to be minimal.

No turbines have been sited in grassland habitat. Nearly all turbines were sited at least 400m from large grassland patches (97% of turbines) and 200m from wetlands (95% of turbines). This largely avoids habitat displacement issues for grassland birds and waterfowl.

5.2.11 Bald Eagle

The Bald Eagle is protected under the BGEPA. However, in August 2013 the MNDNR removed this species from its list of endangered, threatened, and special concern species, changing its status from special concern to no status (MNDNR 2013b). There is one known nest within 10 miles of the site along the Des Moines River. This nest was active during the first portion of the breeding season in 2013 but abandoned during the second portion. No other nests were identified in a stick nest survey of the site and a 2-mile buffer area around the site.

Bald Eagles were observed at nearby Fish Lake during the site visit in April. There were four observations of Bald Eagles during the spring and fall raptor and large bird surveys. One observation was outside the site boundary, and two other observations were over 800m from the observation point. These observations would not be typically used in calculating risk using the USFWS risk model. The remaining Bald Eagle observation was observed within 800m of a point inside the site, and was flying under 200m. This Bald Eagle observation would be used in the USFWS risk model (USFWS 2013), although this individual was not seen clearly and therefore was documented only as a possible sighting.

The site, with its limited forest and lack of open water habitat, does not contain high quality Bald Eagle nesting or foraging habitat. The Bald Eagle population is expanding, and it is possible that Bald Eagles may establish additional nesting territories within 10 miles of the site at some point in the future; however, it is unlikely that Bald Eagle will nest within the site itself.

A guidance document for eagles for wind energy development was completed by the USFWS (2013). The guidance recommends a sequence of investigative steps, leading to a conservation plan that includes mitigation should impacts to eagles warrant mitigation. The steps include calculation of eagle nest density within 10 miles of the project boundary, documentation of eagle use of the area, creation of an impact model, and calculation of mitigation needs. A continuous but fully mitigated level of taking (programmatic take) can be permitted under the Bald and Golden Eagle Protection Act.

Odell is aware of recommendations for avoiding eagle impacts and will follow them accordingly. Although no additional study is required from a risk perspective, additional Bald Eagle surveys are being conducted in order to better understand and adequately discuss BGEPA permitting with the USFWS.

5.2.12 Raptor Collision

There are no known raptor migration routes near the site. Raptors were observed in much lower numbers than those at major migration sites. Due to the low raptor use of the site and typical raptor fatality rates, it is unlikely that significant numbers of raptor fatalities will occur at the Odell site.

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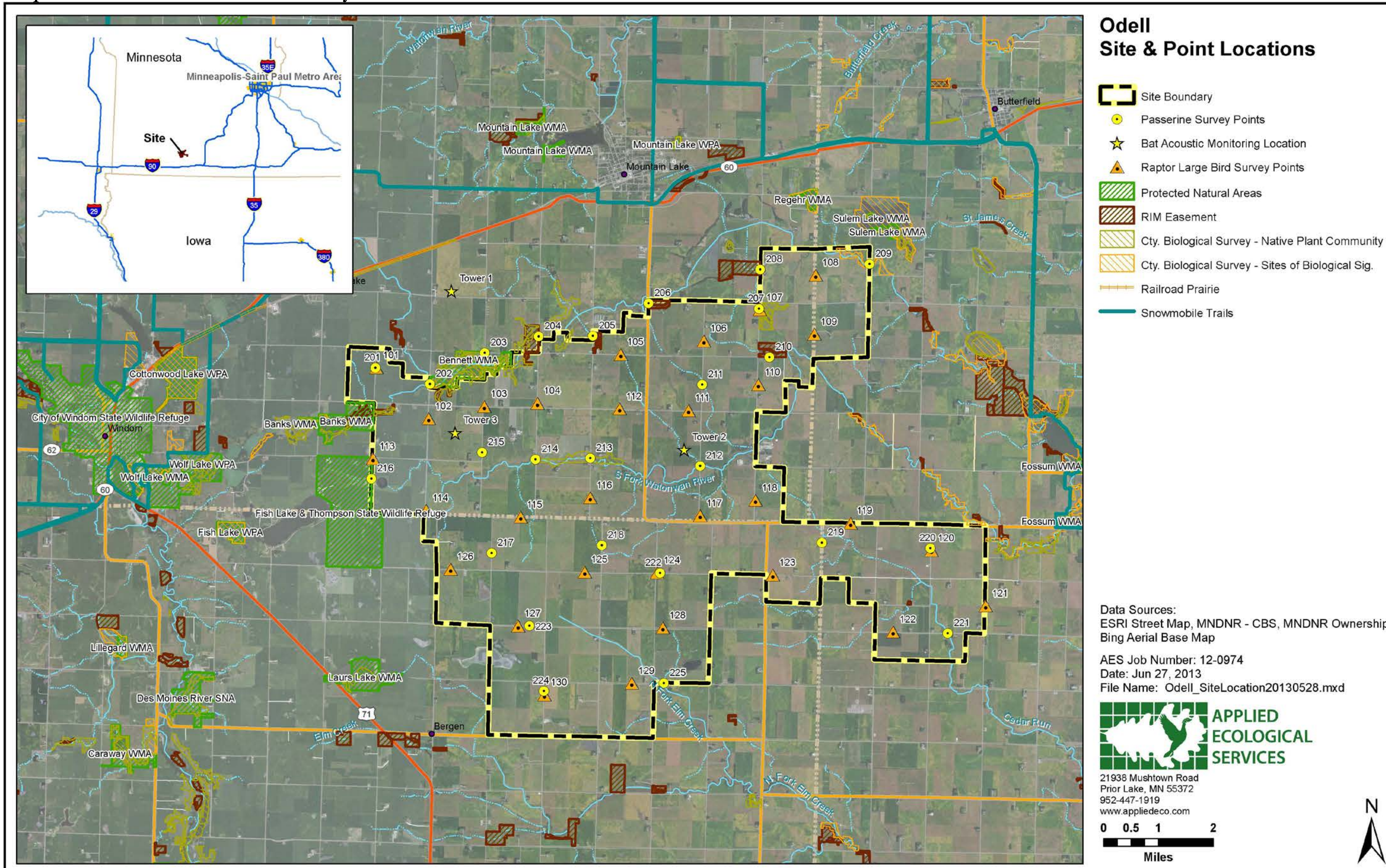
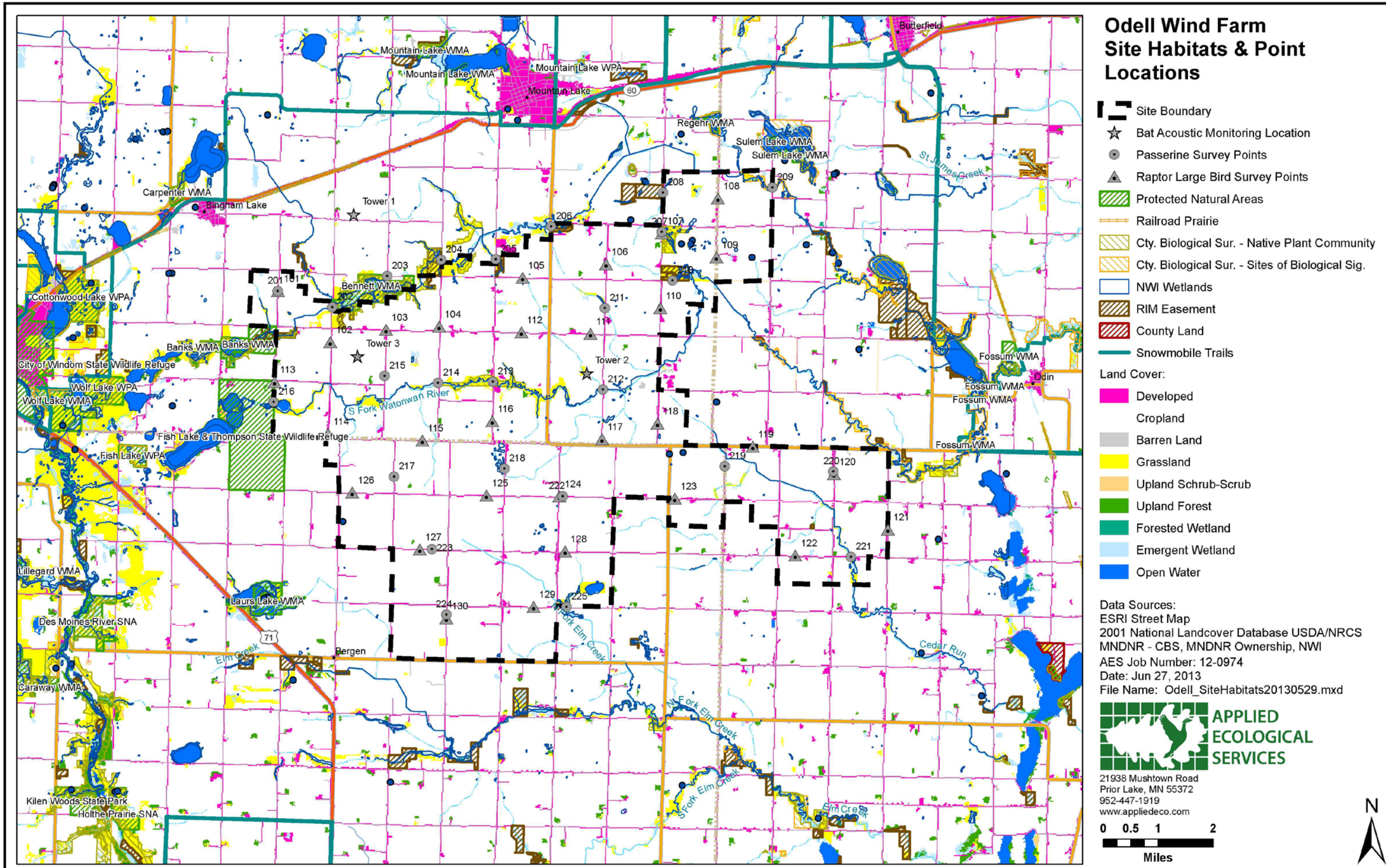
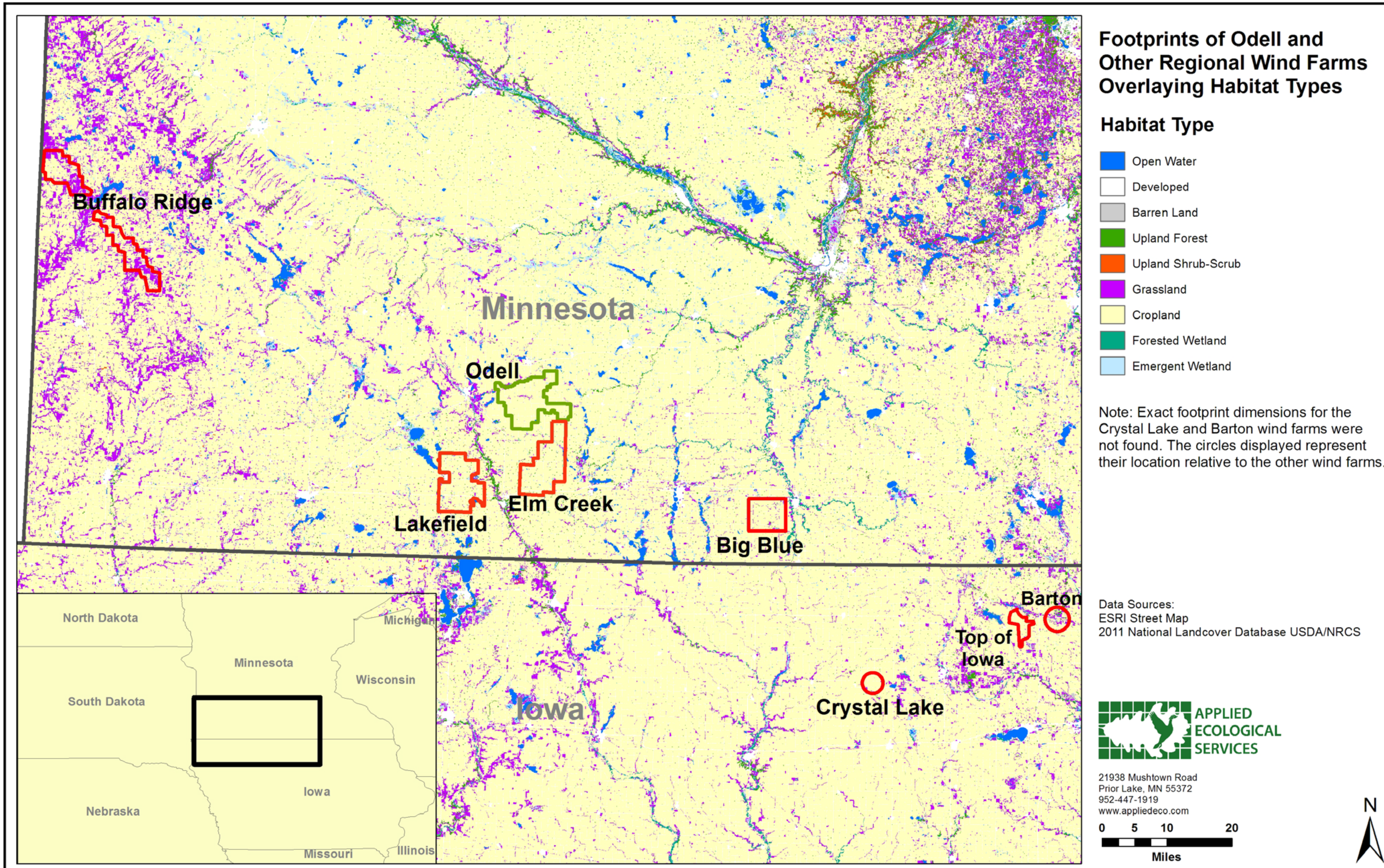
Map Exhibit 1. Site Location & Survey Point Locations



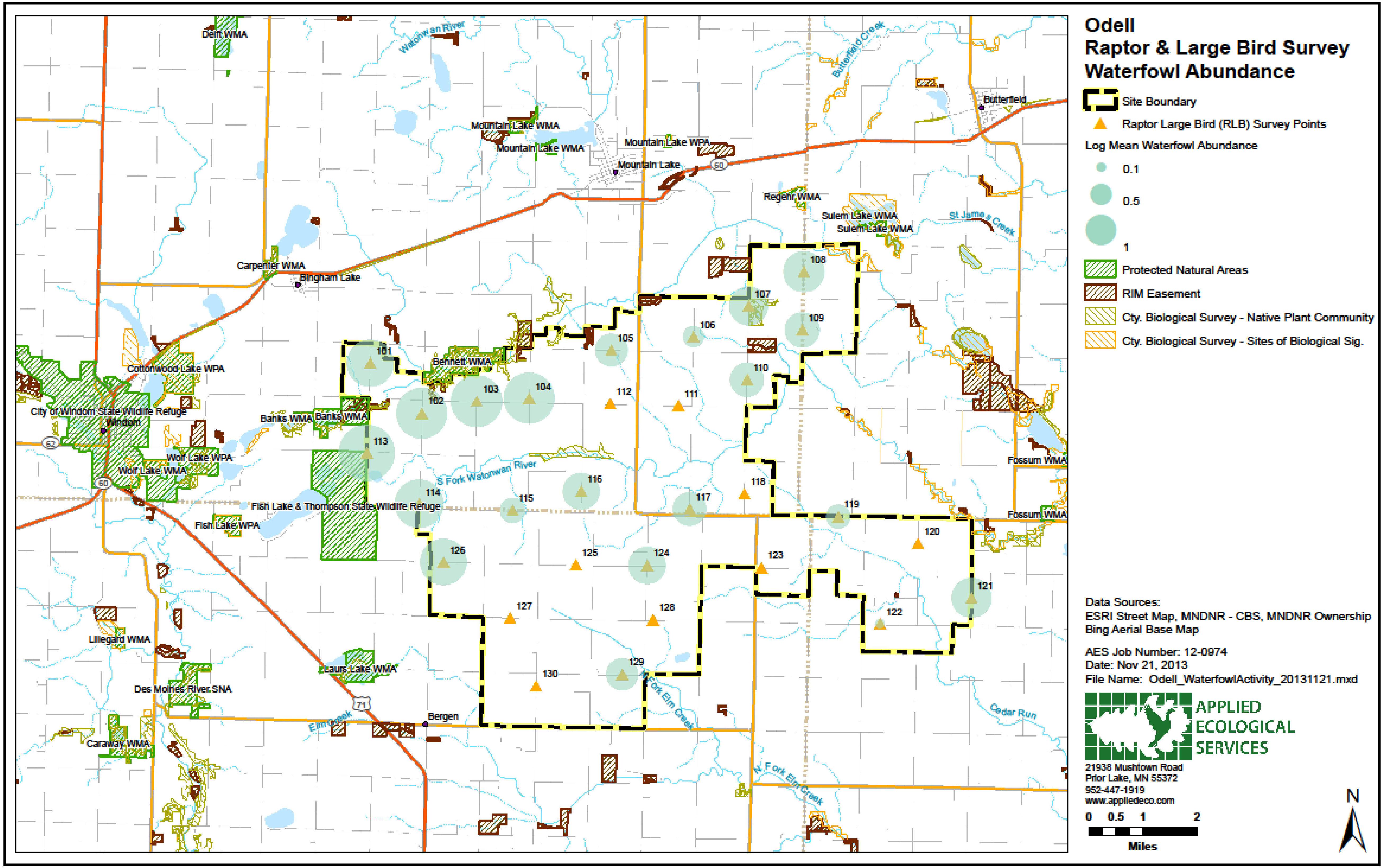
Map Exhibit 2. Site Habitats & Survey Point Locations



Map Exhibit 3. Site Location Relative to Similar Projects in Similar Habitat



Map Exhibit 4. Waterfowl Activity



Appendix 1. Correspondence with USFWS and MNDNR

From: Rheude, Margaret [margaret_rheude@fws.gov]
Sent: Thursday, May 16, 2013 4:55 PM
To: Patrick Smith; Heather C. Kieweg; Kim Chapman; Heather L. Wayne; Jordan B. Burmeister
Subject: Odell Wind Farm Eagle Recommendations
Attachments: Appendix C ECP 2013.pdf

This original email got bounced back - I think it was too big, so I'll try to break it up into smaller pieces

Hi everyone,
this email is mainly concerning eagles as a quick follow-up to our meeting - I was able to pull up the shapefile of the project, as well as the 10-mile buffer area. I only saw one eagle nest within the 10-mile buffer, and none within the project boundary. The nest that I found in my database search is the same one that you have. However, this does not guarantee that there are no eagle nests within either the project area or the 10-mile buffer - the DNR database has not been updated since 2007. I would recommend conducting yearly nest surveys in the spring of each year (before leaf-on) to look for newly built nests (within the 2-mile buffer zone). The updated eagle conservation plan guidance is out, and can be found:
http://www.fws.gov/windenergy/PDF/Eagle%20Conservation%20Plan%20Guidance-Module%201.pdf

There is in-depth information on pre-construction surveys found in Appendix C. I have pulled that out for you, and attached it here. Please note that it recommends using 800m point counts, at least 1 hour in duration, that eagle minutes and eagles are counted, and that there be a differentiation between flying and perched eagles. I have included a spreadsheet with an example of how data might be collected. The columns in green are data that the FWS needs in order to run the collision risk model. The columns in pink are suggestions of additional data you can collect if it suits your needs. For instance, some developers like to record eagle minutes within, below, and above the rotor swept zone. For the FWS model, however, we are looking at whether eagles are at or below 200m, or above 200m. Some wind developers also note additional information, such as the presence of livestock or carcasses that might influence eagle numbers. I would recommend also conducting observer trials to ensure they can accurately determine 200m flight height, as well as 800m radius observation. Do you know how much eagle data you are going to collect? 1 or 2 years?

In our phone call you asked about the recommended frequency of eagle surveys. The FWS recommends eagle surveys at least once a month in each location, with an increase in surveys during the times of the year when eagle activity is likely to increase - for instance - spring/fall migration, or when chicks fledge, or if there appears to be a wintering population of eagles near the site. As discussed, I do think it would be possible to drop a few of the monthly surveys during times where eagle behavior is likely to be the same - ie: April eagle activity is likely similar to May eagle activity - the same could be true for August-September eagle activity. However, I want to state in order to get the most robust dataset - monthly surveys are preferable. In order to help you with your decision of how many surveys to conduct, I would recommend looking at known patterns of eagle activity year-round for your site - using sources such as winter-point count surveys from the Eagle Center in Wabasha, migration patterns observed from Hawk mountain in Duluth, etc. Note that weather patterns (which can vary from year to year) may change predicted eagle behavior. If you do decide to drop some of the monthly eagle surveys, I would be happy to look at your proposed schedule of surveys and give you feedback.

Please find also attached some examples of recording eagle flight patterns, as well as eagle abundance data, and example of eagle "hot-spots" - places that may attract bald eagles.

I will be working on an additional follow-up response concerning T&E species, as well as FWS-interest lands.
Thanks, I'll be in touch soon.

--
Mags Rheude
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Twin Cities Field Office

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Appendix 2. Bird Species Observed at the Odell Site with Relative Number of Individuals by Habitat

^{SGCN}= Minnesota River Prairie SGCN Species; ST = State threatened; ^{SPC} = State special concern; *=Introduced species. Sensitive species listed in **bold**.

		Passerine Surveys Relative Abundance (Individual birds per 10-minute point count)				Raptor and Large Bird Surveys (Individual Birds per Hour Obs.)
Common Name	**Scientific Name**	**Cropland (66 surveys)**	**Grassland (18 surveys)**	**Riparian/Grassland (66 surveys)**	**All Habitats (150 surveys)**	**Cropland (120 Hours)**
Red-winged Blackbird	*Agelaius phoeniceus*	2.97	10.83	7.42	5.87	
Common Grackle	*Quiscalus quiscula*	2.03	2.00	1.88	1.96	
Cliff Swallow	*Petrochelidon pyrrhonota*	0.06	0.00	3.26	1.46	
Tree Swallow	*Tachycineta bicolor*	0.61	0.33	1.68	1.05	
American Robin	*Turdus migratorius*	0.79	1.50	1.17	1.04	
American Goldfinch	*Carduelis tristis*	0.79	1.17	1.20	1.01	
Brown-headed Cowbird	*Molothrus ater*	0.97	0.89	0.88	0.92	
Killdeer	*Charadrius vociferus*	0.82	0.72	0.91	0.85	
Mourning Dove	*Zenaida macroura*	0.55	0.78	0.95	0.75	
Barn Swallow	*Hirundo rustica*	0.52	2.78	0.42	0.75	
Canada Goose	*Branta canadensis*	0.55	0.67	0.92	0.73	41.07
Mallard	*Anas platyrhynchos*	0.14	0.33	1.23	0.64	3.45
Song Sparrow	*Melospiza melodia*	0.41	0.33	0.71	0.53	
Ring-necked Pheasant*	*Phasianus colchicus*	0.29	1.11	0.52	0.49	
Unidentified Duck	*Anatinae (gen, sp)*	0.11	0.17	0.91	0.47	19.17
European Starling*	*Sturnus vulgaris*	0.23	0.28	0.70	0.44	
Common Yellowthroat	*Geothlypis trichas*	0.11	0.50	0.58	0.36	
Harris's Sparrow	*Zonotrichia querula*	0.00	0.00	0.74	0.33	
Savannah Sparrow	*Passerculus sandwichensis*	0.32	0.33	0.32	0.32	
American Crow	*Corvus brachyrhynchos*	0.38	0.17	0.21	0.28	
Unidentified Passerine		0.06	0.39	0.44	0.27	
Bobolink^{SGCN}	***Dolichonyx oryzivorus***	**0.17**	**0.61**	**0.26**	**0.26**	
Vesper Sparrow	***Pooecetes gramineus***	**0.55**	**0.00**	**0.02**	**0.25**	
House Sparrow*	*Passer domesticus*	0.05	0.06	0.48	0.24	
Unidentified Sparrow	*Emberizidae (gen, sp)*	0.23	0.06	0.29	0.23	
Horned Lark	*Eremophila alpestris*	0.39	0.06	0.06	0.21	

Common Name	Scientific Name	Passerine Surveys Relative Abundance (Individual birds per 10-minute point count)				Raptor and Large Bird Surveys (Individual Birds per Hour Obs.)
		Cropland (66 surveys)	Grassland (18 surveys)	Riparian/Grassland (66 surveys)	All Habitats (150 surveys)	Cropland (120 Hours)
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	0.00	0.22	0.38	0.19	
Marsh Wren[SGCN]	***Cistothorus palustris***	**0.00**	**0.39**	**0.32**	**0.19**	
American Coot	***Fulica americana***	**0.00**	**0.00**	**0.33**	**0.15**	**0.05**
Cedar Waxwing	***Bombycilla cedrorum***	**0.00**	**0.00**	**0.24**	**0.11**	
Blue Jay	***Cyanocitta cristata***	**0.08**	**0.11**	**0.12**	**0.10**	
Western Meadowlark	*Sturnella neglecta*	0.05	0.17	0.14	0.10	
Chipping Sparrow	*Spizella passerina*	0.00	0.06	0.15	0.07	
Upland Sandpiper[SGCN]	***Bartramia longicauda***	**0.14**	**0.11**	**0.00**	**0.07**	
Yellow Warbler	*Setophaga petechia*	0.02	0.00	0.15	0.07	
Baltimore Oriole	***Icterus galbula***	**0.05**	**0.06**	**0.09**	**0.07**	
Grasshopper Sparrow[SGCN]	***Ammodramus savannarum***	**0.11**	**0.06**	**0.03**	**0.07**	
Northern Shoveler	***Anas clypeata***	**0.00**	**0.06**	**0.14**	**0.07**	**0.21**
Rock Pigeon*	*Columba livia*	0.03	0.00	0.12	0.07	
Clay-colored Sparrow	***Spizella pallida***	**0.02**	**0.06**	**0.08**	**0.05**	
Field Sparrow[SGCN]	***Spizella pusilla***	**0.00**	**0.22**	**0.05**	**0.05**	
Northern Flicker	***Colaptes auratus***	**0.05**	**0.00**	**0.05**	**0.04**	
Red-tailed Hawk	*Buteo jamaicensis*	0.03	0.11	0.03	0.04	
Blue-winged Teal	***Anas discors***	**0.00**	**0.00**	**0.08**	**0.03**	**0.18**
Unidentified Shorebird		0.02	0.00	0.06	0.03	
Unidentified Swallow	*Hirundidae (gen, sp)*	0.00	0.06	0.06	0.03	
Brown Thrasher[SGCN]	***Toxostoma rufum***	**0.02**	**0.00**	**0.05**	**0.03**	
Gray Catbird	*Dumetella carolinensis*	0.00	0.00	0.06	0.03	
Pied-billed Grebe	***Podilymbus podiceps***	**0.00**	**0.00**	**0.06**	**0.03**	
Red-bellied Woodpecker	*Melanerpes carolinus*	0.00	0.06	0.05	0.03	
Swamp Sparrow	***Melospiza georgiana***	**0.00**	**0.00**	**0.06**	**0.03**	
Unidentified Blackbird	*Icteridae (gen, sp)*	0.05	0.06	0.00	0.03	
Warbling Vireo	***Vireo gilvus***	**0.00**	**0.00**	**0.06**	**0.03**	
Wood Duck	*Aix sponsa*	0.00	0.17	0.02	0.03	
Dickcissel[SGCN]	***Spiza americana***	**0.03**	**0.00**	**0.02**	**0.02**	
Eastern Kingbird	*Tyrannus tyrannus*	0.00	0.00	0.05	0.02	

Common Name	Scientific Name	Passerine Surveys Relative Abundance (Individual birds per 10-minute point count) Cropland (66 surveys)	Grassland (18 surveys)	Riparian/Grassland (66 surveys)	All Habitats (150 surveys)	Raptor and Large Bird Surveys (Individual Birds per Hour Obs.) Cropland (120 Hours)
Wood Thrush[SGCN]	***Hylocichla mustelina***	**0.00**	**0.00**	**0.05**	**0.02**	
Belted Kingfisher	*Megaceryle alcyon*	0.00	0.00	0.03	0.01	
Downy Woodpecker	*Picoides pubescens*	0.00	0.06	0.02	0.01	
Great Blue Heron	***Ardea herodias***	**0.02**	**0.00**	**0.02**	**0.01**	**0.01**
Lesser Yellowlegs	*Tringa flavipes*	0.03	0.00	0.00	0.01	
Northern Cardinal	*Cardinalis cardinalis*	0.00	0.00	0.03	0.01	
Northern Harrier[SGCN]	***Circus cyaneus***	**0.03**	**0.00**	**0.00**	**0.01**	
Orchard Oriole	*Icterus spurius*	0.00	0.00	0.03	0.01	
Purple Martin[SPC]	***Progne subis***	**0.03**	**0.00**	**0.00**	**0.01**	
Rose-breasted Grosbeak[SGCN]	***Pheucticus ludovicianus***	**0.00**	**0.00**	**0.03**	**0.01**	
Ruby-throated Hummingbird	***Archilochus colubris***	**0.00**	**0.00**	**0.03**	**0.01**	
Trumpeter Swan[SPC]	***Cygnus buccinator***	**0.00**	**0.00**	**0.03**	**0.01**	**0.02**
Unidentified Warbler	*Parulidae (gen, sp)*	0.00	0.00	0.03	0.01	
Unidentified Woodpecker	*Picidae (gen, sp)*	0.00	0.06	0.02	0.01	
American Kestrel	***Falco sparverius***	**0.02**	**0.00**	**0.00**	**0.01**	
Black-capped Chickadee	*Poecile atricapillus*	0.02	0.00	0.00	0.01	
Black Tern[SGCN]	***Chlidonias niger***	**0.00**	**0.00**	**0.02**	**0.01**	
Chimney Swift	*Chaetura pelagica*	0.02	0.00	0.00	0.01	
Eastern Phoebe	*Sayornis phoebe*	0.00	0.00	0.02	0.01	
Eastern Wood-Pewee[SGCN]	***Contopus virens***	**0.00**	**0.00**	**0.02**	**0.01**	
Green Heron	*Butorides virescens*	0.00	0.00	0.02	0.01	
Hairy Woodpecker	***Picoides villosus***	**0.02**	**0.00**	**0.00**	**0.01**	
House Finch*	*Carpodacus mexicanus*	0.00	0.00	0.02	0.01	
Least Flycatcher[SGCN]	***Empidonax minimus***	**0.00**	**0.00**	**0.02**	**0.01**	
Nashville Warbler	*Vermivora ruficapilla*	0.00	0.00	0.02	0.01	
Ring-billed Gull	*Larus delawarensis*	0.02	0.00	0.00	0.01	0.82
Red-headed Woodpecker[SGCN]	***Melanerpes erythrocephalus***	**0.00**	**0.00**	**0.02**	**0.01**	
Tennessee Warbler	***Oreothlypis peregrina***	**0.00**	**0.00**	**0.02**	**0.01**	
Turkey Vulture	*Cathartes aura*	0.00	0.00	0.02	0.01	
Unidentified Gull	*Laridae (gen, sp)*	0.02	0.00	0.00	0.01	10.58

Common Name	Scientific Name	Passerine Surveys Relative Abundance (Individual birds per 10-minute point count) Cropland (66 surveys)	Grassland (18 surveys)	Riparian/Grassland (66 surveys)	All Habitats (150 surveys)	Raptor and Large Bird Surveys (Individual Birds per Hour Obs.) Cropland (120 Hours)
White-breasted Nuthatch	*Sitta carolinensis*	0.00	0.00	0.02	0.01	
American White Pelican[SPC]	***Pelecanus erythrorhynchos***	**0.00**	**0.00**	**0.00**	**0.00**	**0.47**
Bald Eagle	***Haliaeetus leucocephalus***	**0.00**	**0.00**	**0.00**	**0.00**	
Double-crested Cormorant	*Phalacrocorax auritus*	0.00	0.00	0.00	0.00	2.65
Franklin's Gull[SPC]	***Leucophaeus pipixcan***	**0.00**	**0.00**	**0.00**	**0.00**	**23.61**
Greater White-fronted Goose	*Anser albifrons*	0.00	0.00	0.00	0.00	0.33
Northern Pintail[SGCN]	***Anas acuta***	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**
Rough-legged Hawk	*Buteo lagopus*	0.00	0.00	0.00	0.00	
Snow Goose	*Chen caerulescens*	0.00	0.00	0.00	0.00	0.43
Unidentified Hawk	*Accipitridae (gen, sp)*	0.00	0.00	0.00	0.00	
Unidentified Raptor		0.00	0.00	0.00	0.00	
Unidentified Waterfowl		0.00	0.00	0.00	0.00	56.25

Appendix 3. Bat Acoustic Monitoring Site Photos


Photo 1. Tower 2 pulley assembly (tower 3 utilizes same system).

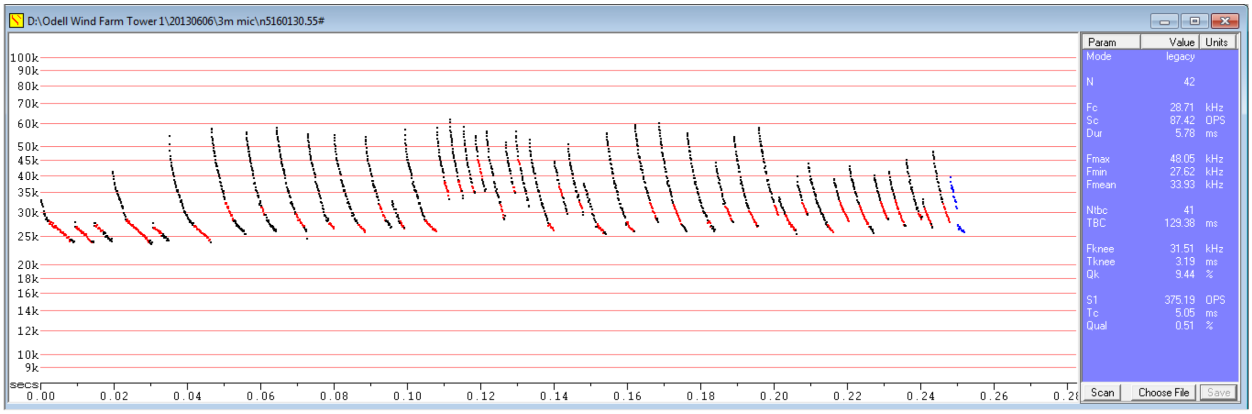

Photo2. Tower 2 50m microphone on tower (tower 3 utilizes same system).


Photo 3. Tower 2 3m microphone, monitoring assembly and landscape setting.

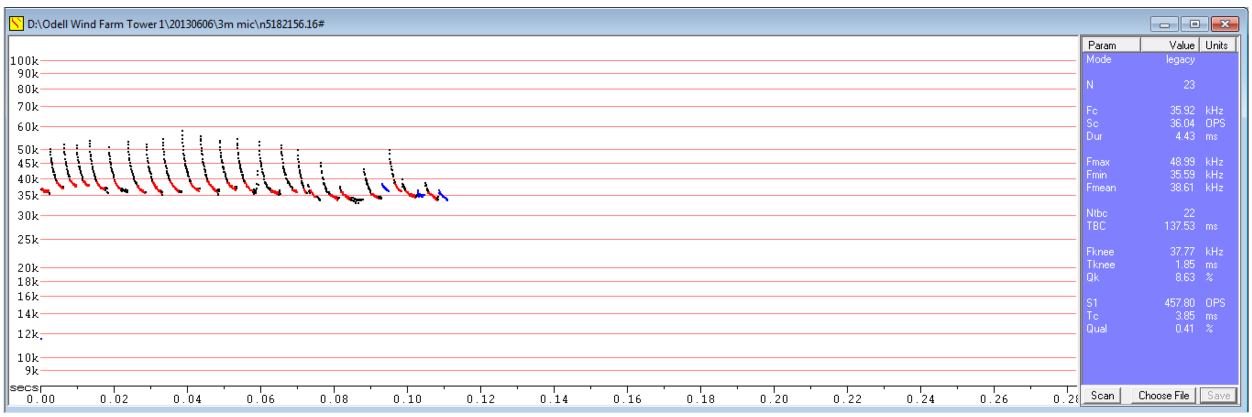

Photo 4. Tower 3 3m microphone, monitoring assembly, and landscape setting.

Appendix 4. Voucher Calls from the Site

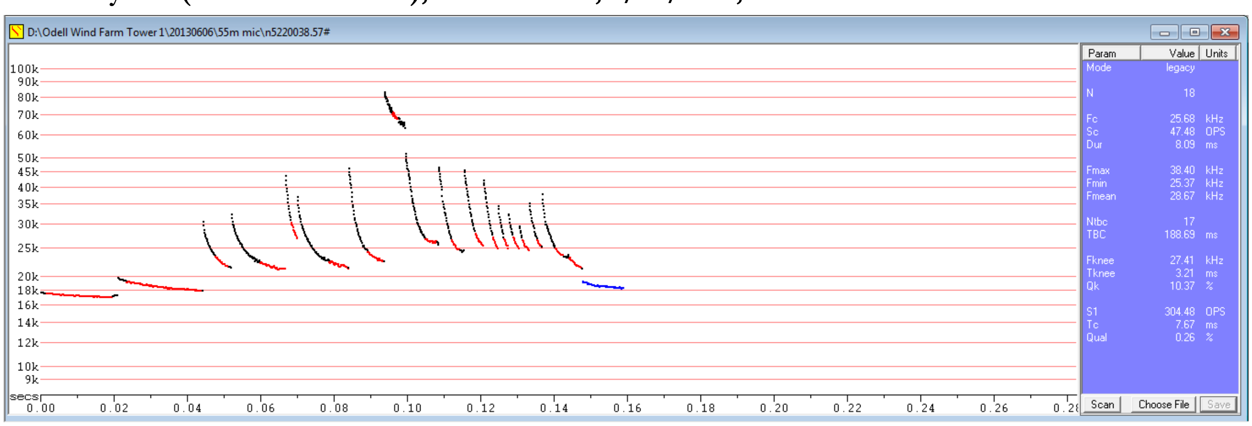
1. **Big Brown (*Eptesicus fuscus*), Tower 1 3m, 5/16/2013, 01:30.**



2. **Eastern Red Bat (*Lasiurus borealis*), Tower 1 3m, 5/18/2013, 21:56.**



3. **Hoary Bat (*Lasiurus cinereus*), Tower 1 55m, 5/22/2013, 00:38.**



Appendix 5. USFWS Site Development and Construction Best Management Practices (USFWS 2012a)

1. Minimize, to the extent practicable, the area disturbed by pre-construction site monitoring and testing activities and installations.

2. Avoid locating wind energy facilities in areas identified as having a demonstrated and unmitigatable high risk to birds and bats.

3. Use available data from state and federal agencies, and other sources (which could include maps or databases), that show the location of sensitive resources and the results of Tier 2 and/or 3 studies to establish the layout of roads, power lines, fences, and other infrastructure.

4. Minimize, to the maximum extent practicable, roads, power lines, fences, and other infrastructure associated with a wind development project. When fencing is necessary, construction should use wildlife compatible design standards.

5. Use native species when seeding or planting during restoration. Consult with appropriate state and federal agencies regarding native species to use for restoration.

6. To reduce avian collisions, place low and medium voltage connecting power lines associated with the wind energy development underground to the extent possible, unless burial of the lines is prohibitively expensive (e.g., where shallow bedrock exists) or where greater adverse impacts to biological resources would result:

a. Overhead lines may be acceptable if sited away from high bird crossing locations, to the extent practicable, such as between roosting and feeding areas or between lakes, rivers, prairie grouse and sage grouse leks, and nesting habitats. To the extent practicable, the lines should be marked in accordance with Avian Power Line Interaction Committee (APLIC) collision guidelines.

b. Overhead lines may be used when the lines parallel tree lines, employ bird flight diverters, or are otherwise screened so that collision risk is reduced.

c. Above-ground low and medium voltage lines, transformers and conductors should follow the 2006 or most recent APLIC "Suggested Practices for Avian Protection on Power Lines."

7. Avoid guyed communication towers and permanent met towers at wind energy project sites. If guy wires are necessary, bird flight diverters or high visibility marking devices should be used.

8. Where permanent meteorological towers must be maintained on a project site, use the minimum number necessary.

9. Use construction and management practices to minimize activities that may attract prey and predators to the wind energy facility.

10. Employ only red, or dual red and white strobe, strobe-like, or flashing lights, not steady burning lights, to meet Federal Aviation Administration (FAA) requirements for visibility lighting of wind turbines, permanent met towers, and communication towers. Only a portion of the turbines within the wind project should be lighted, and all pilot warning lights should fire synchronously.

11. Keep lighting at both operation and maintenance facilities and substations located within half a mile of the turbines to the minimum required:

a. Use lights with motion or heat sensors and switches to keep lights off when not required.

b. Lights should be hooded downward and directed to minimize horizontal and skyward illumination.

c. Minimize use of high-intensity lighting, steady-burning, or bright lights such as sodium vapor, quartz, halogen, or other bright spotlights.

d. All internal turbine nacelle and tower lighting should be extinguished when unoccupied.

12. Establish non-disturbance buffer zones to protect sensitive habitats or areas of high risk for species of concern identified in pre-construction studies. Determine the extent of the buffer zone in consultation with the Service and

state, local and tribal wildlife biologists, and land management agencies (e.g., U.S. Bureau of Land Management (BLM) and U.S. Forest Service (USFS)), or other credible experts as appropriate.

13. Locate turbines to avoid separating bird and bat species of concern from their daily roosting, feeding, or nesting sites if documented that the turbines' presence poses a risk to species.

14. Avoid impacts to hydrology and stream morphology, especially where federal or state-listed aquatic or riparian species may be involved. Use appropriate erosion control measures in construction and operation to eliminate or minimize runoff into water bodies.

15. When practical use tubular towers or best available technology to reduce ability of birds to perch and to reduce risk of collision.

16. After project construction, close roads not needed for site operations and restore these roadbeds to native vegetation, consistent with landowner agreements.

17. Minimize the number and length of access roads; use existing roads when feasible.

18. Minimize impacts to wetlands and water resources by following all applicable provisions of the Clean Water Act (33 USC 1251-1387) and the Rivers and Harbors Act (33 USC 301 et seq.); for instance, by developing and implementing a storm water management plan and taking measures to reduce erosion and avoid delivery of road-generated sediment into streams and waters.

19. Reduce vehicle collision risk to wildlife by instructing project personnel to drive at appropriate speeds, be alert for wildlife, and use additional caution in low visibility conditions.

20. Instruct employees, contractors, and site visitors to avoid harassing or disturbing wildlife, particularly during reproductive seasons.

21. Reduce fire hazard from vehicles and human activities (instruct employees to use spark arrestors on power equipment, ensure that no metal parts are dragging from vehicles, use caution with open flame, cigarettes, etc.). Site development and operation plans should specifically address the risk of wildfire and provide appropriate cautions and measures to be taken in the event of a wildfire.

22. Follow federal and state measures for handling toxic substances to minimize danger to water and wildlife resources from spills. Facility operators should maintain Hazardous Materials Spill Kits on site and train personnel in the use of these.

23. Reduce the introduction and spread of invasive species by following applicable local policies for invasive species prevention, containment, and control, such as cleaning vehicles and equipment arriving from areas with known invasive species issues, using locally sourced topsoil, and monitoring for and rapidly removing invasive species at least annually.

24. Use invasive species prevention and control measures as specified by county or state requirements, or by applicable federal agency requirements (such as Integrated Pest Management) when federal policies apply.

25. Properly manage garbage and waste disposal on project sites to avoid creating attractive nuisances for wildlife by providing them with supplemental food.

26. Promptly remove large animal carcasses (e.g., big game, domestic livestock, or feral animal).

27. Wildlife habitat enhancements or improvements such as ponds, guzzlers, rock or brush piles for small mammals, bird nest boxes, nesting platforms, wildlife food plots, etc. should not be created or added to wind energy facilities. These wildlife habitat enhancements are often desirable but when added to a wind energy facility result in increased wildlife use of the facility which may result in increased levels of injury or mortality to them.