

APPENDIX C

Studies and Assessments

- Critical Issues Analysis
- Whooping Crane Habitat Review

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New Frontier Wind Project Critical Issues Analysis

Element Power

FINAL

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Prepared for

**Element Power
421 SW Sixth Ave, Ste 905
Portland, OR 97204**



elementpower

Prepared by

**HDR Engineering, Inc.
701 Xenia Avenue, Suite 600
Minneapolis, MN 55416**

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HDR

INTRODUCTION

BACKGROUND

Element Power (Element) contracted HDR Engineering, Inc. (HDR) to prepare a critical issues analysis (CIA) for a proposed a utility-scale wind energy project and associated transmission line—the New Frontier Wind Project—located in central North Dakota. The CIA identifies potential development constraints on the proposed project related to publicly available data on land use and biological, archaeological, cultural, historical, and surface hydrological resources within a study area defined by Element. The CIA primarily included a desk-top evaluation of the environmental characteristics of the study area. The information presented in the analysis was obtained from the following:

- ESRI ArcGIS online aerial imagery, streets, and basemap information
- United States Geological Survey (USGS) streams and rivers
- Public lands data: Federal Lands, State Lands, and County Lands
- U.S. Geological Survey (USGS) GAP analysis land cover data
- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps
- USFWS county level species information
- Federal Aviation Administration (FAA) registered airports and Department of Defense (DOD) Preliminary Screening Tool
- Federal Communications Commission
- USGS topographic maps and digital elevation data
- U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) data
- North Dakota Department of Transportation
- North Dakota Geological Survey
- North Dakota State Water Commission
- North Dakota GIS Hub
- North Dakota Game and Fish Department (GFD) PLOTS lands

The final section of this CIA discusses permits and approvals that may be necessary for construction of the project. Figures are presented after the permits and approvals matrix. A site visit to the study area was conducted by HDR staff on November 20, 2009; the transmission corridor had not been established at the time of the study visit and therefore was not reviewed during the study visit. A memo and photos summarizing the site visit are included in Appendix A. Appendix B includes county zoning information. Appendix C contains Department of Defense Preliminary Screening Tool results. Appendix D contains North American Breeding Bird Survey results for a survey transect in the vicinity of the project.

PROJECT LOCATION

The 44,750 acre study area lies within McHenry and Ward counties, North Dakota (Figure 1). Table 1 outlines the townships and sections within the study area. Table 2 outlines the townships and sections within the newly added transmission corridor.

Table 1. Counties, Townships and Sections within Project Study Area

Township Name	Township	Range	Section
<i>McHenry County</i>			
Bjornson	151N	80W	5, 7, 8, 16-23 26-35
<i>Ward County</i>			

Township Name	Township	Range	Section
Greely	151N	81W	13, 24, 25, 22

Table 2. Townships and Sections within Project Transmission Line Corridor

Township Name	Township	Range	Section
<i>McHenry County</i>			
Bjornson	151N	80W	1-4, 10-15, 22-27
Olivia	151N	79W	6, 7, 18, 19, 30
Brown	152N	80W	1-4, 9-16, 21-28, 33-36
Voltaire	152N	79W	19, 30, 31
Velva	153N	80W	35-36
Lebanon	153N	79W	31-32

POPULATION INFORMATION

Table 3 presents population information obtained from the U.S. Census Bureau: 2000 Census and 2008 Census Estimates for the municipalities and small towns near the study area. Ruso and Benedict are the nearest communities to the study area, located less than 1 mile south and 3.5 miles southwest of the study area, respectively. Voltaire is located within the study area. The Point of Interconnection for the transmission line is located at a substation within the city of Voltaire. Bergen is located 5 miles east of the study area. Butte is located 9 miles east of the study area.

Table 3. Population Estimates for Counties, Cities, and Townships near the Study Area

County/ Township/ Town	2000 U.S. Census Population	2008 U.S. Census Estimate
McHenry County	5,987	5,168
Ward County	58,795	55,986
Bjornson Township	59	52
Greely Township	23	23
Ruso	6	5
Benedict	53	47
Butte	82	82
Bergen	11	10
Voltaire	51	45

Source: U.S. Census Bureau

ENVIRONMENTAL CHARACTERISTICS

LAND USE

Land use within and surrounding the study area is rural in nature, with cultivation and pasture being the primary land uses. Some of the grasslands are used for hay. Numerous farmsteads are scattered within the study area, near accessible roads. Ruso (estimated population 5) is located about 0.5 miles south of the study area. With the exception of paved ND State Highway 41 (ND 41), transportation consists of gravel and two-track roads that, in more level terrain, are laid out on section lines. Most areas of rolling terrain are used as pasture and have not been improved with public transportation features. A relatively

expansive coal strip mine (aerial photos indicated greater than 1,000 acres) is located just to the north of the study area. On-site review documents that at least part of this mine is owned by Consolidated Coal Company. The general location of this mine is shown on Figure 4.

There is one missile silo facility located along ND 41, adjacent to the study area boundary (Figure 4). Aerial photography (2009 FSA) indicates that a heliport is associated with this missile silo facility. A missile silo is located approximately 1 mile south of the study area, near the town of Ruso. Both the missile silo facility and silo appear to be in active use; these sites are likely associated with the Minot Air Force Base, but detailed info on these sites is not readily available. One possible missile silo is located adjacent to the eastern boundary of the study area (Section 5 of Olivia Township). Two other possible missile silos area located approximately one mile east of the eastern project boundary (Section 17 of Voltaire Township) and in Section 28 of Olivia Township. Approximate locations of these missile silos and the missile silo facility are shown on Figure 4.

HDR recommends contacting Minot Air Force Base, given the study area’s close proximity to missile silos. Setbacks or avoidance areas may be related to these types of facilities.

LAND COVER

GAP land cover data (Figure 2), aerial photography, and on-site review indicate that the east side of the study area is primarily cropland and planted grassland and the west half is native grassland. Cropland is planted to small grains and some corn, and most of the planted and native grasslands are used as pasture. Larger trees typically are associated with farmsteads, windrows, and stream channels. Shrubs and small trees are scattered and found on steeper terrain, especially within draws located in the north half of the study area. Open water “aquatic” habitats and seasonal wetlands occur throughout the study area. Wetlands and open water are most dense in the west side of the study area, where NWI data indicates there may be as many as 100 basins per square mile. There are several wetlands greater than 25 acres in size, but most wetlands are less than 3 acres. Most streams within the study area are intermittent in nature and in many cases function as drainageways within tilled agricultural fields and pastures.

Table 4 shows the acreages of each land cover type based on GAP data, which displays generalized cover types at a 30 meter resolution.

Table 4. Gap Analysis Land Cover Types within Study Area

Cover Type	Acres	Percentage of Study Area
Agriculture	33,992	76.0
Wetland	3,663	8.18
Prairie	3,259	7.28
Shrubland	2,278	5.09
Woodland	1,070	2.39
Barren	332	0.74
Developed	156	0.35
Total	44,750	100.0

PUBLIC LANDS

Public and private parks and trail — There are no parks or trails that have been identified within the study area.

USFWS Wetland Easements—USFWS administers a program by which the agency holds perpetual easements on basins (i.e., wetlands) that occur on private lands. Basins covered by a wetland easement cannot be drained, filled, leveled, or burned. However, when these basins dry up periodically due to natural changes in local hydrology, they can be farmed, grazed, or hayed.

The USFWS often maps wetland easements by identifying a larger parcel of land (e.g., the public land survey sections, quarter-sections) rather than the actual basin under easement. Only the basins within these parcels are under easement; uplands are not protected as part of the wetland easement. As part of discussions HDR has had with North Dakota USFWS staff in 2009, the USFWS has indicated features such as roads, turbines, and underground cabling may be placed on uplands within a parcel mapped as a wetland easement. During these discussions, however, the USFWS has requested complete avoidance of basins under USFWS wetland easements.

Publicly available USFWS easement data indicates that large parcels within the study area are in wetland easement (Figure 3). Nearly all of these easements are held in the south and west sides of the study area. Publicly available easement data is mapped at a coarse level, and new wetland easements are continually being negotiated by the USFWS. The USFWS should be contacted prior to site development to determine exact locations of wetland easements and basins on these easements.

USFWS Grassland Easements— Grassland easements are similar to wetland easements except that grassland easements perpetually protect both wetlands and uplands. Uplands within grassland easements may not be cultivated, but may be mowed or hayed, and grass seed harvesting may occur after July 15 each year. Grazing is not restricted on these easements.

As part of discussions that HDR has had with North Dakota USFWS staff in 2009, USFWS has revealed that a relatively new process has been developed by which USFWS may offer the opportunity to revert lands out of USFWS grassland easements via a relinquish and release agreement (the process is informally known as the “reversionary clause”). As part of this agreement, it is possible that the applicant would need to complete an environmental assessment or some other sort of National Environmental Policy Act (NEPA) review, provide financial assurances, and mitigate for the loss of easement (via acquiring easement land elsewhere). Additionally, upon decommissioning of any wind project on grassland easements, the land would “revert” back to the USFWS, with a net result of increasing the overall grassland easements in the region.

Publicly available USFWS easement data indicates that approximately 3 square miles of the study area are in concurrent grassland/wetland easements (Figure 3). These grassland/wetland easements are all located along the west side of the study area, near the county line. Publicly available grassland easement data is mapped at a coarse level, and new grassland easements are continually being negotiated by the USFWS. The USFWS should be contacted prior to site development to determine the exact locations of grassland easements, and to determine if the USFWS is amenable to development on these easements.

Western Area Power Administration (WAPA) and the USFWS are in the process of preparing a Programmatic Environmental Impact Statement (PEIS). This document is needed to identify environmental impacts associated with wind energy development and associated transmission systems; identify mitigation strategies, standard construction practices, and best management practices to reduce potential impacts; and to establish a comprehensive environmental program for evaluating future wind-energy proposals. The draft PEIS is scheduled to be published in the fall of 2010 and the Record of Decision to be published in 2011. Once the PEIS has been finalized, developers can expect that avoidance, minimization, and mitigation measures laid out in the PEIS will be expected for all wind projects with USFWS easement lands. Currently, there is a process (through providing a reversionary

clause) for allowing wind development on USFWS grassland easements. However, this process will require extensive coordination and a project-specific review under the National Environmental Policy Act.

National Wildlife Refuges (NWRs) — NWRs are federal lands that are administered by the USFWS for the mission of conservation, management, and, where appropriate, restoration of fish, wildlife, and plant resources within the United States. No NWRs were identified within the study area. One NWR was identified within 5 miles of the study area. Wintering River NWR is located about 2.5 miles east of the study area. Wintering River NWR is about 200 acres in size and is managed as part of the J. Clark Salyer NWR and Wetland Management District (WMD).

Waterfowl Protection Areas (WPAs) — WPAs are lands that are owned and managed by the USFWS that are primarily managed for waterfowl production and public uses such as hunting, fishing, and trapping. There are two WPAs within the study area; Johnson WPA (1 & 2). Johnson WPA 1 is located north of U.S. Hwy 52, northwest of Voltaire. Johnson WPA 2 is located in Section 25 of Brown Township. There are six WPAs within 5 miles of the study area, ranging from 12 to 320 acres in size (Table 5). (Figure 4).

Table 5: WPAs within 5 Miles of Study Area

Closest Distance from Study Area (mi)	WPA Name
0	Johnson WPA (1)
0	Johnson WPA (2)
1.0	Ziech
1.0	Vendler Johnson
1.25	Knutson
2.0	Otis
2.25	Wintering River
5.0	Kohoutek

Source: USFWS January 2003

Wildlife Management Areas (WMAs)—WMAs are state-owned lands managed by the GFD for wildlife habitat. There are no WMAs within the study area, or within 5 miles of the study area.

School Trust Lands— School trust lands are managed through the North Dakota State Land Department (NDSLD). These lands are dedicated to producing income for schools and trust funds in North Dakota. About 99 percent of school trust lands are leased to farmers and ranchers. In addition, about 99 percent of school trust lands are open to the public for non-vehicular use (NDSLD, 2009). There are no NDSLD school trust lands within the study area. There are three school trust properties adjacent to the study area (Figure 4).

Private Land Open to Sportsmen (PLOTS)—These are private lands that are open to public hunting. These lands are enrolled in one of three GFD programs to enhance fish and wildlife populations for sustained public use. These lands may be jointly enrolled with other federal programs such as the Conservation Reserve Program described below. As of November, 2009, there are three PLOTS parcels located within the study area. There is one PLOTS parcel adjacent to the south side of the study area.

Natural Resources Conservation Service (NRCS) Conservation Reserve Program (CRP)—Under the CRP, landowners are compensated for taking agricultural land out of production for a set contract

period, and payments are made on a per-acre basis. While wind development is allowed within CRP parcels, coordination with landowners and the NRCS is necessary to withdraw the impacted areas from the CRP contract and to compensate the NRCS for any payments already distributed for those areas. HDR recommends contacting the local NRCS field office to identify which lands are enrolled in CRP; permission from the individual landowner for each parcel may be required to gain access to CRP data.

Department of Agriculture (USDA) Loan Coordination—The study area is located within a rural agricultural area. Lands under loan from the USDA require special coordination with the USDA if project activities are proposed within those parcels; this coordination can include a modified NEPA review. HDR recommends contacting the USDA to identify which lands have loans from the USDA; permission from the individual landowner for each parcel is required to gain access to USDA loan data.

PUBLIC SERVICES AND INFRASTRUCTURE

See Figure 1 for roads in the study area and railroads near the study area. Missile silos and the missile silo facility observed during the site review are shown in Figure 4. Airports within a 25 mile radius are shown in Figure 5. Figure 6 shows the locations of FCC-licensed towers and existing transmission lines. During the site visit, the presence of a wind energy facility was noted roughly 15 miles northwest of the study area.

State, county, and local roads—Figure 1 shows roads within the study area. ND 41 runs north-south through the center of the study area, and is the only paved roadway. The primary east-west road is 32nd Street North, which is gravel. Other than this road and a short section of 33rd Street North, there are virtually no roads to the west of ND 41 within the study area, as described in Appendix A. East of ND 41 the roads are mostly two-track trails that follow section lines. As noted during the site visit, none of the two-tracks appeared to have been graded; most are simply two ruts running across the landscape. U.S. Hwy 52 runs east-west through Voltaire, which is adjacent to the northern boundary of the study area. A transportation assessment should be completed to evaluate potential access routes and identify improvements necessary to facilitate project construction and operation.

McHenry and Ward counties and the North Dakota Department of Transportation (NDDOT) may require highway crossing permits for any utility crossings of the county or state roads. The North Dakota Public Service Commission (PSC) has voluntary setback requirements of turbine fall down distance from public roads. Article 6, Section 5 of the Ward County Zoning Ordinance states that wind turbines shall be set back a minimum of the height of the structure from road right-of-way, farmsteads, and electrical transmission lines (Appendix B). Section 4.7.A of the McHenry County Zoning Regulations states that building and structure setbacks must be 150 feet from all section lines and the centerline of all township and county roads, or 250 feet from the centerline of all state and federal highways.

Airports and Heliports—FAA data documents three public airports and eight private airports within 25 miles of the study area (Table 6, Figure 4). Review of aerial photography indicates that there is also a helipad located immediately adjacent to the northeast study area boundary. This helipad appears to be associated with the missile silo facility. Setbacks from public and private airports are typically determined in accordance with North Dakota Aeronautics Commission and FAA requirements. In the past, North Dakota Aeronautics Commission has provided guidance on other wind projects relating to safety for crop dusting aircraft and decreasing their risk of colliding with anemometers and turbines.

Table 6. Public/Private Airports Within 25 Miles of the Study Area

Airport/Heliport Name (Airport ID)	Type	Distance from the Study Area (miles)
Linrud Airstrip (NA13)	Private	5.5
Warren Pietsch (ND42)	Private	8.0
Poleschook (89ND)	Private	10.0
Semchenko (5NA0)	Private	13.0
Crooked Lake Airstrip (20ND)	Private	13.0
Makeeff (2ND2)	Private	20.0
Trinity Medical Center	Private	21.5
Minot International	Public	22.0
Turtle Lake Municipal (91N)	Public	23.0
Millers Airstrip	Private	25.0
Garrison Municipal (D05)	Public	25.0
Flying S Ranch	Private	25.0

Source: FAA, 2009

Railroads— There is one railroad within the study area. A rail line, that appears to be owned by CP Rail, trends southwest-northeast from where it forks off of U.S. Hwy 52, through the northern portion of the study area. An east-west rail line, also owned by Canadian Pacific Railway (CP Rail), runs within 0.25 miles of the south study area boundary (Figure 6).

Pipelines—No pipelines have been identified within the study area. There is a gas pipeline that runs approximately 6.5 miles to the southwest of the study area (Figure 6).

Fiber Optic—The presence of underground fiber optic cable was observed during the site visit. Fiber optic markers were seen along ND 41, 33rd Street North, and 35th Street North.

Mines—As noted during the site visit, a coal strip mine is located adjacent to the northwest edge of the study area. At the time of the site visit, no mining activities were occurring. An active gravel mine is located adjacent to the study area in Section 26 of Greely Township (T151N, R81W). Additional gravel mines are located in the study area in Section 1 of Bjornson Township (T151N, R80W) and Sections 6 and 7 of Olivia Township (T152N, R79), as shown on Figure 4.

Missile Silos and Missile Silo Facility— As previously noted in the Land Use section, a missile silo site, B-7, was observed about 1 mile south of the study area along ND 41, in Section 9 of Otis Township (T150N, R80W). In addition, a missile silo facility was noted adjacent to the northeast study area boundary, along ND 41, in Section 9 of Bjornson Township (T151N, R80W). A possible missile silo is located adjacent to the study area in Section 5 of Olivia Township (T151N, R79W). See Figure 4 for a map of these locations.

Based on correspondence with the U.S. Air Force, provided by Element, HDR understands that the Air Force would like a setback distance of at least 1,200 feet from any missile facility. According to the correspondence, the closest turbine to a missile site is 2,800 feet (personal correspondence, Element Power, 2010).

Transmissions lines and FCC towers— One 230 kilovolt (kV) transmission line was observed trending northeast-southwest along the bluff on the west side of ND 41 (Figure 6). Three-phase distribution lines were observed during the site visit along ND 41 and Ward County Road 24/32nd Street

North. Otherwise, distribution lines were present along roadways leading to residences. A 115 kV transmission line is approximately 2 miles west of the study area, and a 230 kV transmission line lies approximately 6.5 miles west of the study area. During the site visit, a meteorological tower was observed along 15th Ave N in McHenry County within the southwest quarter of Section 27 of Bjornson Township (T151N, R80W).

Five FCC communication towers are located within the study area; there are three FCC antennas within 1 mile of the study area (Figure 6). There also appear to be communication structures associated with the military facility located adjacent to the northeast study area boundary. HDR recommends completing a microwave beam path analysis to determine the presence of microwave beam paths in the study area.

Military Facilities, Aviation and Weather Radar

FAA's online *Department of Defense (DoD) Preliminary Screening Tool* (DoD Tool)¹ allows developers to gain preliminary insights regarding potential impacts that structures may have on Long Range Radars, Military Training Routes, and Special Use Airspace prior to official Obstruction Evaluation/Airport Airspace Analysis Filing with the FAA. This tool does not replace any official processes or procedures that may be required by the FAA.

The Long Range Radar Screening type produced the following results for the study area:

- **Green:** No anticipated impact to Air Defense and Homeland Security radars. Aeronautical study required.

The NEXRAD screening type produced the following results:

- **Yellow:** RLOS Coverage At or Below 130m AGL. Impact likely to Weather Surveillance radar – 1988 Doppler (WSR-88D) weather radar operations. Turbines likely in radar line of sight. Impact study required. National Telecommunications & Information Administration (NTIA) notification advised.

The Military Operations screening type produced the following results:

- Your structure falls within the confines of IR678, and may have an impact on military operations. For a more detailed review, please contact Denny Hough at (701)723-2967. This POC (point of contact) will review the analysis and identify any additional areas of concern. Upon completion of this process, the POC will provide you a letter stating the results of the review.

HDR recommends NTIA notification and coordination with the FAA as soon as a project layout is available. The FAA will need to review and authorize the proposed turbine locations prior to construction. HDR recommends contacting the identified POC for military operations for a detailed review of military operations and to identify additional issues of concern. The full DoD Tool review is included as Appendix C.

CULTURAL RESOURCES

Archaeological and Historic Facility Resources

¹ FAA Disclaimer: The DoD Preliminary Screening Tool enables developers to obtain a preliminary review of potential impacts to Long Range Radar(s), Military Training Route(s) and Special Use Airspace prior to official OC/AAA filing. This tool will produce a map of the structure and nearby military airspace or Long Range Radars. The use of this tool is **100% optional** and will provide a first level of feedback and a single point of contact within DoD to discuss impacts/mitigation efforts on the military training mission. **The use of this tool does not in any way replace the official FAA process/procedures.**

A cultural resources database search was completed for the study area. Archaeological and historic facility resources are those places that represent the visible or otherwise tangible record of human activity on the landscape. These resources vary in size, shape, condition, and importance, among other considerations; some are clearly evident on the landscape, while others are buried or only visible to knowledgeable people.

Records were reviewed through the National Register of Historic Places (NRHP) online database which can be accessed through <http://www.nps.gov/history/nR/research/>. This database was used as an initial search to see if any NRHP listed resources are in or near the study area.

It is anticipated that this project falls under multiple state statutes encompassed in the North Dakota Century Code, including:

- 55-03-01, which requires permits to investigate, evaluate, or mitigate adverse effects on cultural resources, historic buildings, structures, or objects in the state of North Dakota.
- 23-06-27, which outlines the protection of unmarked burials and the penalties for their disturbance.
- 55-02-07.1, which protects site location data of prehistoric or historic sites. This statute enables limited access to and release of information from files of the State Historical Society of North Dakota until the director is satisfied that the applicant has a reasonable need for the information as is assured that the release of the information will not result in unnecessary destruction of the resource.
- 55-1008(2) which offers protection to sites listed on the State Historic Sites Registry.
- North Dakota Century Code 49-22 the “North Dakota Energy Conversion and Transmission Facility Siting Act” Which requires the state to site energy conversion facilities and to route transmission facilities in an orderly manner compatible with environmental preservation and the efficient use of resources.

Resources are typically categorized by type and significance. The status of a resource is completed for compliance with Federal regulations, typically Section 106 of the National Historic Preservation Act of 1966 (as amended) (NHPA), by applying the National Register Criteria for Evaluation developed by the National Park Service (Bulletin 15 completed by the staff of the National Register of Historic Places, finalized by Patrick W. Andrus, edited by Rebecca H. Shrimpton, 1990, Revised 1991, 1995, 1997, Revised for Internet 1995, 2001, 2002).

The status of a resource can fall into three possible categories: not eligible, not evaluated, and eligible. A cultural resource is determined “not eligible” when a federal agency has determined the cultural resource to be not eligible for the NRHP. Such resources do not require further investigation. A cultural resource is considered “not evaluated” when a federal agency has not made any determination as to the eligibility of the cultural resource. Further work is needed to understand the significance of the cultural resource. A cultural resource is considered “eligible” when a federal agency has determined the cultural resource to be of value and significant enough to be listed on the NRHP. Coordination with the appropriate parties is needed to discuss project impacts as they relate to the resources.

Resource status is useful for project planning purposes. In addition, when resources have not been evaluated for significance and will be physically impacted by the project, coordination with State Historic Preservation Office (SHPO) to address the impacts will be needed.

Recorded Archaeological and Historic Facility Resources

The online NRHP database was searched for registered properties in McHenry and Ward counties located within the study area and 1 mile outside of the study area. Three NRHP registered historic facilities are located within or 1 mile outside of the study area. These resources include Hotel Berry in Velva, Alfred and Clara Severeid House in Velva, and the Westgaard Bridge in Voltaire.

It is possible there are both recorded and unrecorded resources within the study area that may be significant, but have not been evaluated nor their status determined.

Possible Concerns or Effects

Possible concerns that should be considered for this project include:

- Unrecorded cultural resources located within the study area
- Any ground disturbing activity within the study area that has potential to impact known or unknown cultural resources
- Possible concerns regarding visual impacts to recorded or unrecorded cultural resource properties

Recommendations

Three previously NRHP listed resources have been identified within or near the study area. The presence of previously recorded cultural resources near the project area is an indication that additional as yet undiscovered resources may be present. To assist in initial development of a project layout, HDR recommends a literature search be completed for the study area to identify previously recorded cultural resources. Additionally, HDR recommends that a field survey be completed in the study area prior to construction to identify unrecorded cultural resources that should be avoided. Typically, this includes a field survey for undiscovered cultural resources located (buried or on the surface) within the area potentially directly disturbed by construction activities. Additionally, an evaluation of historic structures within the general project area is sometimes appropriate to inform project development.

If federal permits (e.g. USACE Section 404), federal funds, or federal review under the National Environmental Policy Act is required or used in any part of this project, then Section 106 of the National Historic Preservation Act of 1966 would be applicable. If Section 106 is applicable, a field survey (Phase I Field Inventory) and a formal determination of a resource's eligibility under the NRHP (Phase II Evaluation) will likely be required to consider both recorded and unrecorded above-ground resources.

Taking into consideration the types of climate, agricultural practice, and land use present in the study area, the most probable periods for completing field surveys for archaeological resources would be after spring thaw and before fall freeze, preferably before agricultural land becomes fully grown or after agricultural land has been harvested. However, in area where the primary land use is range land, survey work could take place from spring thaw to fall freeze. An evaluation of historic structures can be completed at any time of the year, but seasons with minimal vegetation cover are more ideal.

GEOLOGIC AND GROUNDWATER RESOURCES

Elevation and Topography

Topography within the study area is undulating, with the steepest topography occurring along a bluff line that trends northwest-southeast west of ND 41 (Figure 7). In addition, steeper topography east of ND 41 is associated with the headwaters of the intermittent streams that occur within wooded draws. There is about a 590 foot (180 meters) range in elevation within the study. Elevation changes within the study area

trend from the southwest (high) to the northeast (low). The high point of about 2,170 feet (660 meters) above sea level (asl) occurs on hilltops within the far west study area. The low point of about 1,575 feet (480 meters) asl occurs along an intermittent stream within the far east side of the study area.

Geology and Groundwater

The study area lies on the eastern side of the Williston Basin and is part of the Missouri Coteau Physiographic Providence. The area is characterized by hilly, collapsed glacial sediment with numerous sloughs, lakes, and closely spaced hills.

The study area is underlain by 6,000 to 8,600 feet of Paleozoic, Mesozoic, and Cenozoic sedimentary rocks that dip towards the west. The Cannonball and Hell Creek formations directly underlay the glacial drift. The Tertiary Cannonball Formation is described as olive black, carbonaceous, and lignitic siltstone and shale, and micaceous, friable sandstone. The unit is generally 225 feet thick in the study area. The underlying (older) Mesozoic Hell Creek Formation consists of gray, greenish-gray, and brown sandstone, mudstone, siltstone, carbonaceous shale, and thin lignite seams. The unit ranges from 200 to 275 feet in thickness where it is overlain by the Cannonball Formation (Bluemie 1982).

Surficial geology within the vicinity of the study area consists of glacial till deposits. The sediments are described as yellowish-brown to olive-gray unsorted, unbedded mixture of angular, subangular, and rounded blocks of rock, gravel, and sand in a stiff matrix of silt and clay. Discontinuous lenses of sand and gravel are common. In the study area, the deposits consist of a steeply sloping bouldery surface of glacial sediment. Hilly areas with numerous kettles with partially to non-integrated drainage are also present. . Glacial sediment thickness ranges from approximately 100 to 200 feet in the study area (Randich 1981).

No recorded areas of seismic activity or subsistence were identified in the study area (National Atlas).

Economic coal deposits were identified within the northwestern portion of the study area. These deposits meet the minimum criteria established by coal companies operating surface mines in North Dakota. These deposits have not been mined and do not represent active mining areas. An active strip mine is located adjacent to the northwest of the study area (Murphy 2008). The mine is listed as being owned by the Consolidated Coal Company (NDDOT 2003). Appendix A indicates this mine appeared to be inactive during the site visit. Construction of the proposed wind farm could restrict or interfere with future surface mining activities for coal reserves.

Six aggregate mining locations (gravel pits) were identified in the study area. Numerous sites were located in the vicinity, to the south of the study area, near Ruso and to the north and northeast of the study area near Velva and between Voltaire and Bergen. Approximately 17 sites were identified within 2 miles of the study area. The locations of the gravel pits are shown in Figure 4.

Groundwater is mainly supplied in the study area by glacial-drift aquifers. The glacial-drift aquifers occur in buried sand and gravel deposits associated with bedrock valleys and glacioaqueous deposits. Bedrock aquifers also provide a source of water, but the quality and yield is significantly less. The Hell Creek and Fox Hill aquifers occur in medium-grained sandstone beds. The rural population and nearby surrounding communities depend on groundwater for their supply. Irrigational use outweighs other uses including rural, municipal, or industrial (Randich 1981). The PSC considers irrigated land an exclusion area under the Energy Conversion Facility Siting Criteria (Section 69-06-08-01-1 of the NDAC²).

² <http://www.legis.nd.gov/information/acdata/pdf/69-06-08.pdf>

SOIL RESOURCES

Only a small percentage of the soils within the study area have been mapped as prime farmland. Most of these mapped prime farmland areas do not appear to be actively cultivated. Figure 8 shows the prime farmland and farmland of statewide and local importance soil classifications. Table 7 shows the acreages of prime farmland within the study area.

Table 7. Prime Farmland Soils Project Study Area

Farmland Status	Acres	% of Study Area
Not Prime Farmland	38,985	87.1
Unclassified	3,051	6.8
Prime Farmland	2,206	5.0
Prime Farmland if Drained	286	0.6
Farmland of Statewide Importance	146	1.2
Farmland of Local Importance	76	0.6
Total	44,750	100

Source: NRCS SSURGO Soils Data

HAZARDOUS MATERIALS

The Environmental Protection Agency (EPA) Superfund National Priorities List (NPL) database was reviewed to determine the potential major hazardous material issues within the study area. An Environmental Data Resources search was not purchased; however, the NDDOT maps were consulted as they often identify known dumps in the area. No NPL sites are present within the study area or within 5 miles of the study area. The Electric Surf IMPD is located approximately 2 miles northwest of the study area in the city of Velva. The site is listed as a non-NPL site as of September 5, 2000 (U.S. EPA CERCLIS 2009).

The Archer Daniels Midland Processing Facility is located approximately two miles east of Voltaire within the study area. This site is listed under numerous EPA programs including:

- Air Facility System/Emission Inventory System/National Emissions Inventory – Active air pollutant emitter.
- Small Quantity Generator (SQG) – Active. SQG generate more than 100 kilograms, but less than 1,000 kilograms, of hazardous waste per month.
- Toxic Release Inventory (TRI) – Reporter. TRI contains information about where toxic chemicals are being used, manufactured, treated, transported, or released into the environment.

CF Industries, Inc – Velva Terminal is located adjacent to U.S. Hwy 52 and 13th Avenue North, in the study area. This site is listed under numerous EPA programs including:

- Conditionally Exempt Small Quantity Generator (CESQG) – This facility generates 100 kilograms or less per month of hazardous waste, or 1 kilogram or less per month of acutely hazardous waste.

There are no hazardous waste handler sites located within the project area (National Atlas 2009).

An area mapped as a sanitary landfill by an ESRI dataset is located in the study area (Figure 4); this area was not identified on the NDDOT maps discussed above. Aerial photos display a small scrap or junkyard

operation (Figure 4). Observations from the site visit indicated this area is located on a farmer's land and appears to be used for personal storage; no signs were posted.

HDR recommends that a Phase I Environmental Site Assessment (ESA) be conducted on all leased properties within the proposed study area in order to properly locate and avoid hazardous and/or potentially hazardous sites. A current Phase I ESA is often requested by an insurance provider or financier of a project in order to identify potential or existing environmental contamination liabilities.

SURFACE WATER AND FLOODPLAIN RESOURCES

Wetlands and Watercourses

As shown in Figure 9, there are intermittent streams, open water, and seasonal wetlands throughout the study area. Most streams within the study area are intermittent in nature and in some cases function as drainageways within tilled agricultural fields. Most wetlands are less than 3 acres in size and are "prairie pothole" type wetlands. Wetlands are most frequent along the west side of the study area. Streams are generally restricted to the east side of the study area. Wetlands and streams are discussed in more detail in the sections below.

Floodplains

The study area is located in an area of McHenry and Ward counties that has not been mapped by the Federal Emergency Management Agency (FEMA), and Flood Insurance Rate Maps (FIRMs) are not available. Preliminary review of topographic and aerial maps indicates that there may be relatively narrow floodplains associated with the streams located along the east side for study area.

BIOLOGICAL RESOURCES

Wetlands

The NWI program was established by the USFWS to provide maps of wetlands within the United States. These maps are frequently used as a preliminary source of information as part of wetland identification within an area. Table 8 provides the acres of NWI wetlands that have been mapped within in the study area. NWI indicates less than 6 percent of the study area is wetland. Wetland acreage may be even greater than NWI indicates, as on-site review and FSA aerial photography suggests that NWI data, in some cases, maps wetlands at only 80 or 90 percent of actual size. Figure 9 shows the locations of NWI wetlands.

Table 8. NWI Wetlands in the Study Area

Type of Wetland	Acres of Wetland	% of Study Area
Freshwater Emergent Wetland	2,075	4.6
Lake	322	0.72
Freshwater Pond	179	0.4
Freshwater Forested/Shrub Wetland	1.97	< 1.0
Total	2,578	5.7

Source: USFWS NWI

Wetlands and open waterbodies are most dense in the west side of the study area, where NWI data indicates there may be as many as 100 basins per square mile. Several wetlands within the study area are greater than 25 acres in size, but most wetlands are less than 3 acres. Wetlands within the west half of the study area appear to be isolated, and thus would not likely fall under the jurisdiction of the Army Corps of Engineers (Corps). However, most of the wetlands along the west and south sides of the study area, as mentioned in the public lands discussion, are held in USFWS wetland easements (Figure 3).

Approximately eight intermittent streams occur in the east half of the study area. These streams, and wetlands adjacent to these streams, may have the potential to fall under Corps jurisdiction.

Vegetation

As discussed above and shown on Figure 2, the east half of the study area is dominated by planted crops such as small grains, sunflowers, and corn. The west half of the study area is mostly grassland; on-site review confirmed grassland is used for both pasture and hayland. Many of the pasture areas appear to have never been tilled and support native mixed grass plant communities. Green needlegrass, little bluestem, junegrass, blue grama, wheatgrass, and sideoats grama are species that would be expected to occur in these native areas. Moderate to heavy grazing pressure appears to have degraded the quality of some of these native grasslands. Hayed areas have typically been planted to non-native grasses, such as smooth brome and crested wheatgrass, or to alfalfa. Hayed areas are usually correlated with more level terrain.

Larger trees, such as cottonwood, green ash, and willow are typically associated with farmsteads, windrows and with stream channels. Shrubs and small trees are scattered and found on steeper terrain. Shrub and small tree species include silverberry, hawthorn, and chokecherry. Wetlands with seasonal hydrology are expected to support species such as smartweed and prairie cordgrass. Deeper wetland habitats support submersed plants, and emergent species such as cattails.

North Dakota has listed 12 species which are considered noxious weeds throughout the state of North Dakota (North Dakota Century Code chapter 63-01.1³). The Noxious Weed Law requires individuals to control noxious weeds on land they own or control. The North Dakota Weed Mapper has noted the presence of the following noxious weeds: leafy spurge, Canada thistle, wormwood, and field bindweed, along Kongsberg Road, along the eastern boundary of the study area (State of North Dakota 2009). County and city weed boards may develop and compile their own list of noxious weeds, provided the list includes all weeds determined to be noxious by the North Dakota Agriculture Commissioner. McHenry County does not list any noxious weeds but Ward County lists false chamomile and yellow toadflax.

Wildlife

Potential wildlife species within the study area would be typical of agricultural landscapes, pasture grasslands, and wetland habitat in the region. These species include mammals such as badgers, beaver, ground squirrels, chipmunks, mice, voles, rats, moles, shrews, raccoons, skunk, and bats. Snakes, lizards, frogs, and toads are also found in the area. Birds in the area include songbirds, raptors, waterfowl, and other grassland birds. The North American Breeding Bird Survey, discussed later in this report, has identified more than 134 species of birds within the vicinity of the study area.

Construction and operation of wind energy facilities and transmission lines can result in direct and indirect impacts to birds and bats. Direct impacts include strike mortality from turbine blades, power lines, and related infrastructure, electrocution from overhead collector and transmission lines, and loss of habitat. Indirect impacts may include displacement of birds and bats from their habitat, site avoidance, and behavioral modification.

A wide variety of birds may use the study area seasonally during migration. Migrating birds may use local ponds and wetlands for stopovers and local birds use the marshland, shrubland, and forested habitat for nesting. During the site visit, seasonal and open water wetlands were observed in grasslands within the study area. These wetlands are typical “prairie pothole” type wetlands that are found within the region.

³ <http://www.legis.nd.gov/cencode/t041c47.pdf>

Bats may be found within the Project area due to the potential presence of roosting habitat (rock formations, caves, human-made structures, dead or dying trees, etc.) and feeding habitat (riparian corridors and wetlands with higher nocturnal insect densities).

Terrestrial wildlife is most common in grasslands, fencerows, intermittent creeks, and wetland areas. These areas provide corridors for migration and foraging as well as ample cover for small mammals, raptors, waterfowl, upland game birds, and other common wildlife in the area.

The GFD has identified 100 Species of Conservation Priority (SoCP) across the State in its Wildlife Action Plan (Hagen et al. 2005). These species are considered important for conservation in the State of North Dakota but do not have any legal protection. Table 9 shows SoCP mammals, reptiles, and amphibians known within the Missouri Coteau region, which includes the study area. SoCP birds are discussed in the next section.

Table 9. Mammals, Reptiles, and Amphibians of Conservation Priority Within the Missouri Coteau Region

Species			Habitat
Common Name	Scientific Name	Type of Species	
Richardson’s ground squirrel	<i>Spermophilus richardsonii</i>	Mammal	Sandy, well-drained soils of prairies and pastures.
Canadian toad	<i>Bufo hemiophrys</i>	Amphibian	Margins of lakes, ponds, and prairie potholes.
Plains spadefoot	<i>Spea bombifrons</i>	Amphibian	Found in the dry prairies, sagebrush communities, and farm fields.
Western hognose snake	<i>Heterodon nasicus</i>	Reptile	Prefers sandy or gravelly habitats like sand prairies, very open portions of prairies, or sand dunes with very little cover.
Smooth green snake	<i>Liochlorophis vernalis</i>	Reptile	Grasslands.

Source: North Dakota Wildlife Action Plan

A review of the North Dakota Natural Heritage conservation database was not completed for this analysis, but is recommended if the project is advanced to identify species of concern or ecosystems considered significant by the state of North Dakota. See the section below for more information on federally protected species and North Dakota SoCP.

Breeding Bird Surveys

There are no North American Breeding Bird Survey (BBS) routes that cross the study area. There are three BBS routes within 25 miles of the study area; Denbign (12 mi north), Douglas Creek (25 mi southwest), and Sheyenne Lake (25 mi southeast). Survey routes are shown on Figure 10. Surveys along each 24.5 mile long route are conducted annually during the peak of the nesting season, usually in May or June. The results of these surveys are used to estimate the number of birds that a very good birder would encounter in about 2.5 hours of birding along the BBS route. The Denbign BBS has recorded 123 bird species, the Douglas Creek BBS recorded 114 species, and the Sheyenne Lake BBS recorded 124 species (Appendix D).

The 10 most frequently recorded BBS species along each route are listed in Table 10.

Table 10: Ten Most Frequently Recorded Species in BBS

Route Name	Bird Estimate*	Common Name	Scientific Name
Denbigh	150.0	Western meadowlark	<i>Sturnella neglecta</i>
	110.1	Red-winged blackbird	<i>Agelaius phoeniceus</i>
	107.3	Chestnut-col. longspur	<i>Calcarius ornatus</i>
	76.3	Brown-headed cowbird	<i>Molothrus ater</i>
	76.1	Mourning dove	<i>Zenaida macroura</i>
	71.1	Horned lark	<i>Eremophila alpestris</i>
	61.8	Western kingbird	<i>Tyrannus verticalis</i>
	59.3	Common grackle	<i>Quiscalus quiscula</i>
	43.8	Vesper sparrow	<i>Pooecetes gramineus</i>
	40.5	Yellow-head. blackbird	<i>Xanthocephalus xanthocephala</i>
Sheyenne Lake	474.2	Red-winged blackbird	<i>Agelaius phoeniceus</i>
	258.6	Yellow-head. blackbird	<i>Xanthocephalus xanthocephala</i>
	226.7	Brown-headed cowbird	<i>Molothrus ater</i>
	162.6	Western meadowlark	<i>Sturnella neglecta</i>
	158.3	Common grackle	<i>Quiscalus quiscula</i>
	111.0	Mallard	<i>Anas platyrhynchos</i>
	92.1	Horned lark	<i>Eremophila alpestris</i>
	83.4	Mourning dove	<i>Zenaida macroura</i>
	68.5	Cliff swallow	<i>Petrochelidon pyrrhonota</i>
	66.6	Clay-colored sparrow	<i>Spizella 16meria</i>
Douglas Creek	229.9	Horned lark	<i>Eremophila alpestris</i>
	182.0	Western meadowlark	<i>Sturnella neglecta</i>
	176.7	Red-winged blackbird	<i>Agelaius phoeniceus</i>
	155.8	Brown-headed cowbird	<i>Molothrus ater</i>
	97.8	Cliff swallow	<i>Petrochelidon pyrrhonota</i>
	95.2	Common grackle	<i>Quiscalus quiscula</i>
	82.3	Mourning dove	<i>Zenaida macroura</i>
	66.0	House sparrow	<i>Passer domesticus</i>
	54.1	Lark bunting	<i>Calamospiza melanocorys</i>
	41.0	Eastern kingbird	<i>Tyrannus tyrannus</i>

*the number of birds that a very good birder would encounter in about 2.5 hours of birding along the BBS route.

As noted in the wildlife discussion, above, GFD has developed a list of 100 Species of Conservation Priority (SoCP). Of the 100 species on this list, 45 are birds.

The Denbign BBS has recorded 31 species that are considered SoCP, Douglas Creek 28, and Sheyenne Lake 31. The 10 most frequently recorded SoCP along each BBS route are listed in Table 11.

Table 11: Ten North Dakota Species of Conservation Priority Recorded in BBS

Route Name	Bird Estimate*	Common Name	Scientific Name
Denbign	107.3	Chestnut-col. longspur	<i>Calcarius ornatus</i>
	39.3	Upland sandpiper	<i>Bartramia longicauda</i>
	31.5	Grasshopper sparrow	<i>Ammodramus savannarum</i>
	24.8	Bobolink	<i>Dolichonyx oryzivorus</i>
	23.2	Lark bunting	<i>Calamospiza melanocorys</i>
	20.0	Franklin's gull	<i>Larus pipixcan</i>
	18.8	Baird's sparrow	<i>Ammodramus bairdii</i>
	17.1	Sprague's pipit	<i>Anthus spragueii</i>
	7.6	Black tern	<i>Chlidonias niger</i>
	4.6	Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Sheyenne Lake	57.3	Bobolink	<i>Dolichonyx oryzivorus</i>
	41.8	Lark bunting	<i>Calamospiza melanocorys</i>
	32.1	Grasshopper sparrow	<i>Ammodramus savannarum</i>
	20.6	Sedge wren	<i>Cistothorus platensis</i>
	16.0	Wilson's phalarope	<i>Phalaropus tricolor</i>
	15.7	Upland sandpiper	<i>Bartramia longicauda</i>
	15.5	American white pelican	<i>Pelecanus erythrorhynchos</i>
	14.2	Black tern	<i>Chlidonias niger</i>
	13.7	Chestnut-col. longspur	<i>Calcarius ornatus</i>
12.2	Redhead	<i>Aythya 17mericana</i>	
Douglas Creek	54.1	Lark bunting	<i>Calamospiza melanocorys</i>
	32.8	Chestnut-col. longspur	<i>Calcarius ornatus</i>
	23.4	Grasshopper sparrow	<i>Ammodramus savannarum</i>
	20.7	Bobolink	<i>Dolichonyx oryzivorus</i>
	15.6	Upland sandpiper	<i>Bartramia longicauda</i>
	11.1	Franklin's gull	<i>Larus pipixcan</i>
	7.9	Northern pintail	<i>Anas acuta</i>
	7.1	Marbled godwit	<i>Limosa fedoa</i>
	3.3	Loggerhead shrike	<i>Lanius ludovicianus</i>
2.4	Willet	<i>Catoptrophorus semipalmatu</i>	

*the number of birds that a very good birder would encounter in about 2.5 hours of birding along the BBS route.

Migratory birds, which include most of the species documented in the BBS, are protected under the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703-712). The MBTA is distinct from the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531-1544) because it protects migratory bird species that are not necessarily threatened or endangered.

Sharp-tailed grouse are ground-nesting game birds that have been recorded along all three BBS routes. Sharp-tailed grouse are known to use grass-covered hilltops, similar to habitats that occur within the study area, as breeding grounds that are referred to as “leks.” Sharp-tailed grouse are known to re-use the same lek locations for consecutive years. While not protected by the MBTA, sharp-tailed grouse are a SoCP. GFD conducts regular surveys for grouse leks and keeps this information in a database that may be made available upon request. GFD offers an open hunting season on sharp-tailed grouse that generally runs from September through January.

More detailed habitat assessments and/or targeted surveys of the study area might need to be conducted prior to construction to evaluate potential impacts to bird and bat species from the proposed project. HDR recommends that Element contact the USFWS, GFD, and the North Dakota Parks and Recreation Department (which oversees the North Dakota Natural Heritage conservation database) to discuss the need for siting surveys and pre-construction plans, including an Avian and Bat Protection Plan (ABPP).

Federally Listed Species

Section 7 of the ESA requires that all federal agencies consider and avoid, if possible, adverse impacts to federally listed threatened or endangered species or their critical habitats, which may result from their direct, regulatory, or funding actions. The USFWS is responsible for compiling and maintaining the federal list of threatened and endangered species. Section 7 of the ESA also prohibits the taking of any federally listed species by any person without prior authorization. The term “taking” is broadly defined at the federal level and explicitly extends to any habitat modifications that may significantly impair the ability of that species to feed, reproduce, or otherwise survive. While the prohibition of “taking” federal species applies to anyone, the prohibition of the destruction or adverse modification of designated critical habitat only applies to federal agencies.

North Dakota USFWS agents have stated in past communications with HDR for other wind projects in the region that Section 10(a)(1)(B) of the ESA allows non-federal parties planning activities that have no federal nexus, but which could result in the incidental taking of listed animals, to voluntarily apply for an incidental take permit. The application must include a Habitat Conservation Plan (HCP) laying out the proposed actions, determining the effects of those actions on affected federally-listed fish and wildlife species and their habitats (often including proposed or candidate species), and defining measures to minimize and mitigate adverse effects.

The USFWS provides federally threatened and endangered species data at the county level for public use. According to the USFWS, McHenry and Ward County support two endangered, one threatened, and one candidate species (Table 12). There is also designated piping plover critical habitat within both McHenry and Ward Counties (Figure 10).

Table 12. Federally Listed Species that Occur in McHenry and Ward Counties

Common Name	Scientific Name	Habitat	Status
Dakota skipper	<i>Hesperia dacotae</i>	Prairie	Candidate
Gray wolf	<i>Canis lupus</i>	Frequently observed in Turtle Mountains	Endangered
Piping plover	<i>Charadrius melodus</i>	Missouri River sandbars, alkali beaches	Threatened/Critical Habitat
Whooping crane	<i>Grus americana</i>	Wetlands; migrant western ND	Endangered

Source: USFWS

Dakota Skipper—The Dakota skipper is a tawny-orange to brown butterfly with a one-inch wingspan. Dakota skippers are known to occur within parts of western Minnesota, northeastern South Dakota, and north-central and southeastern North Dakota. Dakota skippers are typically associated with high quality native prairie ranging from wet-mesic tallgrass prairie to dry-mesic mixed grass prairie. These prairies usually have a high diversity of wildflowers and grasses. Dakota skipper populations have declined historically due to widespread conversion of native prairie. Although no requirement exists to protect candidate species, the USFWS considers it within the spirit of the ESA to consider this species as having significant value and worth protecting.

Gray Wolf—the gray wolf was historically found throughout North America, with the exception of parts of the southwest and southeast United States. There have been documented occurrences of gray wolves in North Dakota during the 1990s. The presence of wolves in most of North Dakota would likely remain sporadic and consist of occasional dispersing animals from Minnesota and Manitoba (USFWS 2008a). Wolves have most frequently been observed in the Turtle Mountains of North Dakota, approximately 75 miles from the study area (USFWS 2008b).

Piping Plover—the piping plover breeding range stretches from south central Canada into the Midwest United States. The majority of piping plover breeding pairs found in the United States are concentrated in Montana, the Dakotas, and Nebraska. This population of piping plover winters in the Gulf of Mexico. In North Dakota, the piping plover nests on midstream sandbars along the Missouri and Yellowstone Rivers and along shorelines of alkali wetlands. More piping plovers nest in North Dakota than any other state (USFWS 2008b). The 1996 breeding census recorded about 1,400 breeding pairs within the Northern Great Plains.

There is no USFWS-designated critical habitat for the piping plover in the study area (50 CFR Part 17); the closest piping plover critical habitat is within Spichke WPA, about 12 miles east of the study area (Figure 10). No obvious alkali wetlands were observed for accessible roadways during on-site review. The one-day on-site visit does not represent a comprehensive inventory of alkali wetlands within the study area, however, and further review may be required to confirm the presence or absence of suitable piping plover breeding habitat within the study area. If breeding habitat is determined to be absent, there still may remain potential for piping plover to move or migrate across the study area.

Whooping Cranes—Historic nesting ranges for the whooping crane are thought to have extended throughout the northern Great Plains (Whooping Crane International Recovery Plan, USFWS 2007a). The Aransas-Wood Buffalo population of whooping cranes winters in the Aransas National Wildlife Refuge on the Texas Gulf Coast, and then migrates across the Great Plains to breed in the summer in the Wood Buffalo National Park in Northwest Territories, Canada. This population contained 236 individuals in October 2007 (Stehn and Wassenich 2008), and is the only self-sustaining wild population (USFWS 2007b).

As shown in Figure 10, the study area is within the central corridor (75 percent zone) within the 200-mile wide migratory corridor; this corridor was identified by the USFWS based on sightings since 1975 (USFWS 2007). According to available GIS data, no sightings have been officially documented within the study area, but several sightings have been documented in proximity to the study as shown in Figure 10. On-site review indicates that some of the wetlands within the study area may have the potential to serve as suitable roosting and feeding habitat for migration stopover. During discussions that HDR has had with North Dakota USFWS agents regarding wind projects in similar North Dakota habitats, the USFWS has stated that wind energy facilities have the “potential to affect” whooping cranes during fall and spring migration. Potential affects may be direct (e.g., collision mortality) or indirect (e.g., avoidance of the site resulting in cranes seeking alternate habitat).

Development of a multi-state, programmatic whooping crane Habitat Conservation Plan (HCP) for wind development is currently in process, which includes the central region of the United States between the Gulf of Mexico and the Canadian border, and makes up the entire portion of the whooping crane's migration corridor. This will provide a mechanism for individual wind development companies to apply for an incidental take permit under the ESA, and thus help prevent the potential liability that would occur if an endangered species is taken without legal protection. The alternative to the programmatic HCP would be the development of an individual, project specific, HCP as part of an incidental take permit.

USFWS has been taking a very cautious approach to energy projects within the whooping crane migratory corridor and should be consulted early on in the project development process to discuss potential impacts and probable avoidance or mitigation strategies.

Recommendations

More detailed habitat assessments and/or targeted surveys of the study area might need to be conducted prior to construction to evaluate potential impacts to bird and bat species from the proposed project. HDR recommends that Element contact the USFWS, GFD, and the North Dakota Parks and Recreation Department (which oversees the North Dakota Natural Heritage conservation database) to discuss the need for siting surveys and pre-construction plans, including an Avian and Bat Protection Plan (ABPP).

PERMITS AND APPROVALS

Table 13 provides a summary of the environmental permits that may be required by federal, state, and local permitting agencies, based on HDR's permitting experience with similar projects. Not all of these permits may be required. Conversely, other permits not listed below may be necessary depending on the issues identified as the project is developed.

Under the PSC process, a letter of intent is required for the construction of an energy conversion or transmission facility within North Dakota. To obtain a Certificate of Site Compatibility from the PSC for a wind project greater than 60 MW nameplate capacity, an Applicant must prepare an application that addresses criteria set forth by the PSC in the Energy Conversion and Transmission Facility Siting Act. A guidance document for this application is found at <http://www.psc.state.nd.us/jurisdiction/pud/energy-conversion-siting-guidelines.pdf>. The PSC has voluntary guidelines requesting wind developers have setbacks of 1,500 feet from occupied residences, turbine fall down distance from transmission lines and public roads and 1.5 times the RD from non-leased properties. For transmission lines greater than 115 kV, a Certificate of Corridor Compatibility and Route Permit is required from the PSC. Both the Certificate of Site Compatibility and the Certificate of Corridor Compatibility and Route Permit require adherence to exclusionary criteria, avoidance criteria, selection criteria and policy criteria. Public hearings are associated with both application types.

Tanya Senechal, Deputy Auditor for McHenry County provided contact information for all members on the County Zoning Board (Appendix B) and indicated a conditional use permit and public meeting would be associated with the zoning process. McHenry County Zoning Regulations are available at <http://www.mchenrycountynd.com/about/default.asp?ID=327>. In McHenry County, a fee of \$100 applies to an application for an amendment, conditional use permit, variance permit or any other activity which requires an advertised public hearing.

HDR contacted McHenry and Ward counties to inquire about local zoning requirements. Mike Vendzel, Director and Building Inspector for the Ward County Tax Equalization Office, indicated that Ward County is very familiar with wind development. A commercial wind energy development is almost complete in the southern part of the county, and meteorological towers are installed in the western part of the county. The wind ordinance for Ward County is attached as Appendix B. No special use permit is necessary, unless wind development occurs in areas zoned as commercial or residential. No permits are necessary for meteorological towers. Public hearings are conducted on a case by case basis; if Mr. Vendzel reviews the plans for wind energy development and believes something should go before the Planning Commission, then a hearing will be conducted. The Planning Commission meets every second Thursday of every month at 7:30 PM.

CONCLUSIONS

Through due diligence and proactive project development, the potential critical issues associated with this study area may be minimized or avoided. According to HDR's review, the critical issues associated with this study area include the following:

- Limited access within the study area due to lack of infrastructure
- Location of the study area centered within the federally listed whooping crane migratory corridor and several whooping cranes sightings near study area
- Sensitive biological habitat (i.e., NWI wetland areas); USFWS wetland and grassland easements; presence of several GFD SoCP within the Missouri Coteau geographic region; and close proximity to WPAs
- A potential impact to NEXRAD and Military Operations
- Possible setbacks or avoidance areas due to the presence of missile silos and a missile silo facility
- Potential impact to undiscovered cultural resources

The site visit confirmed there are a limited number of roads within the study area. A fair amount of infrastructure upgrades may be required in order to accommodate construction and operation of a wind project.

To minimize or avoid these critical issues and other wildlife impacts that may arise, HDR suggests early coordination and consultation with the USFWS regarding wetland and grassland easements, GFD, and the North Dakota Parks and Recreation Department regarding impacts to the sensitive species listed in Tables 9 and 10, as well as other species of birds and bats potentially occurring in the area. HDR additionally recommends that Element consider preparing and implementing an Avian and Bat Protection Plan during construction and operation of the project.

HDR recommends that Element consider the Wind Turbine Guidelines Advisory Committee Recommendations to the USFWS (March 4, 2010⁴) to protect wildlife resources while siting and developing a wind project at this site. This would include consulting with the USFWS and the GFD and completing a more detailed Tier 2 site characterization study. If appropriate, more detailed habitat assessments and/or targeted surveys (Tier 3 field studies) might also be conducted prior to construction to better predict wildlife impacts and identify potential mitigation options. If combined with post-construction monitoring, these studies and surveys will improve the industry's understanding of how select species may be impacted by wind energy development. For this project in particular, potential field studies requested by agencies may include:

- Bat surveys
- Avian point county surveys
- Sharp-tailed grouse lek surveys
- Grassland nesting breeding birds surveys
- Dakota skipper surveys
- Piping plover nesting surveys
- Whooping crane habitat assessment

Regarding impacts to weather radar, HDR recommends coordination with the FAA, NTIA notification, and preparation of an impact study. The identified military operations POC should be contacted for a

⁴ http://www.fws.gov/habitatconservation/windpower/wind_turbine_advisory_committee.html

detailed review of military operations and to determine if additional issues of concern not identified in the DoD Preliminary Screening Tool exist; specifically in regards to the study area's close proximity to missile silos to determine if there are any setbacks or avoidance areas related to this type of facility.

HDR recommends that a Phase I Environmental Site Assessment be completed in the study area prior to construction.

HDR recommends that a cultural resource literature search and field surveys be completed for the study area prior to construction.

HDR recommends pre-permit meetings with McHenry and Ward counties and the PSC to discuss the project and permitting expectations. Although HDR was unable to confirm the public perception towards wind projects in McHenry and Ward counties, local community support is critical for developers to obtain. HDR recommends Element Power contact McHenry and Ward counties and the federal and state agencies with properties in and near the study area early in the development process to explain the project and develop support. Additionally, we recommend that Element develop a public involvement plan to maximize public support.

Table 13. Potential Permits and Approvals

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
Federal Approvals							
FAA	49 USC 44718	Notice of Proposed Construction (Form 7461-1) Hazard Determination Notice of Actual Construction or Alteration (Form 7461-2)	Notifies FAA of proposed structures that might affect navigable airspace. Form requires proposed markings and lighting. FAA must review possible impacts to air safety and navigation, as well as the potential for adverse effects on radar systems.	All turbines/ structures over 200 feet tall; and/or turbines/ structures under 200 feet tall near an airport.	No fee.	One week to prepare application; submit notice at least 30 days prior to anticipated start of construction and after construction has been completed.	http://www.faa.gov/
USACE	Clean Water Act	Section 404 Permit	Required for the discharge of dredged or fill material into waters of U.S. Minimal levels of fill may be covered under existing General Permits/Letters of Permission	Presence of waters of the U.S. that will be impacted by project	No fee.	Depends on level of fill and type of permit required (individual vs. nationwide)	http://www.usace.army.mil/

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
US Fish and Wildlife – Region Six	Section 7/9 /10 of Endangered Species Act (ESA)	Consultation pursuant to Section 7 or 10 of the Endangered Species Act – USFWS and project proponent (or federal agency) to coordinate on how to implement proposed project while avoiding impacts to federally-listed endangered species to the greatest extent feasible.	Determination that “take” is likely to occur during a proposed non-Federal activity and a decision by the landowner or project proponent to apply for an incidental take permit. Federal activities and non-Federal activities that receive Federal funding or require a Federal permit (other than a section 10 permit) typically obtain incidental take authority through the consultation process under section 7 of the ESA. Thus, the Habitat Conservation Plan (HCP) process is designed to address non-Federal land or water use or development activities that do not involve a Federal action that is subject to section 7 consultation.	Presence of endangered species near the study area and project potentially impacting the endangered species. If a federal permit or approval is required, Section 7 Consultation will be necessary.	No Fee	Prior to ground disturbing activities. Depending on project size and potential impacts to listed species – 1 to 6 months.	http://www.fws.gov/endangered/hcp/hcpbook.htm http://www.fws.gov/mountain-prairie/endspp/
	Compatibility Analysis for wetland/ grassland easements	USFWS and project proponent and consult on project compatibility and special use permit for special easements.	If turbines are placed in wetland or grassland easements then a compatibility determination by the wetland management district is required.	Placement of turbines in a wetland or grassland easement	No fee	Prior to ground disturbing activities. Depending on the number of easements the time for review could be longer – 1 to 3 months.	
US Environmental Protection Agency	40 CFR 112	Spill Prevention and Counter-measure Control Plan	Would be required if any facility associated with the project (O&M or substation) has a tank holding more than 1,320 gallons.	Oil storage of more than 1,320 gallons of oil		A copy of the plan will need to be maintained on file with the owner/operator and reviewed by the certifying engineer every five years.	

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
State Approvals							
North Dakota Public Service Commission	Pursuant to North Dakota Century Code 49-22	Certificate of Site Compatibility	For facilities with greater than 60 MW nameplate capacity. The PSC has voluntary requirements requesting wind developers have setbacks of 1,500 feet from occupied residences, turbine fall down distance from transmission lines and public roads and 1.5 times the rotor diameter from non-leased properties	Generation of power described in previous column.		180 days prior to construction (minimum).	http://www.psc.state.nd.us/jurisdiction/electricity-laws.html
	Pursuant to North Dakota Century Code 49-22	Certificate of Corridor Compatibility and Route Permit	High voltage transmission line approval. Application for both approvals can be prepared/reviewed concurrently. Requires adherence to exclusionary criteria, avoidance criteria, selection criteria and policy criteria	Transmission line greater than 115 kV.		180 days prior to construction days prior to construction (minimum).	http://www.psc.state.nd.us/jurisdiction/electricity-laws.html
North Dakota Department of Health	Clean Water Act	Section 401 Certification	Verify that project construction would comply with state water quality standards.	A 401 Water Quality Certification required if a Section 404 permit is required	No fee.	Same as a Section 404 Permit.	http://www.ndhealth.gov/WQ/
	National Pollutant Discharge Elimination System Act	General Permit (Construction)	For stormwater discharges from construction activities	Grading of more than 1 acre.	No fee for small construction activities	Permit to be filed prior to construction with a Stormwater Pollution Prevention Plan (SWPPP).	http://www.ndhealth.gov/WQ/Storm/Construction/ConstructionHome.htm
		Septic Tank and Drainfield Permit	Required for installation of septic system at O&M facility	Installation of a septic system		Prior to construction	

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
North Dakota Division of Emergency Services		Emergency Planning and Community Right-to-Know Act (EPCRA) Tier II report	Use of hazardous chemicals / materials.	Generate 220 pounds or more per month hazardous waste	\$413	Submit annually.	http://www.nd.gov/des/uploads/resources/330/tierii-reportinginfopacket.pdf
North Dakota Department of Transportation		Road Approach/ Access Permit	Required to provide driveway access to state owned right of way.	Project requires change in access to or from state right of way or change in use of property.		Prior to construction	
	North Dakota Century Code 24-01	Utility Permit / Risk Management Documents	Required to install utilities within state owned right-of-way	Project requires a utility line crossing of DOT right-of-way	Between \$100-\$200 per crossing	Prior to construction	http://www.dot.nd.gov/divisions/design/utilitypermits.htm
North Dakota Highway Patrol		Overheight/ Overweight Permit	Required to transport oversize loads on state maintained roads.	Project construction requires oversize/ overweight truck loads.	Depends on load being carried between \$20 and \$100	Prior to construction	http://www.nd.gov/ndhp/permits/permits.html
State Historic Preservation Office (SHPO) and the Office of the State Archaeologist (OSA)	Pursuant to North Dakota Century Code 55-10; 49-22 and Section 106 Compliance	Review and Coordination	Field reviews for archaeological resources will likely be required by the North Dakota PSC as a condition of the Certificate of Site Compatibility. Section 106 Compliance is required if there is a federal permit or approval	Certificate of Site Compatibility Review by the ND PSC or federal permit/approval.	No Fee	Prior to construction	
North Dakota Department of Game and Fish		Wildlife conservation recommendations	Consultation will be required as part of by North Dakota PSC review of the Certificate of Site Compatibility	Certificate of Site Compatibility Review by ND PSC	No Fee		
North Dakota State Water Commission		Temporary Water Permit	Required for temporary use of surface or groundwater	Construction water used onsite		Prior to construction; permit is valid for up to one year	http://www.swc.state.nd.us/4dlink9/4dcgi/GetSubCategoryRecord/Permits/Water%20Permits

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
Local Regulations							
McHenry County	County Zoning Regulations, Article 4, Section 4	Conditional Use Permit (CUP) and Public Hearing	A CUP may be issued for a specified period of time with automatic cancellation at the end of that time unless it is renewed, or conditions may be applied to the issuance of the Permit and periodic review may be required to determine if the conditional use has any detrimental effects on neighboring uses or districts.	Wind development in McHenry County.	\$100	Following the public hearing, the Planning Commission shall consider the application and make a recommendation to the County Commission within 30 days.	http://www.mchenrycountyd.com/about/default.asp?ID=327
	County Zoning Regulations, Article 4, Section 3	Building Permit	No building or structure, other than those associated with the normal incidents of agriculture, shall be erected, moved, added to, or structurally altered without a building permit.	CUP for wind development in McHenry County.		Prior to construction	http://www.mchenrycountyd.com/about/default.asp?ID=327
	County Zoning Regulations, Article 4, Section 5	Variance Permit	Land uses not listed as permitted or a conditional use (i.e. wind development) shall be considered a prohibited use and shall not be allowed without following the amendment or variance procedures of the regulations.	CUP for wind development in McHenry County.	\$100	Prior to construction	http://www.mchenrycountyd.com/about/default.asp?ID=327
Ward County		Special Use Permit	If wind development occurs on land zoned as commercial or residential, a special use permit is necessary. If wind development occurs on land zoned agricultural, no special use is needed.	Wind development on land zoned as commercial or residential.		Prior to construction	http://www.co.ward.nd.us/taxequalization/zoning%20fees.shtml

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
Ward County		Utility Permit on County Highway Right-of-Way	Application necessary for permission to place, construct and maintain utility development on County highway right-of-way.	Construction and placement of utilities on County highway right-of-way.		Prior to construction	http://www.co.ward.nd.us/UserFiles/File/highway/Application%20and%20Permits/Ward%20County%20Utility%20Permit%20w%20Fields.pdf
		Agreement to Repair Utilities under Roadway	The applicant shall maintain any road affected by its work and keep such road in a condition that shall safely and adequately accommodate traffic.	Utility work on County roadway and right-of-way.		Prior to construction	http://www.co.ward.nd.us/UserFiles/File/highway/Application%20and%20Permits/Agreement%20to%20Repair%20Utilities%20under%20Roadway.pdf
		Approach Permit	Approach permit required for construction of an approach, as required by the minimum standards.	Construction of an approach.		Prior to construction	http://www.co.ward.nd.us/UserFiles/File/highway/Application%20and%20Permits/Ward%20County%20Approach%20Permit.pdf
	Article 20	Building Setback Requirements When Abutting Highways	All land subdivided under the provisions of this resolution, and all non-farm structures constructed, reconstructed or moved within the zoned area of the unincorporated part of Ward County shall provide set-backs when abutting.	May apply to construction of O&M building.		Prior to construction	http://www.co.ward.nd.us/UserFiles/File/highway/Application%20and%20Permits/Setback%20Requirements.pdf

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
		Single Movement of Oversized or Overweight	Required for movement of all wind turbine parts.	Transportation of oversized or overweight loads.	Oversized = \$20 Overweight = \$70 Excessive Overweight = \$210	Prior to construction	http://www.co.ward.nd.us/UserFiles/File/highway/Application%20and%20Permits/Overweight%20&%200Oversized%20Loads%20App%20-%20Windtower.pdf http://www.co.ward.nd.us/highway/loadrestrictions.shtml

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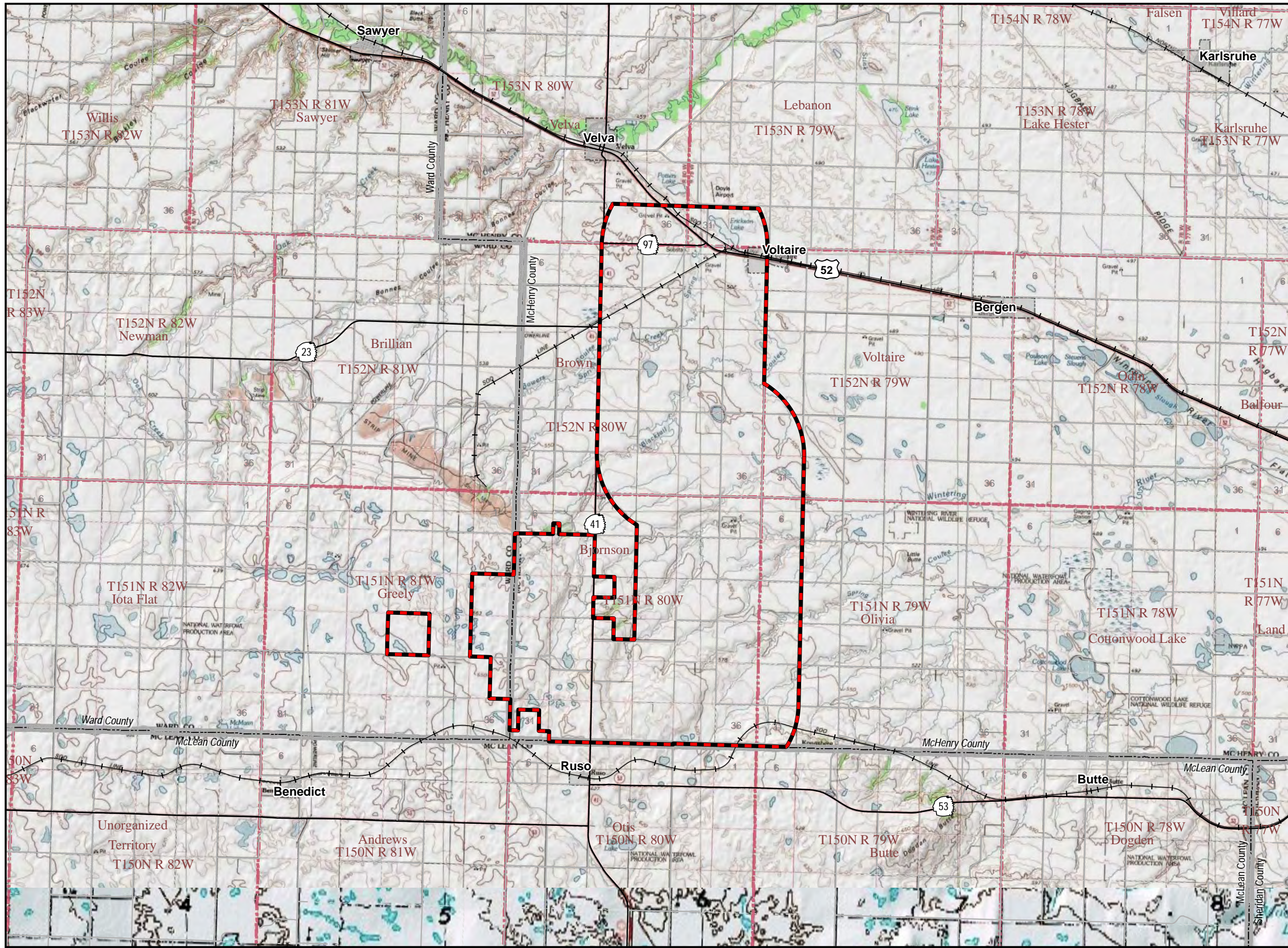
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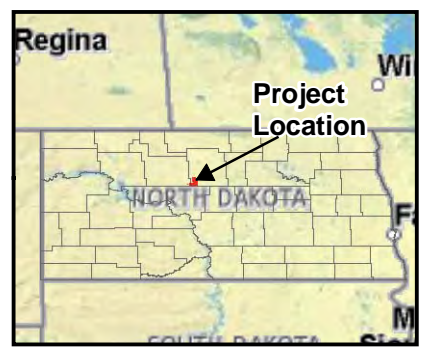
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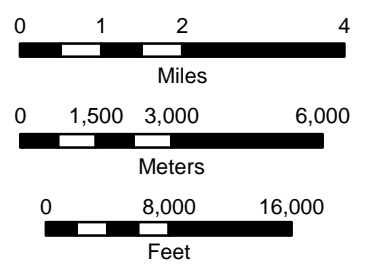
**Element Power
New Frontier
Wind Project**

Figure 1
Study Area Location



McHenry and Ward Counties,
North Dakota

- Study Area Boundary
- Railroad
- Highway
- Local Road
- Municipal Boundary
- Section Boundary
- Township Boundary
- County Boundary



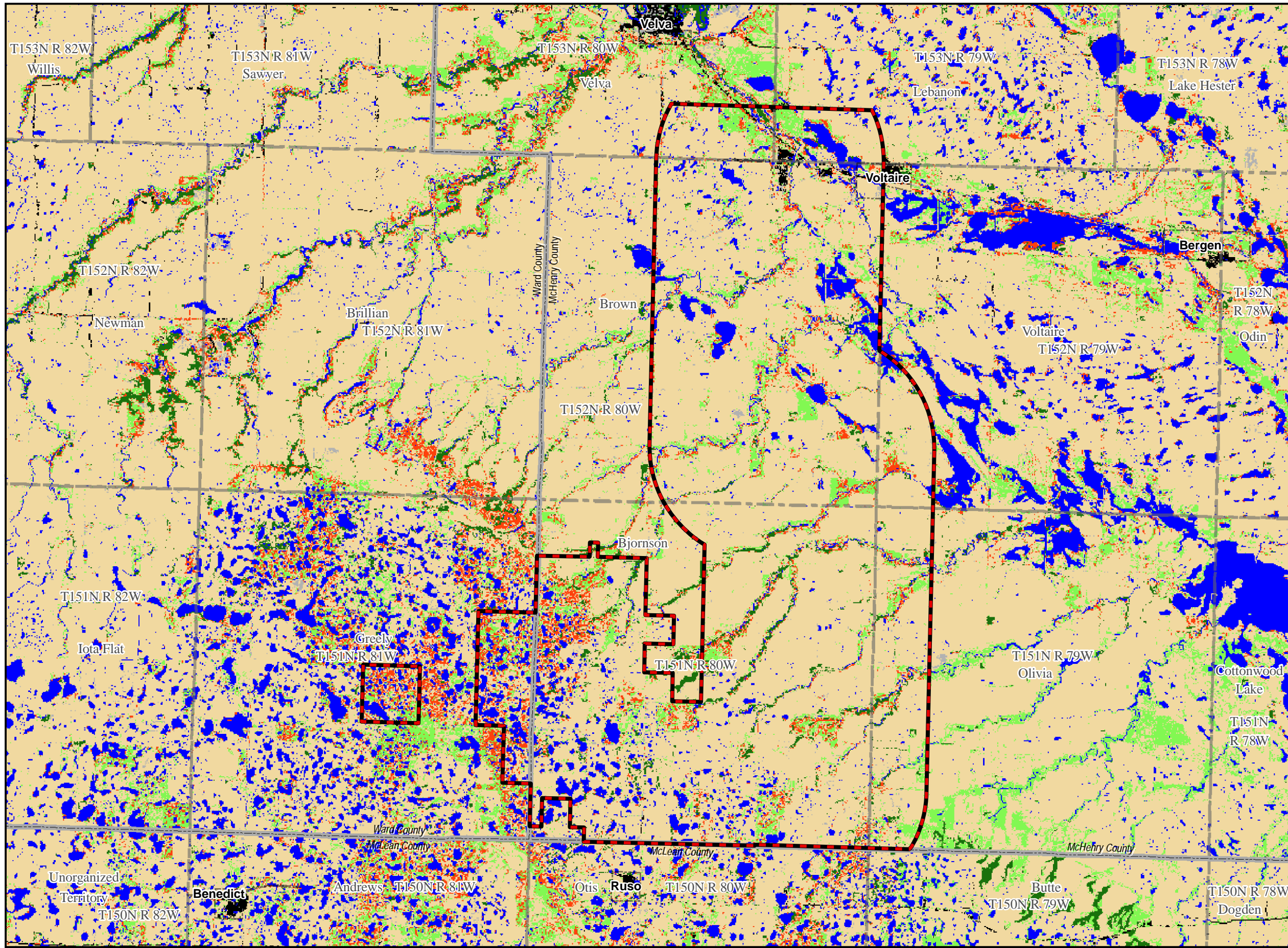
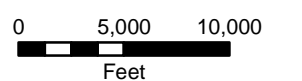
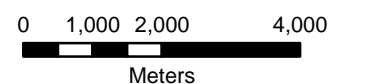
Element Power New Frontier Wind Project

Figure 2 Land Cover



McHenry and Ward Counties,
North Dakota

- Study Area Boundary
- 2004 GAP Land Cover**
- Barren/Sparse Vegetation
- Agriculture
- Developed
- Prairie
- Shrubland
- Wetland
- Woodland






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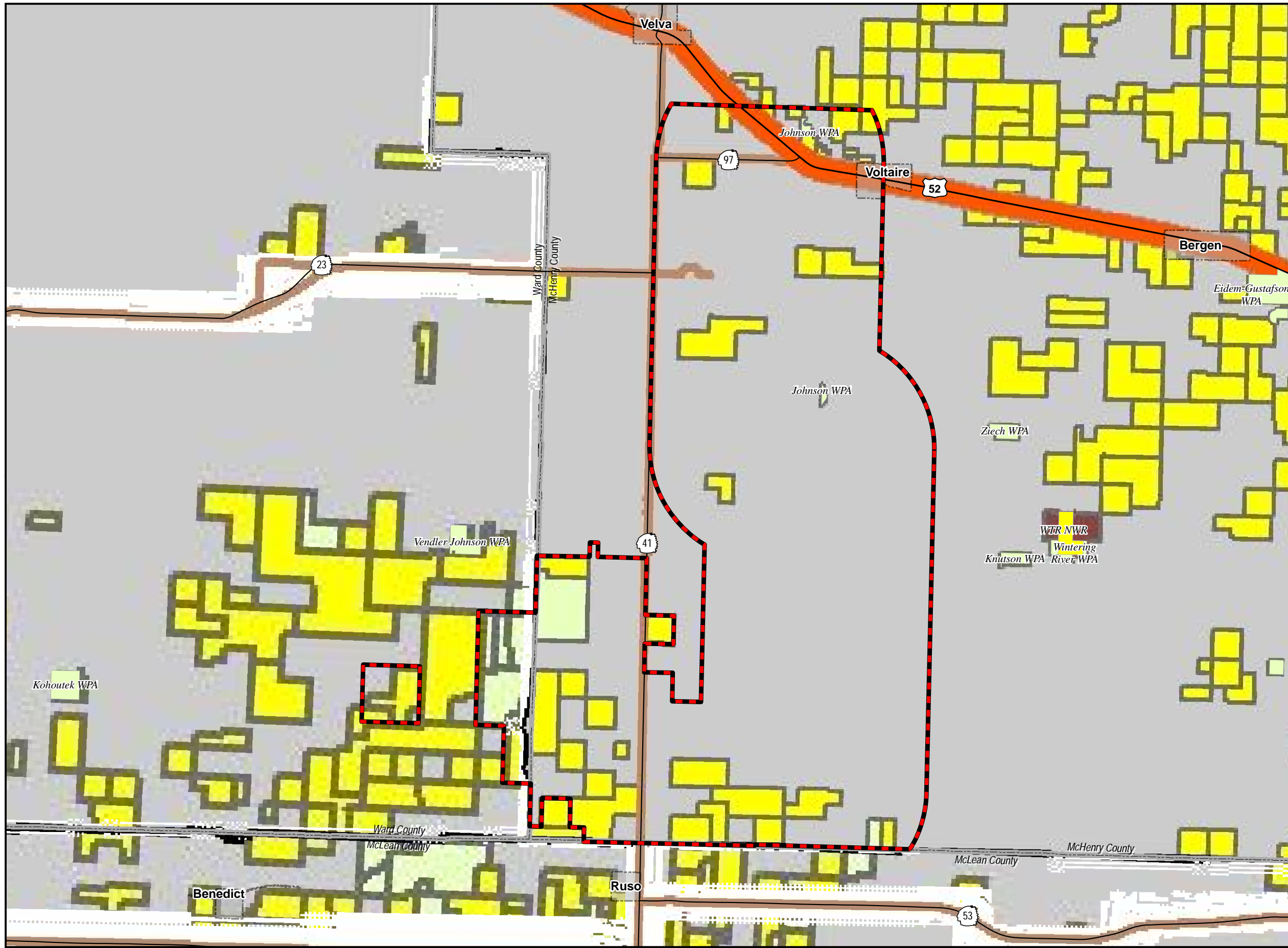
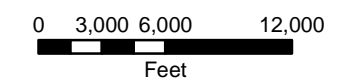
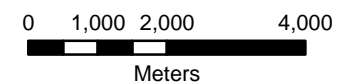
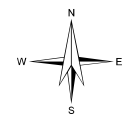
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Figure 3
USFWS Easements



McHenry and Ward Counties,
North Dakota

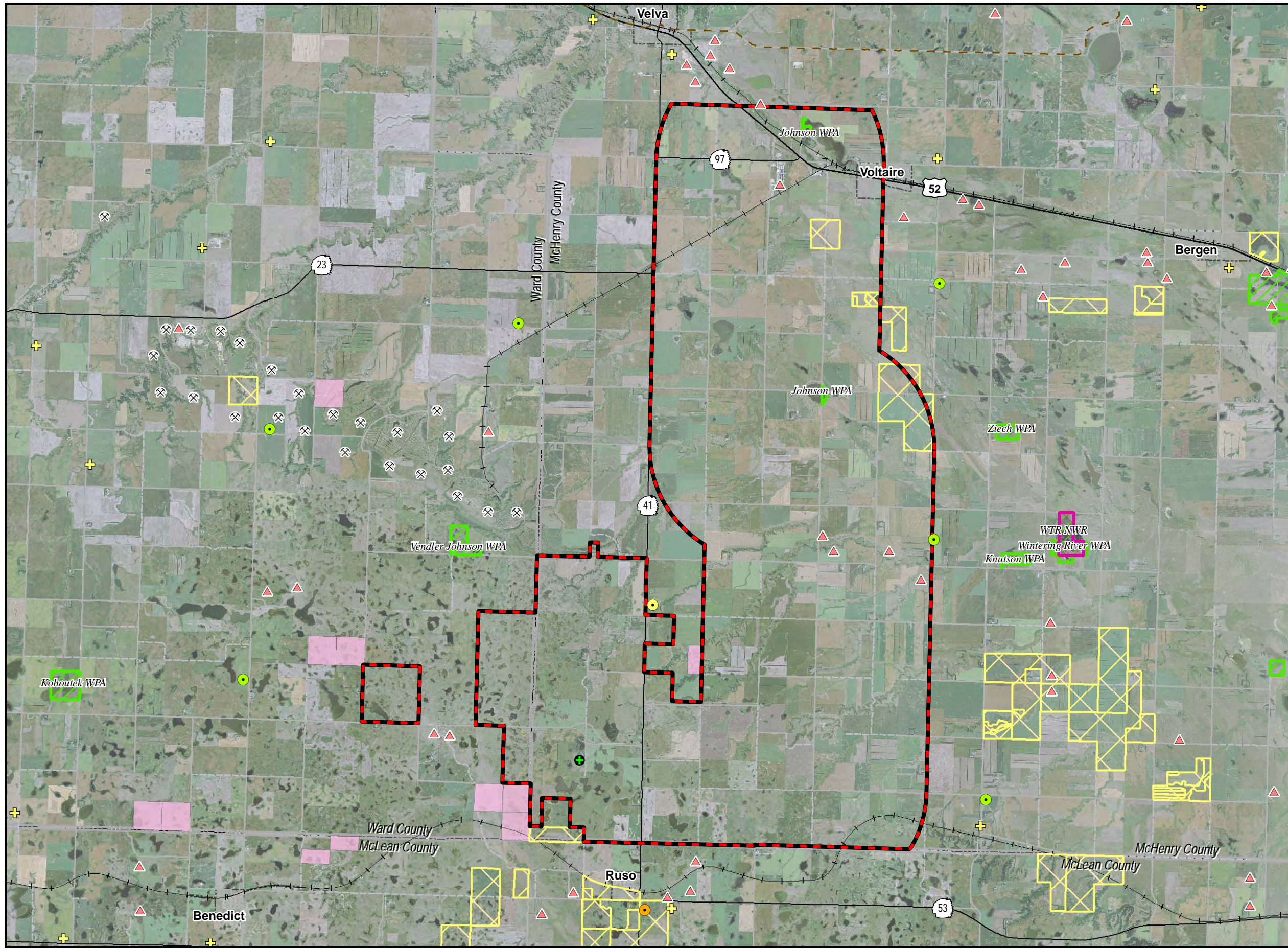
-  Study Area Boundary
-  Wetland Easement
-  Wetland and Grassland Easement



Data Source: US Fish and Wildlife Service, January 2003

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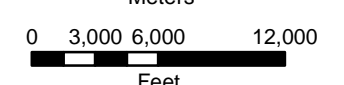
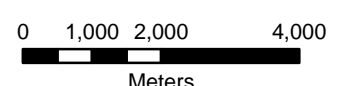
Element Power New Frontier Wind Project

Figure 4
Public Land and
Resources



McHenry and Ward Counties,
North Dakota

- Study Area Boundary
- Missile Silo Facility*
- Missile Silo*
- Possible Missile Silo**
- + Scrap/Junkyard
- + Cemetery
- ▲ Gravel Pit
- ⊗ Coal Mine
- School Trust Land
- PLOTS
- USFWS Land**
- National Wildlife Refuge
- Waterfowl Production Area



*Identified during November 20, 2009 on-site review
 **Identified as part of GIS review; not field verified. Based on possible missile silo signatures on 2009 FSA aerial photos

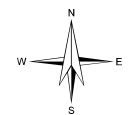
Element Power New Frontier Wind Project

Figure 5
Airports and Heliports



McHenry and Ward Counties,
North Dakota

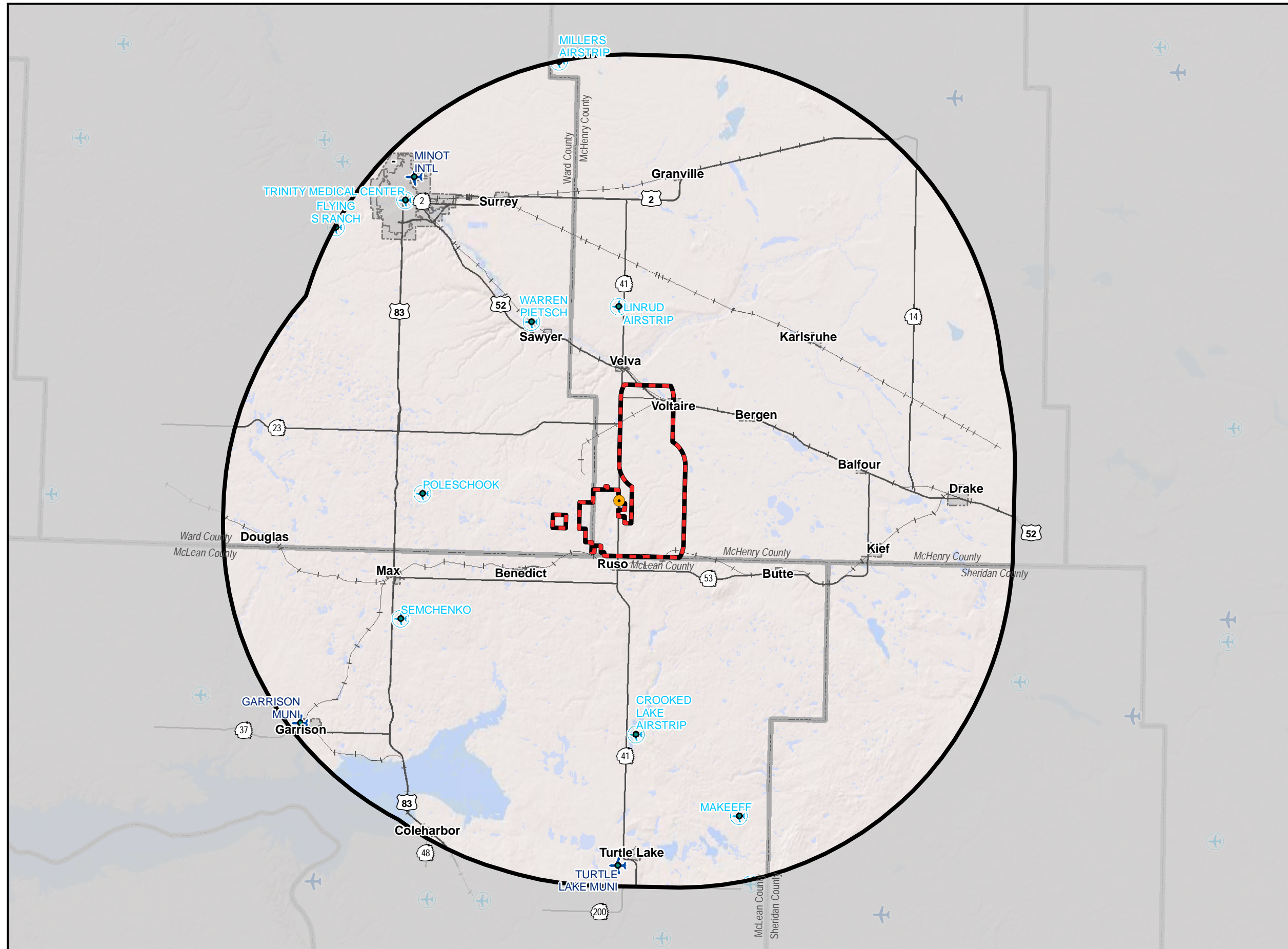
- Study Area Boundary
- 25-mile Project Buffer
- Military Heliport*
- Public Airport
- Private Airport



0 2 4 8
Miles

0 4,000 8,000 16,000
Meters

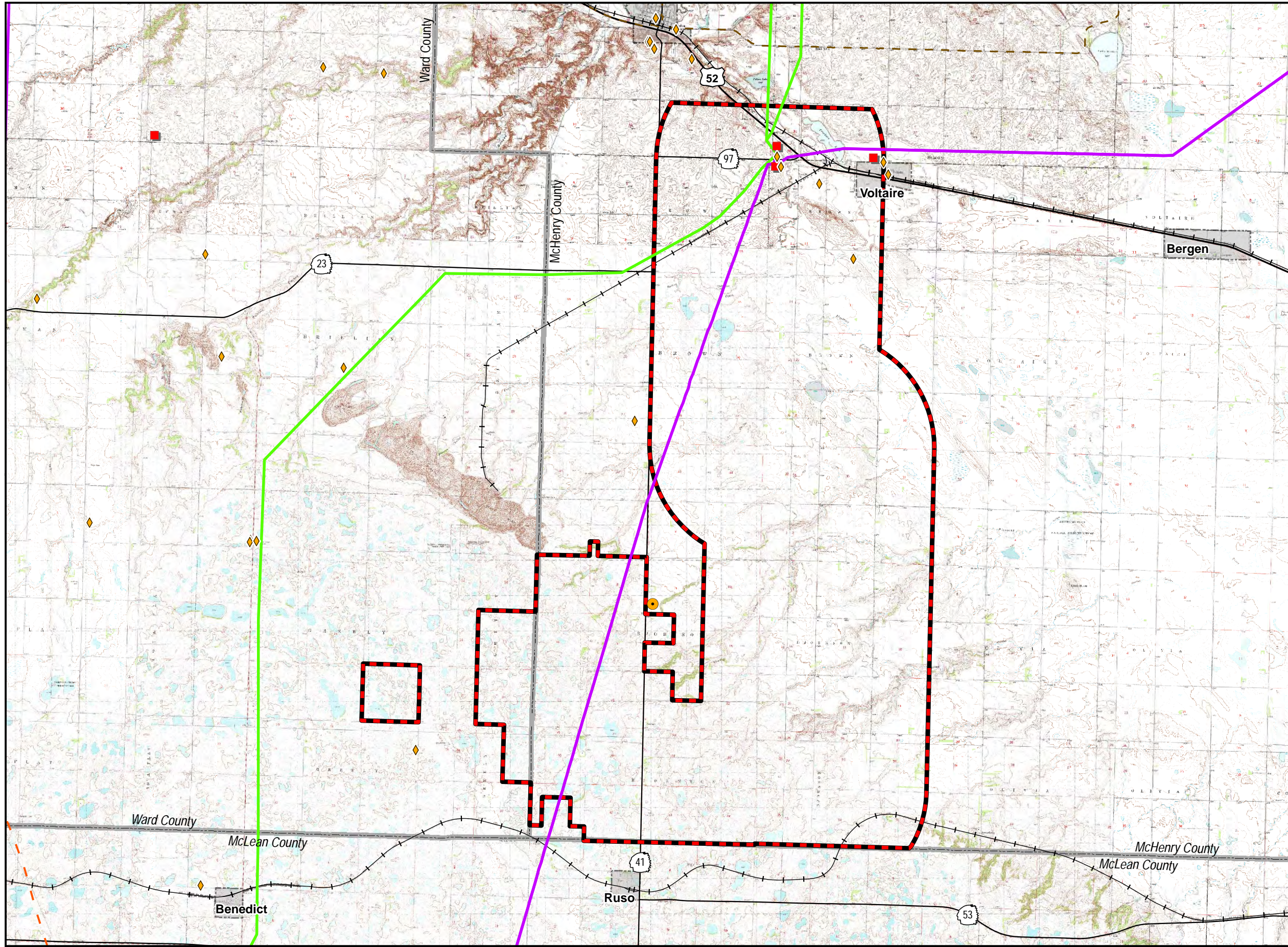
0 15,000 30,000 60,000
Feet



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*Not mapped in FAA database. Identified as part of November 20, 2009 on-site review.

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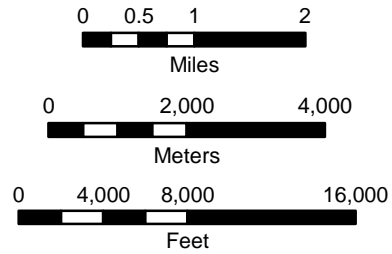


**Element Power
New Frontier
Wind Project**
Figure 6
Communications and
Energy Related
Infrastructure



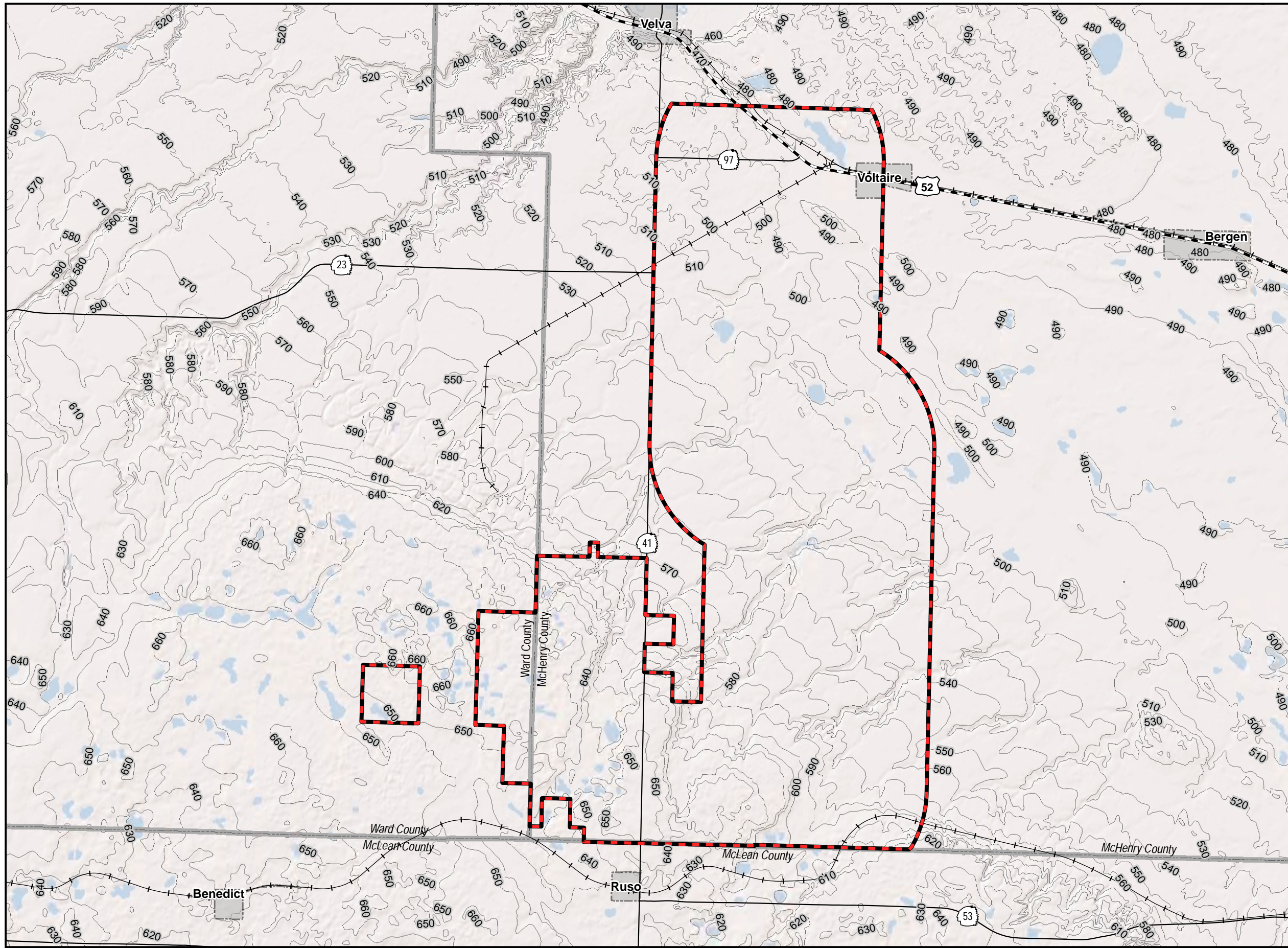
McHenry and Ward Counties,
North Dakota

- Study Area Boundary
- FCC Tower
- Antennas (military)*
- Substation
- Gas Pipeline
- Existing Transmission Lines**
- 230 kV
- 115 kV



*Identified during November 20, 2009 on-site review; Associated with missile silo facility

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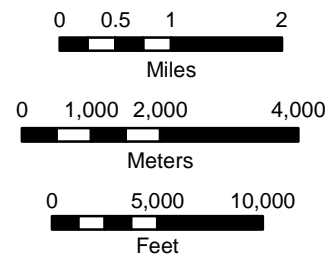
Element Power New Frontier Wind Project

Figure 7 Topography



McHenry and Ward Counties,
North Dakota

- Study Area Boundary
- 10 m Contour



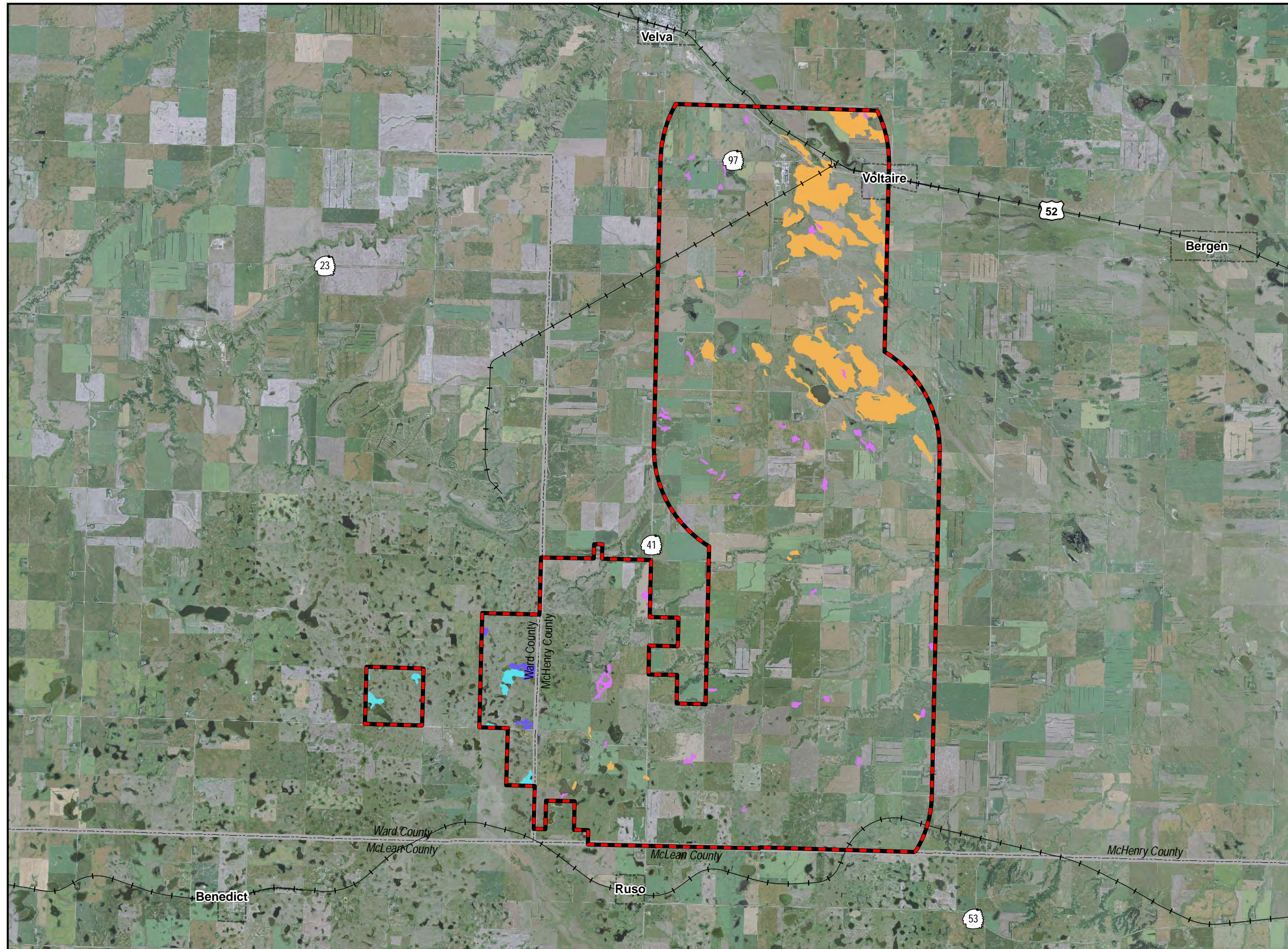
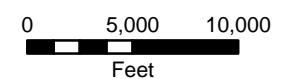
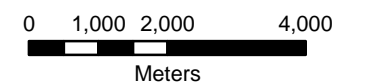
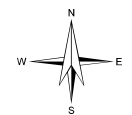
Element Power New Frontier Wind Project

Figure 8 Soils



McHenry and Ward Counties,
North Dakota

- Study Area Boundary
- SSURGO Prime Farmland**
- All areas are prime farmland
- Prime farmland if drained
- Farmland of statewide importance
- Farmland of local importance



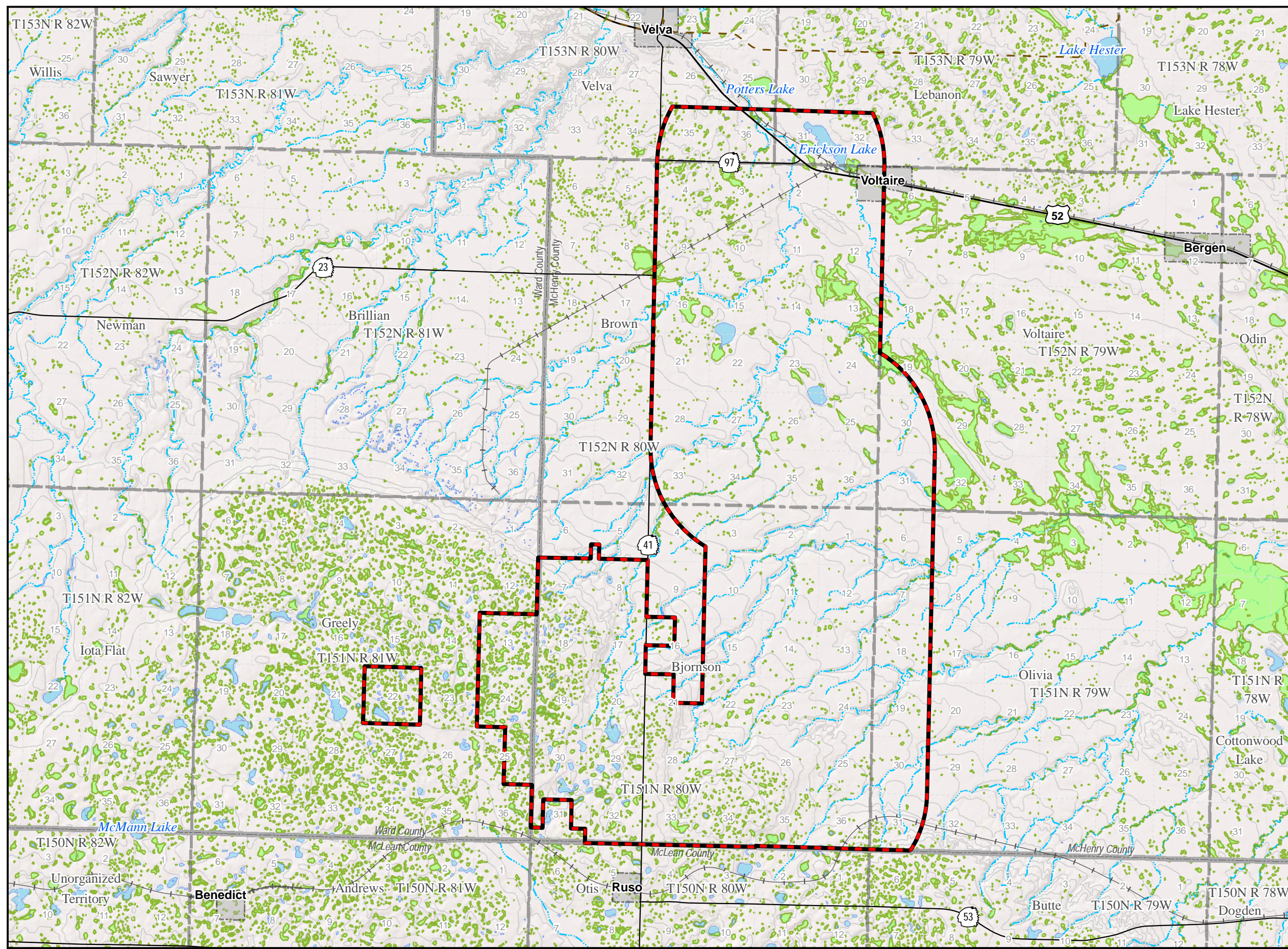
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Element Power New Frontier Wind Project

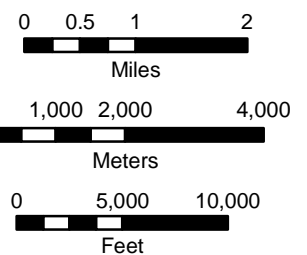
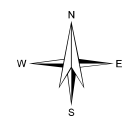
Figure 9 Surface Water and Wetlands



McHenry and Ward Counties,
North Dakota



- Study Area Boundary
- Intermittent Stream
- NWI Wetland**
- Lake or Pond
- Freshwater Emergent Wetland
- 10 m Contour



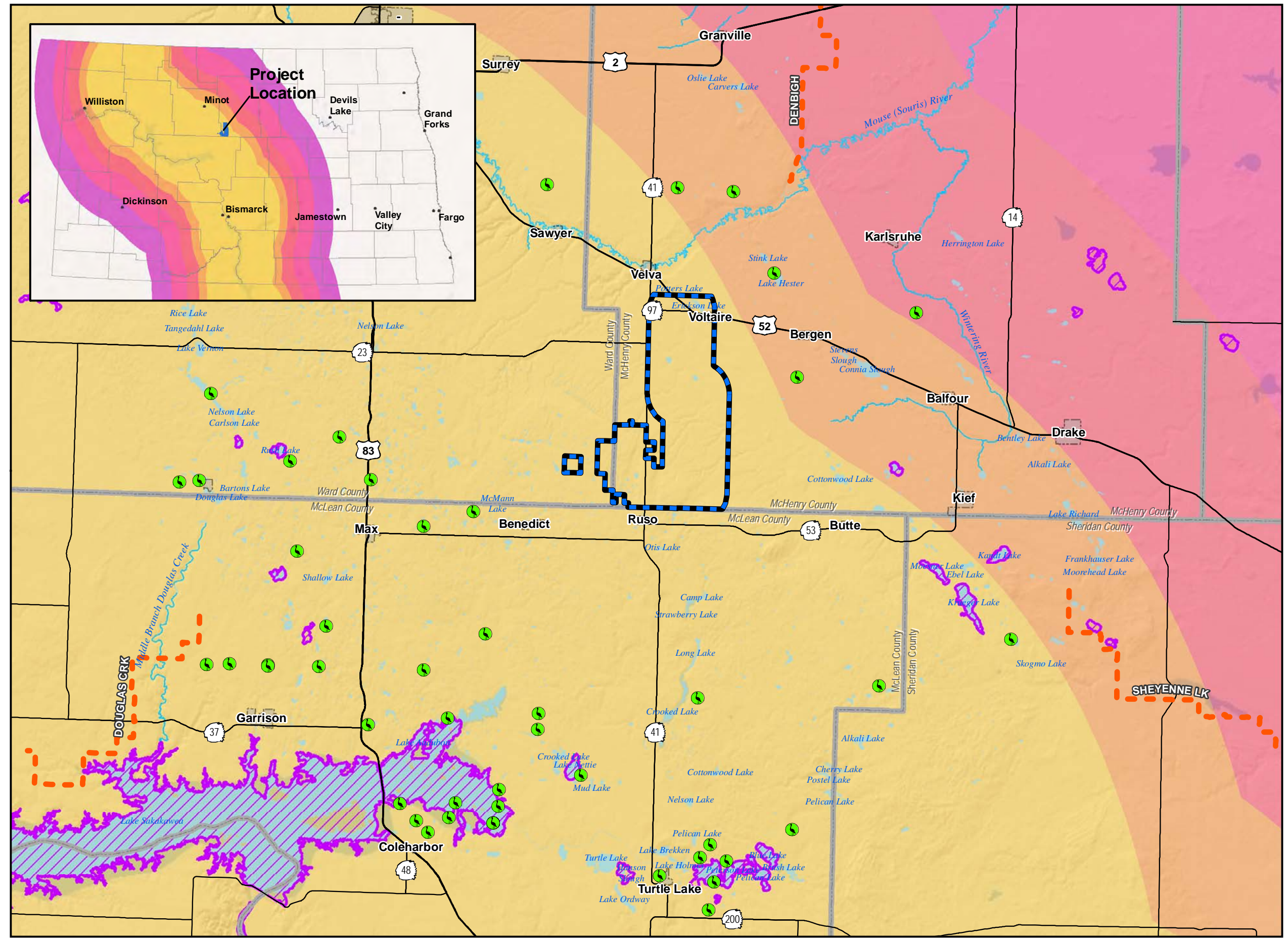
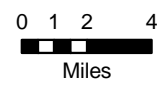
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**Element Power
New Frontier
Wind Project**
Figure 10
Whooping Crane,
Piping Plover, and
Breeding Bird Survey



McHenry and Ward Counties,
North Dakota

- Study Area Boundary
 - Breeding Bird Survey
 - Confirmed Whooping Crane Sightings through Fall 2007
 - Piping Plover Critical Habitat
- Whooping Crane Migration Corridor**
- 40 mi (75.08%)
 - 50 mi (79.44%)
 - 65 mi (85.04%)
 - 85 mi (89.83%)
 - 110 mi (94.83%)



Map Document: (M:\maps-gis-files\gis\proj\ElementPower\125323_NewFrontier\map_docs\CIANewFrontier_11x17L_Fig10WhoopingCrane.mxd) 4/18/2010 4:40:58 PM

Appendix A – Site Visit Memo and Photos

To:	Element Power		
From:	Brian Hunker	Project:	New Frontier Wind Project, Critical Issues Analysis Site Visit
cc:			
Date:	November 23, 2009	Job No:	125323, Task 2

1.0 RE: CRITICAL ISSUES ANALYSIS SITE VISIT

On November 20, 2009, Brian Hunker, Environmental Scientist for HDR, conducted a one day windshield survey of the study area for Element Power’s New Frontier Wind Project, located in McHenry and Ward counties, North Dakota. The survey was conducted from public roadways to confirm general site features within the study area. Major landcover types were also mapped during this visit.

The study area contains few roads, resulting in poor site access. West of State Highway (ND) 41 there are no roads within the middle of the study area. East of ND 41 the roads are mostly two-track trails on section lines (Photo 61).

Topography within the study area is undulating, with the steepest topography occurring along a bluff line that trends northeast-southwest west of ND 41 (Photo 80). In addition, steeper topography east of ND 41 is associated with the headwaters of the intermittent streams that occur within the wooded draws (Photos 80 & 100). The site is situated on the border of the Missouri Plateau and the Drift Prairie geophysical areas. The study area was comprised predominantly of agriculture and pasture lands, with rural farmsteads scattered throughout. Small grains and hay were the dominant crop types (Photo 77), with sunflower and corn planted to a lesser degree. Farmsteads, in most cases, were surrounded by planted tree rows. Pasture was generally associated with steeper terrain. Many of these pastures appeared to have never been tilled, although in most cases, the prairie plant community has been degraded by moderate to heavy grazing pressure (Photo 102). Larger trees were observed to be growing within the draws and riparian areas (Photo 85).

An old coal strip mine was present immediately adjacent to the northwest corner of the study area, in Greely Township (T151N, R81W) (Photos 88-95). The coal mine was evident by vegetated spoil piles and excavated areas. No coal mining activity was observed during the site visit, such as earth moving, haul trucks, or a railway. There was an abandoned railway leading north out of the mine area, along 195th Street SE. No adjacent properties within the study area were posted as being owned or leased by a coal mining company, as is common practice within North Dakota.

Most streams within the study area were intermittent in nature that function as drainageways within tilled agricultural fields or are dammed for stock water ponds within pastures (Photos 70-71). Wetland basins were common, both seasonally flooded and open water basins. Wetlands appeared more common west of ND 41.

Fiber optic cable was the only underground feature noted within the study area. One transmission line was observed trending northeast-southwest along the bluff west of ND 41 (Photo 73). Three-phase distribution

lines were observed along ND 41 and Ward County Road 24/32nd Street N. Otherwise, distribution lines were present along roadways leading to residences.

1.1 TRANSPORTATION FEATURES OF THE STUDY AREA

ND 41 is the major roadway through the study area (Photo 64). Photo 75 shows 33rd Street, a typical gravel road within the study area. Most of the study area was inaccessible under the current road infrastructure. In particular, the area west of ND 41 did not contain roads. Easily accessible roads within the study area are listed in the following table. A majority of these roads followed section lines.

Table 1. Major Roads within Study Area

Name	Orientation
Asphalt	
State Highway 41	N/S
Gravel	
35 th Street N/303 rd Avenue SE	E/W
34 th Street N (only east of ND 41)	E
33 rd Street N (west of ND 41 for 1-mile-long & east of ND 41 for 1-mile-long between 14 th Ave N and 13 Ave N)	E/W
32 ½ Street N (east of ND 41 for 2 miles long)	E/W
County Road 24 /32 nd Street N (31 ½ Street N)	E/W
167 th Street SE	N/S
13 th Avenue N (between 35 th St N and 31 st St N)	N/S

All other roads within the study area were narrow two-track dirt roads (Photo 61). None of the two-tracks appeared to have been graded; most are simply two ruts running across the landscape.

1.2 ABOVEGROUND FEATURES OF THE STUDY AREA

The study area contained a 230 kilovolt (kV) H-frame transmission line that trends northeast-southwest along the base of a bluff west of ND 41 (Photo 76). Three three-phase distribution lines were observed within the study area (Photo 68): one running north-south along ND 41, a second running west from ND 41 along County Road 24 /32nd Street N (31 ½ Street N becomes 32nd Street N), and a third running east from ND 41 along 32 ½ Street N. Distribution lines paralleled less than half of the gravel roadways (noted above), and tended to be associated with larger roads and rural residences. A meteorological tower was observed along 15th Ave N in McHenry County within the southwest quarter of Section 27 of Bjornson Township (T151N, R80W). One communication tower was noted about a half-mile south of the study area along 181st Street SE in Ward County within Section 27 of Greely Township (T151N, R81W).

1.3 UNDERGROUND FEATURES OF THE STUDY AREA

Fiber optic cable was the only marked underground utility that was observed. Fiber optic markers were seen along ND 41, 33rd Street N, and 35th Street N.

1.4 NATURAL FEATURES OF THE STUDY AREA

Agriculture and pasture were the prevalent land uses within the study area. Small grains were the most common crop, with corn and sunflowers planted at lesser amounts (Photo 100). Some fields were tilled, and therefore crop type was not identifiable. In addition, hay lands were frequently observed (Photo 77). Pasture lands are scattered throughout, with a higher density in the west half of the study area (Photo 106). Most of these pastures appeared to never have been tilled and support mixed grass prairie plant communities. Moderate to heavy grazing pressure has degraded the quality of some of these prairies.

No signed wildlife management areas or Private Lands Open to Sportsmen (PLOTS) program parcels were observed within the study area.

Wooded vegetation occupied the prairie draws, mostly located within the northeastern portion of the study area (Photo 100). Large trees were generally restricted to the groves surrounding farmsteads (Photo 81) and draws, although planted tree rows in fields (Photo 99) and wooded wetlands (Photo 62) were occasionally observed.

Wetlands within the study area were scattered and numerous. Wetlands appeared more common within the western and southern portions of the study area. Typically, wetlands were less than five acres in size; and in general, they displayed either open water or seasonal hydrologic characteristics (Photos 105 and 106). Seasonal wetlands were usually surrounded by tilled fields in the northwestern portion of the study area. Open water basins were more common within the western and southern portions of the study area. One open water wetland complex was associated with a dammed intermittent stream near 33rd Street N (Photos 72 & 74). Wetland locations aligned fairly well with U.S. Fish and Wildlife National Wetland Inventory (NWI) mapping, although wetlands are likely slightly larger than the NWI data indicates.

A former coal strip mine was located adjacent to the northwest edge of the study area (Photos 88-95). At the time of the site visit, no mining activities were occurring. An active gravel mine was located adjacent to the study area in Section 26 of Greely Township (T151N, R81W) (Photo 104).

No cemeteries or churches were noted within the study area.

1.5 ADDITIONAL SITE OBSERVATIONS

Missile Silo and Control Facility

A missile silo site, B-7, was observed about one-mile south of the study area along ND 41, in Section 9 of Otis Township (T150N, R80W) (Photo 60). In addition, a missile control facility was noted within the study area along ND 41, in Section 9 of Bjornson Township (T151N, R80W) (Photos 97-98).

Wind Farm

A wind energy facility was observed in the distance, north of the study area.

Photo #	Direction	Caption	Map Book Page
59	N	ND 41; paved; Club 41 in Ruso	F5
60	E	Missile Site B-7; one-mile south of study area	NA
61	E	Intersection of ND 41 and 30th Street N; two-track road - 30th Street N	F5
62	W	Intersection of ND 41 and 30th Street N	F5
63	S	Intersection of ND 41 and 30th Street N; ND 41	F5
64	N	Intersection of ND 41 and 30th Street N; ND 41	F5
65	E	Intersection of ND 41 and 32th Street N; Abandoned house	E5
66	W	Intersection of ND 41 and 30th Street N; fallow field with wetland	E5
67	N	Intersection of ND 41 and 30th Street N; ND 41; 3 Phase line	E5
68	S	Intersection of ND 41 and 30th Street N; ND 41; 3 Phase line	E5
69	E	Intersection of ND 41 and 33rd Street N; Vacant building	D5
70	S	33rd Street N; Intermittent stream	D5
71	N	33rd Street N; Intermittent stream; wooded	D5
72	N	33rd Street N; earthen dam; dammed intermittent stream; 230 kV H-frame	D5
73	S	230 kV H-Frame	D4
74	E	33rd Street N	D4
75	W	33rd street N; bluff line	D4
76	S	230 kV H-Frame	D4
77	W	Hay field and wheat field	D4
78	E	Bluff	D4
79	S	230 kV H-Frame along bluff	D4
80	SE	Intermittent stream valley between ND 41 and the 230 kV H-Frame	D4
81	N	Residence	D4
82	S	Excavated stock pond; hay field	C4
83	E	35th Street N; hay field; corn field; fiber optic marker	C4
84	W	35th Street N; hay field; corn field; fiber optic marker	C4
85	N	corn field; wooded draw	C4
86	NW	Coal mine spoil piles	C4
87	S	Pasture bluffs south of 35th Street N	C4
88	SE	Coal mine spoil piles	C4
89	SE	Coal mine spoil piles	C4
90	S	Coal mine spoil piles	C4
91	S	Coal mine spoil piles	C4

92 S	Coal mine spoil piles	C4
93 SW	Coal mine spoil piles	C4
94 SW	Coal mine spoil piles	C4
95 W	Coal mine spoil piles	C4
96 N	trees of a wood draw	C5
97 N	Missile control facility	D5
98 N	Missile control facility	D5
99 S	Crop field with shelterbelt - tree row	D5
100 N	Wheat field; wooded draw	E5
101 S	Pasture	E5
102 SE	Pasture	E5
103 N	Typical open water wetland on field edge	F5
104 SE	Gravel piles from gravel operation	E2
105 NE	Typical field with open water wetland	D2
106 NW	Typical pasture	D2



P1010059



P1010060



P1010061



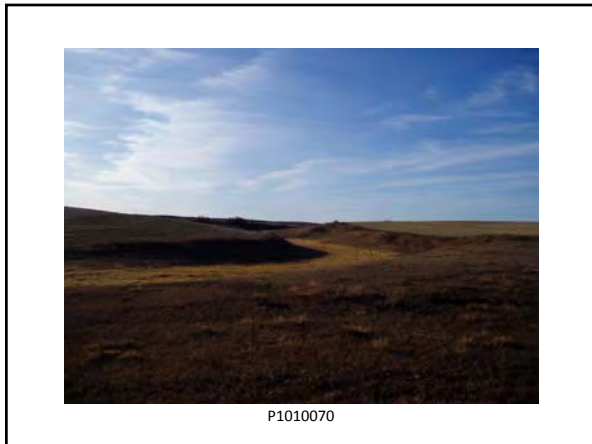
P1010062



P1010063



P1010064







P1010077



P1010078



P1010079



P1010080



P1010081



P1010082



P1010083



P1010084



P1010085



P1010086



P1010087



P1010088





P1010095



P1010096



P1010097



P1010098



P1010099



P1010100



P1010101



P1010102



P1010103



P1010104



P1010105



P1010106

Appendix B – County Zoning

WARD COUNTY TAX DIRECTOR
WARD COUNTY COURTHOUSE

FACSIMILE TRANSMITTAL SHEET

TO:

Ingrid

FROM:

Mike ✓

COMPANY:

DATE

12-2-09

FAX NUMBER:

763-591-5413

TOTAL NO OF PAGES INCLUDING COVER:

PHONE NUMBER:

SENDER'S REFERENCE NUMBER:

RE:

YOUR REFERENCE NUMBER:

URGENT

FOR REVIEW

PLEASE COMMENT

PLEASE REPLY

PLEASE RECYCLE

NOTES/COMMENTS:

Ward County NID - Wind Tower
Zoning

ARTICLE 6
"A-1" AGRICULTURE DISTRICT REGULATIONS

Section 1. A-1 Agriculture District.

The regulations set forth in this article or set forth elsewhere in this order, when referred to in this article, are the district regulations in an "A-1" Agriculture District.

Section 2. Use Regulations.

A building or premises shall be used only for the following purposes:

- A. Farming, including the usual farm buildings and structures.
- B. Truck and flower gardening, nurseries, orchards, and greenhouses.
- C. Public elementary, and high schools, or private schools with a curriculum the same as ordinarily given in public elementary or high schools.
- D. Public or private forest and wildlife reservations or similar conservation projects.
- E. Public parks, parkways and playgrounds.
- F. Quarries for the excavation of stone, gravel, sand, clay or similar minerals.
- G. Roadside stands offering for sale only farm products which are produced on the premises.
- H. Grain elevators and the usual accessory structures including buildings for seasonal temporary storage of grain whenever such elevator and temporary storage are located upon or adjacent to a railroad right-of-way.
- I. Pumping or booster stations along a pipe line or substation along an electrical transmission line.
- J. Sanitary land-fill operations as approved by the County Building Inspector and State Health Department.
- K. Communication towers.
- * L. Electrical wind generator towers.

Section 3. Height Regulations.

No non-agriculture building shall exceed two and one half stories (2 1/2) or thirty-five (35) feet in height except as in Article 16.

Section 4. Area Regulations.

No non-agriculture building shall be erected within fifty(50) feet of any property or street line; provided, however, that temporary roadside stands may be located within the front yards. Off-street

parking requirements for all non-agriculture buildings shall comply with Article 17.

Section 5. Exemptions.

* The uses permitted in Section 2 Subsections K and L shall be exempt from the height regulations in Section 3. These uses shall be set back from the road right of way, farmsteads and electrical transmission lines a minimum of the height of the structure. A permit shall be obtained from the County Building Inspector with a fee of \$500.00 for each tower with a maximum fee of \$2,500.00 on a wind farm project; the developer must submit a site plan before a permit is issued.

INTENSITY OF USE: Every lot or tract of land of the unincorporated areas of Ward County, zoned as agricultural use under authority of this resolution, shall contain at least forty (40) acres.

ARTICLE 7

"R-1" SINGLE-FAMILY RESIDENCE DISTRICT

Section 1. "R-1" Single-Family Residence District.

The regulations set forth in this article or set forth elsewhere in this resolution when referred to in this article are the regulations in the "R-1" Single-Family Residence District.

Section 2. Use Regulations.

A building or premise shall be used only for the following purposes:

- A. Single-family dwelling.
- B. Parks, playgrounds, museums, libraries, and community buildings owned and operated by public agencies.
- C. Public school, elementary or high or a private school having a curriculum the same as ordinarily given in a public school.
- D. Country club or golf course, except miniature course or practice driving tee operated for commercial purposes.
- E. Churches or other places of worship or Sunday school.
- F. Home occupations.
- G. Accessory building or use, including a private garage customarily incident to the above uses but not involving the conduct of a business, and including a private stable.
- H. A church or public bulletin board or temporary sign appertaining to the lease, hire or sale of a building or premise; which sign or bulletin board shall not exceed 10 square feet in area.

McHenry COUNTY PLANNING COMMISSION (zoning)

Darlene Carpenter	407 Main St S Rm 201	Towner ND 58788	537-5724	Term
Robin Gordon	P O Box 334	Drake ND 58736	465-0273	Term
Stephen Ashley	P O Box 66	Velva ND 58790	338-2032	12/31/2009
Vern Kongsle	208 5th Ave NW	Towner ND 58788	537-5668	Term
Erling Markusen	5349 Markusen Lane	Towner ND 58788	728-6699	12/31/2009
Todd Thompson		Towner ND 58788		Term
Debbie Schiele		Towner ND 58788		Term
Clem Leier	P O Box 117	Velva ND 58790	338-2201	12/31/2011
Ardien Tandberg	6839 17th Ave N	Deering ND 58731	728-6433	12/31/2009
Jerry Anderson	PO Box 218	Granville ND 58741	728-6929	
Thomas Weninger	3969 11 Ave NE	Drake ND 58736	465-3235	12/31/2009

Appendix C – Department of Defense Preliminary Screening Tool



<< OE/AAA

DoD Preliminary Screening Tool

Disclaimer:

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

Instructions:

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

Screening Type: Long Range Radar Geometry Type: Single Point

Point	Latitude				Longitude			
	Deg	Min	Sec	Dir	Deg	Min	Sec	Dir
1	48	1	11	N	100	50	33	W

Horizontal Datum:

Map Legend:

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





<< OE/AAA

DoD Preliminary Screening Tool

Disclaimer:

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

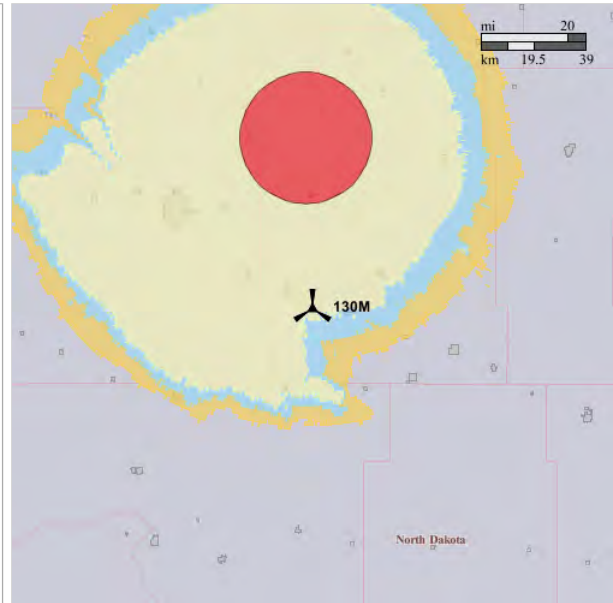
Instructions:

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

Screening Type: Geometry Type:

Point	Latitude				Longitude			
	Deg	Min	Sec	Dir	Deg	Min	Sec	Dir
1	48	1	11	N	100	50	33	W

Horizontal Datum:



Map Legend:

- Green:** Minimal to no impact to Weather Surveillance Radar-1988 Doppler (WSR-88D) weather radar operations. National Telecommunications & Information Administration (NTIA) notification advised.
- Yellow:** RLOS Coverage At or Below 130m AGL. Impact likely to WSR-88D weather radar operations. Turbines likely in radar line of sight. Impact study required. NTIA notification advised.
- Blue:** RLOS Coverage At or Below 160m AGL. Impact likely to WSR-88D weather radar operations. Turbines likely in radar line of sight. Impact study required. NTIA notification advised.
- Gold:** RLOS Coverage At or Below 200m AGL. Impact likely to WSR-88D weather radar operations. Turbines likely in radar line of sight. Impact study required. NTIA notification advised.
- Red:** Impact highly likely to WSR-88D weather radar operations and wind turbine electronics. Turbines likely in radar line of sight. Aeronautical study required. NTIA notification strongly advised.

For more information, or to discuss the screening results, please contact NOAA at wind.energy.matters@noaa.gov



The system is experiencing difficulty in sending Email and FAA is currently working towards resolving this issue.
We apologize for any inconvenience.

« OE/AAA

DoD Preliminary Screening Tool

Disclaimer:

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

Instructions:

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

Screening Type: Military Operations Geometry Type: Single Point

Point	Latitude				Longitude			
	Deg	Min	Sec	Dir	Deg	Min	Sec	Dir
1	47	52	52.82	N	100	56	24.17	W

Horizontal Datum: NAD83

Your structure falls within the confines of IR678, and may have an impact on military operations. For a more detailed review, please contact Denny Hough at (701)723-2967. This POC will review the analysis and identify any additional areas of concern. Upon completion of this process, the POC will provide you a letter stating the results of the review.

This is a preliminary review of your proposal and does not preclude official FAA processes.

Your search data is not retained and the privacy of all your searches is assured.



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

Appendix D – Breeding Bird Surveys



Species List

North American Breeding Bird Survey Route

DENBIGH

<u>Species</u>	<u>Birds/route</u>	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Pied-billed Grebe</u> <i>Podilymbus podiceps</i>	1.84	Route Change	Regional Change	Id Tips
<u>American White Pelican</u> <i>Pelecanus erythrorhynchos</i>	0.31	Route Change	Regional Change	Id Tips
<u>American Bittern</u> <i>Botaurus lentiginosus</i>	2.50	Route Change	Regional Change	Id Tips
<u>Black-crn. Night Heron</u> <i>Nycticorax nycticorax</i>	0.03	Route Change	Regional Change	Id Tips
<u>Canada Goose</u> <i>Branta canadensis</i>	1.38	Route Change	Regional Change	Id Tips
<u>Wood Duck</u> <i>Aix sponsa</i>	0.28	Route Change	Regional Change	Id Tips
<u>Gadwall</u> <i>Anas strepera</i>	3.03	Route Change	Regional Change	Id Tips
<u>American Wigeon</u> <i>Anas americana</i>	0.25	Route Change	Regional Change	Id Tips
<u>Mallard</u> <i>Anas platyrhynchos</i>	9.66	Route Change	Regional Change	Id Tips
<u>Blue-winged Teal</u> <i>Anas discors</i>	5.59	Route Change	Regional Change	Id Tips
<u>Northern Shoveler</u> <i>Anas clypeata</i>	1.53	Route Change	Regional Change	Id Tips
<u>Northern Pintail</u> <i>Anas acuta</i>	3.47	Route Change	Regional Change	Id Tips
<u>Green-winged Teal</u> <i>Anas crecca</i>	0.16	Route Change	Regional Change	Id Tips
<u>Canvasback</u> <i>Aythya valisineria</i>	0.09	Route Change	Regional Change	Id Tips
<u>Redhead</u> <i>Aythya americana</i>	0.16	Route Change	Regional Change	Id Tips

<u>Lesser Scaup</u> <i>Aythya affinis</i>	0.69	Route Change	Regional Change	Id Tips
<u>Hooded Merganser</u> <i>Lophodytes cucullatus</i>	0.06	Route Change	Regional Change	Id Tips
<u>Ruddy Duck</u> <i>Oxyura jamaicensis</i>	0.13	Route Change	Regional Change	Id Tips
<u>Northern Harrier</u> <i>Circus cyaneus</i>	1.91	Route Change	Regional Change	Id Tips
<u>Cooper's Hawk</u> <i>Accipiter cooperii</i>	0.09	Route Change	Regional Change	Id Tips
<u>Swainson's Hawk</u> <i>Buteo swainsoni</i>	2.47	Route Change	Regional Change	Id Tips
<u>Red-tailed Hawk</u> <i>Buteo jamaicensis</i>	2.84	Route Change	Regional Change	Id Tips
<u>Ferruginous Hawk</u> <i>Buteo regalis</i>	0.72	Route Change	Regional Change	Id Tips
<u>American Kestrel</u> <i>Falco sparverius</i>	2.25	Route Change	Regional Change	Id Tips
<u>Gray Partridge</u> <i>Perdix perdix</i>	0.84	Route Change	Regional Change	Id Tips
<u>Ring-necked Pheasant</u> <i>Phasianus colchicus</i>	0.97	Route Change	Regional Change	Id Tips
<u>Sharp-tailed Grouse</u> <i>Tympanuchus phasianellus</i>	0.19	Route Change	Regional Change	Id Tips
<u>Wild Turkey</u> <i>Meleagris gallopavo</i>	0.19	Route Change	Regional Change	Id Tips
<u>Virginia Rail</u> <i>Rallus limicola</i>	0.03	Route Change	Regional Change	Id Tips
<u>Sora</u> <i>Porzana carolina</i>	2.97	Route Change	Regional Change	Id Tips
<u>American Coot</u> <i>Fulica americana</i>	3.16	Route Change	Regional Change	Id Tips
<u>Killdeer</u> <i>Charadrius vociferus</i>	14.09	Route Change	Regional Change	Id Tips
<u>American Avocet</u> <i>Recurvirostra americana</i>	0.25	Route Change	Regional Change	Id Tips
<u>Willet</u> <i>Catoptrophorus semipalmatu</i>	2.41	Route Change	Regional Change	Id Tips
<u>Upland Sandpiper</u> <i>Bartramia longicauda</i>	39.28	Route Change	Regional Change	Id Tips
<u>Marbled Godwit</u> <i>Limosa fedoa</i>	2.72	Route Change	Regional Change	Id Tips
<u>Common Snipe</u> <i>Gallinago gallinago</i>	14.50	Route Change	Regional Change	Id Tips

<u>Wilson's Phalarope</u> <i>Phalaropus tricolor</i>	1.81	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Franklin's Gull</u> <i>Larus pipixcan</i>	20.00	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Ring-billed Gull</u> <i>Larus delawarensis</i>	0.22	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Forster's Tern</u> <i>Sterna forsteri</i>	0.03	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Black Tern</u> <i>Chlidonias niger</i>	7.56	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Rock Dove</u> <i>Columba livia</i>	1.38	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Mourning Dove</u> <i>Zenaida macroura</i>	76.09	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Black-billed Cuckoo</u> <i>Coccyzus erythrophthalmus</i>	4.63	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Great Horned Owl</u> <i>Bubo virginianus</i>	0.66	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Burrowing Owl</u> <i>Athene cunicularia</i>	0.06	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Short-eared Owl</u> <i>Asio flammeus</i>	0.16	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Red-headed Woodpecker</u> <i>Melanerpes erythrocephalus</i>	0.19	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Sapsucker (3 species)</u> <i>Sphyrapicus spp.</i>	0.03	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Yellow-bell. Sapsucker</u> <i>Sphyrapicus varius</i>	0.03	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Downy Woodpecker</u> <i>Picoides pubescens</i>	0.50	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Hairy Woodpecker</u> <i>Picoides villosus</i>	0.09	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Northern Flicker</u> <i>Colaptes spp.</i>	6.94	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Eastern Wood-Pewee</u> <i>Contopus virens</i>	0.19	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Willow Flycatcher</u> <i>Empidonax traillii</i>	1.63	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Willow/Alder Flycatcher</u> <i>Empidonax spp.</i>	1.63	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Least Flycatcher</u> <i>Empidonax minimus</i>	13.59	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Eastern Phoebe</u> <i>Sayornis phoebe</i>	0.38	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>

<u>Say's Phoebe</u> <i>Sayornis saya</i>	0.16	Route Change	Regional Change	Id Tips
<u>Western Kingbird</u> <i>Tyrannus verticalis</i>	61.75	Route Change	Regional Change	Id Tips
<u>Eastern Kingbird</u> <i>Tyrannus tyrannus</i>	33.28	Route Change	Regional Change	Id Tips
<u>Loggerhead Shrike</u> <i>Lanius ludovicianus</i>	0.59	Route Change	Regional Change	Id Tips
<u>Warbling Vireo</u> <i>Vireo gilvus</i>	13.81	Route Change	Regional Change	Id Tips
<u>Red-eyed Vireo</u> <i>Vireo olivaceus</i>	0.72	Route Change	Regional Change	Id Tips
<u>Blue Jay</u> <i>Cyanocitta cristata</i>	0.38	Route Change	Regional Change	Id Tips
<u>Black-billed Magpie</u> <i>Pica pica</i>	3.16	Route Change	Regional Change	Id Tips
<u>American Crow</u> <i>Corvus brachyrhynchos</i>	18.88	Route Change	Regional Change	Id Tips
<u>Horned Lark</u> <i>Eremophila alpestris</i>	71.09	Route Change	Regional Change	Id Tips
<u>Tree Swallow</u> <i>Tachycineta bicolor</i>	1.44	Route Change	Regional Change	Id Tips
<u>N. Rough-winged Swallow</u> <i>Stelgidopteryx serripennis</i>	0.66	Route Change	Regional Change	Id Tips
<u>Bank Swallow</u> <i>Riparia riparia</i>	15.31	Route Change	Regional Change	Id Tips
<u>Cliff Swallow</u> <i>Petrochelidon pyrrhonota</i>	3.00	Route Change	Regional Change	Id Tips
<u>Barn Swallow</u> <i>Hirundo rustica</i>	17.47	Route Change	Regional Change	Id Tips
<u>Black-capped Chickadee</u> <i>Poecile atricapillus</i>	0.81	Route Change	Regional Change	Id Tips
<u>White-breasted Nuthatch</u> <i>Sitta carolinensis</i>	0.09	Route Change	Regional Change	Id Tips
<u>House Wren</u> <i>Troglodytes aedon</i>	24.66	Route Change	Regional Change	Id Tips
<u>Sedge Wren</u> <i>Cistothorus platensis</i>	4.16	Route Change	Regional Change	Id Tips
<u>Marsh Wren</u> <i>Cistothorus palustris</i>	1.53	Route Change	Regional Change	Id Tips
<u>Eastern Bluebird</u> <i>Sialia sialis</i>	0.28	Route Change	Regional Change	Id Tips
<u>Mountain Bluebird</u> <i>Sialia currucoides</i>	0.25	Route Change	Regional Change	Id Tips

<u>Veery</u> <i>Catharus fuscescens</i>	3.56	Route Change	Regional Change	Id Tips
<u>American Robin</u> <i>Turdus migratorius</i>	12.66	Route Change	Regional Change	Id Tips
<u>Gray Catbird</u> <i>Dumetella carolinensis</i>	2.59	Route Change	Regional Change	Id Tips
<u>Northern Mockingbird</u> <i>Mimus polyglottos</i>	0.03	Route Change	Regional Change	Id Tips
<u>Brown Thrasher</u> <i>Toxostoma rufum</i>	6.28	Route Change	Regional Change	Id Tips
<u>European Starling</u> <i>Sturnus vulgaris</i>	16.44	Route Change	Regional Change	Id Tips
<u>Sprague's Pipit</u> <i>Anthus spragueii</i>	17.06	Route Change	Regional Change	Id Tips
<u>Cedar Waxwing</u> <i>Bombycilla cedrorum</i>	4.09	Route Change	Regional Change	Id Tips
<u>Yellow Warbler</u> <i>Dendroica petechia</i>	10.56	Route Change	Regional Change	Id Tips
<u>Black-and-white Warbler</u> <i>Mniotilta varia</i>	0.06	Route Change	Regional Change	Id Tips
<u>American Redstart</u> <i>Setophaga ruticilla</i>	0.50	Route Change	Regional Change	Id Tips
<u>Ovenbird</u> <i>Seiurus aurocapillus</i>	0.03	Route Change	Regional Change	Id Tips
<u>Northern Waterthrush</u> <i>Seiurus noveboracensis</i>	0.13	Route Change	Regional Change	Id Tips
<u>Common Yellowthroat</u> <i>Geothlypis trichas</i>	9.25	Route Change	Regional Change	Id Tips
<u>Yellow-breasted Chat</u> <i>Icteria virens</i>	0.22	Route Change	Regional Change	Id Tips
<u>Chipping Sparrow</u> <i>Spizella passerina</i>	2.84	Route Change	Regional Change	Id Tips
<u>Clay-colored Sparrow</u> <i>Spizella pallida</i>	21.75	Route Change	Regional Change	Id Tips
<u>Vesper Sparrow</u> <i>Poocetes gramineus</i>	43.75	Route Change	Regional Change	Id Tips
<u>Lark Sparrow</u> <i>Chondestes grammacus</i>	0.97	Route Change	Regional Change	Id Tips
<u>Lark Bunting</u> <i>Calamospiza melanocorys</i>	23.22	Route Change	Regional Change	Id Tips
<u>Savannah Sparrow</u> <i>Passerculus sandwichensis</i>	24.22	Route Change	Regional Change	Id Tips
<u>Grasshopper Sparrow</u> <i>Ammodramus savannarum</i>	31.53	Route Change	Regional Change	Id Tips

<u>Baird's Sparrow</u> <i>Ammodramus bairdii</i>	18.81	Route Change	Regional Change	Id Tips
<u>Le Conte's Sparrow</u> <i>Ammodramus leconteii</i>	3.66	Route Change	Regional Change	Id Tips
<u>Nelson's S.t. Sparrow</u> <i>Ammodramus nelsoni</i>	0.50	Route Change	Regional Change	Id Tips
<u>Song Sparrow</u> <i>Melospiza melodia</i>	3.16	Route Change	Regional Change	Id Tips
<u>Swamp Sparrow</u> <i>Melospiza georgiana</i>	0.22	Route Change	Regional Change	Id Tips
<u>Chestnut-col. Longspur</u> <i>Calcarius ornatus</i>	107.28	Route Change	Regional Change	Id Tips
<u>Rose-breasted Grosbeak</u> <i>Pheucticus ludovicianus</i>	0.75	Route Change	Regional Change	Id Tips
<u>Dickcissel</u> <i>Spiza americana</i>	2.00	Route Change	Regional Change	Id Tips
<u>Bobolink</u> <i>Dolichonyx oryzivorus</i>	24.84	Route Change	Regional Change	Id Tips
<u>Red-winged Blackbird</u> <i>Agelaius phoeniceus</i>	110.09	Route Change	Regional Change	Id Tips
<u>Western Meadowlark</u> <i>Sturnella neglecta</i>	150.03	Route Change	Regional Change	Id Tips
<u>Yellow-head. Blackbird</u> <i>Xanthocephalus xanthocephala</i>	40.53	Route Change	Regional Change	Id Tips
<u>Brewer's Blackbird</u> <i>Euphagus cyanocephalus</i>	30.44	Route Change	Regional Change	Id Tips
<u>Common Grackle</u> <i>Quiscalus quiscula</i>	59.34	Route Change	Regional Change	Id Tips
<u>Brown-headed Cowbird</u> <i>Molothrus ater</i>	76.34	Route Change	Regional Change	Id Tips
<u>Orchard Oriole</u> <i>Icterus spurius</i>	9.41	Route Change	Regional Change	Id Tips
<u>Baltimore Oriole</u> <i>Icterus galbula</i>	10.81	Route Change	Regional Change	Id Tips
<u>Pine Siskin</u> <i>Carduelis pinus</i>	0.03	Route Change	Regional Change	Id Tips
<u>American Goldfinch</u> <i>Carduelis tristis</i>	19.06	Route Change	Regional Change	Id Tips
<u>House Sparrow</u> <i>Passer domesticus</i>	38.53	Route Change	Regional Change	Id Tips

Use Back Arrow to Return to Browser



Species List

North American Breeding Bird Survey Route

SHEYENNE LK

<u>Species</u>	<u>Birds/route</u>	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Pied-billed Grebe</u> <i>Podilymbus podiceps</i>	5.29	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Horned Grebe</u> <i>Podiceps auritus</i>	0.14	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Red-necked Grebe</u> <i>Podiceps grisegena</i>	0.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Eared Grebe</u> <i>Podiceps nigricollis</i>	3.14	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Western/Clark's Grebe</u> <i>Aechmophorus spp.</i>	7.19	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>American White Pelican</u> <i>Pelecanus erythrorhynchos</i>	15.52	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Double-crest. Cormorant</u> <i>Phalacrocorax auritus</i>	20.33	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>American Bittern</u> <i>Botaurus lentiginosus</i>	5.38	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Great Blue Heron</u> <i>Ardea herodias</i>	0.29	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Cattle Egret</u> <i>Bubulcus ibis</i>	0.14	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Black-crn. Night Heron</u> <i>Nycticorax nycticorax</i>	11.67	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Canada Goose</u> <i>Branta canadensis</i>	13.71	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Wood Duck</u> <i>Aix sponsa</i>	2.24	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Gadwall</u> <i>Anas strepera</i>	58.81	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>American Wigeon</u> <i>Anas americana</i>	5.00	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>

<u>American Black Duck</u> <i>Anas rubripes</i>	0.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Mallard</u> <i>Anas platyrhynchos</i>	110.95	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Blue-winged Teal</u> <i>Anas discors</i>	48.33	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Northern Shoveler</u> <i>Anas clypeata</i>	22.43	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Northern Pintail</u> <i>Anas acuta</i>	12.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Green-winged Teal</u> <i>Anas crecca</i>	2.33	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Canvasback</u> <i>Aythya valisineria</i>	3.90	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Redhead</u> <i>Aythya americana</i>	12.19	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Ring-necked Duck</u> <i>Aythya collaris</i>	0.57	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Lesser Scaup</u> <i>Aythya affinis</i>	13.43	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Bufflehead</u> <i>Bucephala albeola</i>	0.76	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Hooded Merganser</u> <i>Lophodytes cucullatus</i>	0.14	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Ruddy Duck</u> <i>Oxyura jamaicensis</i>	6.14	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Bald Eagle</u> <i>Haliaeetus leucocephalus</i>	0.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Northern Harrier</u> <i>Circus cyaneus</i>	3.38	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Cooper's Hawk</u> <i>Accipiter cooperii</i>	0.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Swainson's Hawk</u> <i>Buteo swainsoni</i>	1.57	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Red-tailed Hawk</u> <i>Buteo jamaicensis</i>	5.14	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Ferruginous Hawk</u> <i>Buteo regalis</i>	0.14	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>American Kestrel</u> <i>Falco sparverius</i>	0.29	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Gray Partridge</u> <i>Perdix perdix</i>	1.95	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Ring-necked Pheasant</u> <i>Phasianus colchicus</i>	30.76	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>

<u>Sharp-tailed Grouse</u> <i>Tympanuchus phasianellus</i>	4.38	Route Change	Regional Change	Id Tips
<u>Wild Turkey</u> <i>Meleagris gallopavo</i>	0.24	Route Change	Regional Change	Id Tips
<u>Virginia Rail</u> <i>Rallus limicola</i>	0.62	Route Change	Regional Change	Id Tips
<u>Sora</u> <i>Porzana carolina</i>	4.57	Route Change	Regional Change	Id Tips
<u>American Coot</u> <i>Fulica americana</i>	24.52	Route Change	Regional Change	Id Tips
<u>Killdeer</u> <i>Charadrius vociferus</i>	22.05	Route Change	Regional Change	Id Tips
<u>American Avocet</u> <i>Recurvirostra americana</i>	5.95	Route Change	Regional Change	Id Tips
<u>Willet</u> <i>Catoptrophorus semipalmatu</i>	5.33	Route Change	Regional Change	Id Tips
<u>Spotted Sandpiper</u> <i>Actitis macularia</i>	0.71	Route Change	Regional Change	Id Tips
<u>Upland Sandpiper</u> <i>Bartramia longicauda</i>	15.67	Route Change	Regional Change	Id Tips
<u>Marbled Godwit</u> <i>Limosa fedoa</i>	7.95	Route Change	Regional Change	Id Tips
<u>Common Snipe</u> <i>Gallinago gallinago</i>	6.00	Route Change	Regional Change	Id Tips
<u>Wilson's Phalarope</u> <i>Phalaropus tricolor</i>	15.95	Route Change	Regional Change	Id Tips
<u>Franklin's Gull</u> <i>Larus pipixcan</i>	7.52	Route Change	Regional Change	Id Tips
<u>Ring-billed Gull</u> <i>Larus delawarensis</i>	18.10	Route Change	Regional Change	Id Tips
<u>California Gull</u> <i>Larus californicus</i>	0.48	Route Change	Regional Change	Id Tips
<u>Common Tern</u> <i>Sterna hirundo</i>	0.10	Route Change	Regional Change	Id Tips
<u>Forster's Tern</u> <i>Sterna forsteri</i>	1.67	Route Change	Regional Change	Id Tips
<u>Black Tern</u> <i>Chlidonias niger</i>	14.19	Route Change	Regional Change	Id Tips
<u>Rock Dove</u> <i>Columba livia</i>	4.76	Route Change	Regional Change	Id Tips
<u>Mourning Dove</u> <i>Zenaida macroura</i>	83.38	Route Change	Regional Change	Id Tips
<u>Black-billed Cuckoo</u> <i>Coccyzus erythrophthalmus</i>	0.90	Route Change	Regional Change	Id Tips

<u>Great Horned Owl</u> <i>Bubo virginianus</i>	1.19	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Burrowing Owl</u> <i>Athene cucularia</i>	0.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Short-eared Owl</u> <i>Asio flammeus</i>	1.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Common Nighthawk</u> <i>Chordeiles minor</i>	0.24	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Belted Kingfisher</u> <i>Ceryle alcyon</i>	0.29	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Downy Woodpecker</u> <i>Picoides pubescens</i>	0.33	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Hairy Woodpecker</u> <i>Picoides villosus</i>	0.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Northern Flicker</u> <i>Colaptes spp.</i>	2.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Alder Flycatcher</u> <i>Empidonax alnorum</i>	0.14	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Willow Flycatcher</u> <i>Empidonax traillii</i>	6.86	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Willow/Alder Flycatcher</u> <i>Empidonax spp.</i>	7.00	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Least Flycatcher</u> <i>Empidonax minimus</i>	5.48	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Say's Phoebe</u> <i>Sayornis saya</i>	1.14	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Western Kingbird</u> <i>Tyrannus verticalis</i>	56.62	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Eastern Kingbird</u> <i>Tyrannus tyrannus</i>	58.14	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Loggerhead Shrike</u> <i>Lanius ludovicianus</i>	1.52	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Warbling Vireo</u> <i>Vireo gilvus</i>	5.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Red-eyed Vireo</u> <i>Vireo olivaceus</i>	0.19	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Blue Jay</u> <i>Cyanocitta cristata</i>	0.38	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>American Crow</u> <i>Corvus brachyrhynchos</i>	5.86	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Horned Lark</u> <i>Eremophila alpestris</i>	92.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Tree Swallow</u> <i>Tachycineta bicolor</i>	3.86	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>

<u>N. Rough-winged Swallow</u> <i>Stelgidopteryx serripennis</i>	1.71	Route Change	Regional Change	Id Tips
<u>Bank Swallow</u> <i>Riparia riparia</i>	17.81	Route Change	Regional Change	Id Tips
<u>Cliff Swallow</u> <i>Petrochelidon pyrrhonota</i>	68.52	Route Change	Regional Change	Id Tips
<u>Barn Swallow</u> <i>Hirundo rustica</i>	48.76	Route Change	Regional Change	Id Tips
<u>Black-capped Chickadee</u> <i>Poecile atricapillus</i>	0.14	Route Change	Regional Change	Id Tips
<u>House Wren</u> <i>Troglodytes aedon</i>	18.95	Route Change	Regional Change	Id Tips
<u>Sedge Wren</u> <i>Cistothorus platensis</i>	20.62	Route Change	Regional Change	Id Tips
<u>Marsh Wren</u> <i>Cistothorus palustris</i>	21.86	Route Change	Regional Change	Id Tips
<u>Eastern Bluebird</u> <i>Sialia sialis</i>	0.19	Route Change	Regional Change	Id Tips
<u>American Robin</u> <i>Turdus migratorius</i>	9.62	Route Change	Regional Change	Id Tips
<u>Gray Catbird</u> <i>Dumetella carolinensis</i>	1.81	Route Change	Regional Change	Id Tips
<u>Brown Thrasher</u> <i>Toxostoma rufum</i>	8.81	Route Change	Regional Change	Id Tips
<u>European Starling</u> <i>Sturnus vulgaris</i>	7.38	Route Change	Regional Change	Id Tips
<u>Sprague's Pipit</u> <i>Anthus spragueii</i>	0.10	Route Change	Regional Change	Id Tips
<u>Cedar Waxwing</u> <i>Bombycilla cedrorum</i>	2.00	Route Change	Regional Change	Id Tips
<u>Yellow Warbler</u> <i>Dendroica petechia</i>	20.38	Route Change	Regional Change	Id Tips
<u>American Redstart</u> <i>Setophaga ruticilla</i>	0.10	Route Change	Regional Change	Id Tips
<u>Common Yellowthroat</u> <i>Geothlypis trichas</i>	36.24	Route Change	Regional Change	Id Tips
<u>Chipping Sparrow</u> <i>Spizella passerina</i>	0.10	Route Change	Regional Change	Id Tips
<u>Clay-colored Sparrow</u> <i>Spizella pallida</i>	66.57	Route Change	Regional Change	Id Tips
<u>Vesper Sparrow</u> <i>Pooecetes gramineus</i>	37.10	Route Change	Regional Change	Id Tips
<u>Lark Sparrow</u> <i>Chondestes grammacus</i>	0.19	Route Change	Regional Change	Id Tips

<u>Lark Bunting</u> <i>Calamospiza melanocorys</i>	41.76	Route Change	Regional Change	Id Tips
<u>Savannah Sparrow</u> <i>Passerculus sandwichensis</i>	31.38	Route Change	Regional Change	Id Tips
<u>Grasshopper Sparrow</u> <i>Ammodramus savannarum</i>	32.05	Route Change	Regional Change	Id Tips
<u>Baird's Sparrow</u> <i>Ammodramus bairdii</i>	1.48	Route Change	Regional Change	Id Tips
<u>Le Conte's Sparrow</u> <i>Ammodramus leconteii</i>	8.43	Route Change	Regional Change	Id Tips
<u>Nelson's S.t. Sparrow</u> <i>Ammodramus nelsoni</i>	1.90	Route Change	Regional Change	Id Tips
<u>Song Sparrow</u> <i>Melospiza melodia</i>	14.48	Route Change	Regional Change	Id Tips
<u>Swamp Sparrow</u> <i>Melospiza georgiana</i>	0.10	Route Change	Regional Change	Id Tips
<u>Chestnut-col. Longspur</u> <i>Calcarius ornatus</i>	13.71	Route Change	Regional Change	Id Tips
<u>Bobolink</u> <i>Dolichonyx oryzivorus</i>	57.29	Route Change	Regional Change	Id Tips
<u>Red-winged Blackbird</u> <i>Agelaius phoeniceus</i>	474.19	Route Change	Regional Change	Id Tips
<u>Eastern Meadowlark</u> <i>Sturnella magna</i>	0.05	Route Change	Regional Change	Id Tips
<u>Western Meadowlark</u> <i>Sturnella neglecta</i>	162.62	Route Change	Regional Change	Id Tips
<u>Yellow-head. Blackbird</u> <i>Xanthocephalus xanthocephala</i>	258.62	Route Change	Regional Change	Id Tips
<u>Brewer's Blackbird</u> <i>Euphagus cyanocephalus</i>	8.33	Route Change	Regional Change	Id Tips
<u>Common Grackle</u> <i>Quiscalus quiscula</i>	158.33	Route Change	Regional Change	Id Tips
<u>Brown-headed Cowbird</u> <i>Molothrus ater</i>	226.67	Route Change	Regional Change	Id Tips
<u>Orchard Oriole</u> <i>Icterus spurius</i>	10.29	Route Change	Regional Change	Id Tips
<u>Baltimore Oriole</u> <i>Icterus galbula</i>	6.14	Route Change	Regional Change	Id Tips
<u>American Goldfinch</u> <i>Carduelis tristis</i>	17.14	Route Change	Regional Change	Id Tips
<u>House Sparrow</u> <i>Passer domesticus</i>	35.10	Route Change	Regional Change	Id Tips

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Species List

North American Breeding Bird Survey Route

DOUGLAS CRK

<u>Species</u>	<u>Birds/route</u>	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Pied-billed Grebe</u> <i>Podilymbus podiceps</i>	0.45	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Western/Clark's Grebe</u> <i>Aechmophorus spp.</i>	0.40	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>American White Pelican</u> <i>Pelecanus erythrorhynchos</i>	0.90	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Double-crest. Cormorant</u> <i>Phalacrocorax auritus</i>	0.50	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>American Bittern</u> <i>Botaurus lentiginosus</i>	0.90	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Great Blue Heron</u> <i>Ardea herodias</i>	0.65	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Black-crn. Night Heron</u> <i>Nycticorax nycticorax</i>	0.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Turkey Vulture</u> <i>Cathartes aura</i>	0.20	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Canada Goose</u> <i>Branta canadensis</i>	17.25	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Wood Duck</u> <i>Aix sponsa</i>	0.15	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Gadwall</u> <i>Anas strepera</i>	6.50	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>American Wigeon</u> <i>Anas americana</i>	0.85	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Mallard</u> <i>Anas platyrhynchos</i>	27.95	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Blue-winged Teal</u> <i>Anas discors</i>	3.80	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Northern Shoveler</u> <i>Anas clypeata</i>	0.80	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>

<u>Northern Pintail</u> <i>Anas acuta</i>	7.85	Route Change	Regional Change	Id Tips
<u>Green-winged Teal</u> <i>Anas crecca</i>	0.50	Route Change	Regional Change	Id Tips
<u>Ruddy Duck</u> <i>Oxyura jamaicensis</i>	0.30	Route Change	Regional Change	Id Tips
<u>Northern Harrier</u> <i>Circus cyaneus</i>	1.45	Route Change	Regional Change	Id Tips
<u>Cooper's Hawk</u> <i>Accipiter cooperii</i>	0.10	Route Change	Regional Change	Id Tips
<u>Swainson's Hawk</u> <i>Buteo swainsoni</i>	1.50	Route Change	Regional Change	Id Tips
<u>Red-tailed Hawk</u> <i>Buteo jamaicensis</i>	0.50	Route Change	Regional Change	Id Tips
<u>Ferruginous Hawk</u> <i>Buteo regalis</i>	0.10	Route Change	Regional Change	Id Tips
<u>American Kestrel</u> <i>Falco sparverius</i>	0.10	Route Change	Regional Change	Id Tips
<u>Gray Partridge</u> <i>Perdix perdix</i>	2.85	Route Change	Regional Change	Id Tips
<u>Ring-necked Pheasant</u> <i>Phasianus colchicus</i>	19.15	Route Change	Regional Change	Id Tips
<u>Sharp-tailed Grouse</u> <i>Tympanuchus phasianellus</i>	0.40	Route Change	Regional Change	Id Tips
<u>Wild Turkey</u> <i>Meleagris gallopavo</i>	0.30	Route Change	Regional Change	Id Tips
<u>Virginia Rail</u> <i>Rallus limicola</i>	0.05	Route Change	Regional Change	Id Tips
<u>Sora</u> <i>Porzana carolina</i>	3.60	Route Change	Regional Change	Id Tips
<u>American Coot</u> <i>Fulica americana</i>	1.90	Route Change	Regional Change	Id Tips
<u>Killdeer</u> <i>Charadrius vociferus</i>	16.15	Route Change	Regional Change	Id Tips
<u>American Avocet</u> <i>Recurvirostra americana</i>	0.10	Route Change	Regional Change	Id Tips
<u>Willet</u> <i>Catoptrophorus semipalmatu</i>	2.40	Route Change	Regional Change	Id Tips
<u>Spotted Sandpiper</u> <i>Actitis macularia</i>	0.30	Route Change	Regional Change	Id Tips
<u>Upland Sandpiper</u> <i>Bartramia longicauda</i>	15.55	Route Change	Regional Change	Id Tips
<u>Marbled Godwit</u> <i>Limosa fedoa</i>	7.05	Route Change	Regional Change	Id Tips

<u>Common Snipe</u> <i>Gallinago gallinago</i>	3.95	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Wilson's Phalarope</u> <i>Phalaropus tricolor</i>	2.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Franklin's Gull</u> <i>Larus pipixcan</i>	11.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Ring-billed Gull</u> <i>Larus delawarensis</i>	16.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>California Gull</u> <i>Larus californicus</i>	0.35	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Common Tern</u> <i>Sterna hirundo</i>	0.25	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Forster's Tern</u> <i>Sterna forsteri</i>	0.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Black Tern</u> <i>Chlidonias niger</i>	0.20	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Rock Dove</u> <i>Columba livia</i>	2.95	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Mourning Dove</u> <i>Zenaida macroura</i>	82.25	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Black-billed Cuckoo</u> <i>Coccyzus erythrophthalmus</i>	0.70	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Great Horned Owl</u> <i>Bubo virginianus</i>	0.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Burrowing Owl</u> <i>Athene cunicularia</i>	0.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Common Nighthawk</u> <i>Chordeiles minor</i>	0.40	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Belted Kingfisher</u> <i>Ceryle alcyon</i>	0.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Red-headed Woodpecker</u> <i>Melanerpes erythrocephalus</i>	0.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Downy Woodpecker</u> <i>Picoides pubescens</i>	0.10	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Northern Flicker</u> <i>Colaptes spp.</i>	2.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Willow Flycatcher</u> <i>Empidonax traillii</i>	4.95	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Willow/Alder Flycatcher</u> <i>Empidonax spp.</i>	4.95	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Least Flycatcher</u> <i>Empidonax minimus</i>	2.05	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Say's Phoebe</u> <i>Sayornis saya</i>	0.75	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>

<u>Western Kingbird</u> <i>Tyrannus verticalis</i>	39.25	Route Change	Regional Change	Id Tips
<u>Eastern Kingbird</u> <i>Tyrannus tyrannus</i>	40.95	Route Change	Regional Change	Id Tips
<u>Loggerhead Shrike</u> <i>Lanius ludovicianus</i>	3.30	Route Change	Regional Change	Id Tips
<u>Warbling Vireo</u> <i>Vireo gilvus</i>	3.10	Route Change	Regional Change	Id Tips
<u>Red-eyed Vireo</u> <i>Vireo olivaceus</i>	0.20	Route Change	Regional Change	Id Tips
<u>Blue Jay</u> <i>Cyanocitta cristata</i>	1.05	Route Change	Regional Change	Id Tips
<u>Black-billed Magpie</u> <i>Pica pica</i>	1.85	Route Change	Regional Change	Id Tips
<u>American Crow</u> <i>Corvus brachyrhynchos</i>	11.15	Route Change	Regional Change	Id Tips
<u>Horned Lark</u> <i>Eremophila alpestris</i>	229.90	Route Change	Regional Change	Id Tips
<u>Tree Swallow</u> <i>Tachycineta bicolor</i>	0.95	Route Change	Regional Change	Id Tips
<u>N. Rough-winged Swallow</u> <i>Stelgidopteryx serripennis</i>	0.20	Route Change	Regional Change	Id Tips
<u>Bank Swallow</u> <i>Riparia riparia</i>	7.55	Route Change	Regional Change	Id Tips
<u>Cliff Swallow</u> <i>Petrochelidon pyrrhonota</i>	97.80	Route Change	Regional Change	Id Tips
<u>Barn Swallow</u> <i>Hirundo rustica</i>	29.90	Route Change	Regional Change	Id Tips
<u>Black-capped Chickadee</u> <i>Poecile atricapillus</i>	0.60	Route Change	Regional Change	Id Tips
<u>House Wren</u> <i>Troglodytes aedon</i>	11.10	Route Change	Regional Change	Id Tips
<u>Sedge Wren</u> <i>Cistothorus platensis</i>	1.05	Route Change	Regional Change	Id Tips
<u>Marsh Wren</u> <i>Cistothorus palustris</i>	2.10	Route Change	Regional Change	Id Tips
<u>Veery</u> <i>Catharus fuscescens</i>	0.05	Route Change	Regional Change	Id Tips
<u>American Robin</u> <i>Turdus migratorius</i>	11.35	Route Change	Regional Change	Id Tips
<u>Gray Catbird</u> <i>Dumetella carolinensis</i>	0.95	Route Change	Regional Change	Id Tips
<u>Brown Thrasher</u> <i>Toxostoma rufum</i>	8.60	Route Change	Regional Change	Id Tips

<u>European Starling</u> <i>Sturnus vulgaris</i>	4.60	Route Change	Regional Change	Id Tips
<u>Sprague's Pipit</u> <i>Anthus spragueii</i>	0.15	Route Change	Regional Change	Id Tips
<u>Cedar Waxwing</u> <i>Bombycilla cedrorum</i>	3.70	Route Change	Regional Change	Id Tips
<u>Yellow Warbler</u> <i>Dendroica petechia</i>	4.90	Route Change	Regional Change	Id Tips
<u>Ovenbird</u> <i>Seiurus aurocapillus</i>	0.05	Route Change	Regional Change	Id Tips
<u>Common Yellowthroat</u> <i>Geothlypis trichas</i>	8.05	Route Change	Regional Change	Id Tips
<u>Spotted Towhee</u> <i>Pipilo maculatus</i>	0.10	Route Change	Regional Change	Id Tips
<u>Chipping Sparrow</u> <i>Spizella passerina</i>	1.50	Route Change	Regional Change	Id Tips
<u>Clay-colored Sparrow</u> <i>Spizella pallida</i>	6.95	Route Change	Regional Change	Id Tips
<u>Vesper Sparrow</u> <i>Pooecetes gramineus</i>	8.10	Route Change	Regional Change	Id Tips
<u>Lark Sparrow</u> <i>Chondestes grammacus</i>	1.75	Route Change	Regional Change	Id Tips
<u>Lark Bunting</u> <i>Calamospiza melanocorys</i>	54.10	Route Change	Regional Change	Id Tips
<u>Savannah Sparrow</u> <i>Passerculus sandwichensis</i>	7.15	Route Change	Regional Change	Id Tips
<u>Grasshopper Sparrow</u> <i>Ammodramus savannarum</i>	23.40	Route Change	Regional Change	Id Tips
<u>Baird's Sparrow</u> <i>Ammodramus bairdii</i>	2.15	Route Change	Regional Change	Id Tips
<u>Le Conte's Sparrow</u> <i>Ammodramus leconteii</i>	0.10	Route Change	Regional Change	Id Tips
<u>Nelson's S.t. Sparrow</u> <i>Ammodramus nelsoni</i>	0.10	Route Change	Regional Change	Id Tips
<u>Song Sparrow</u> <i>Melospiza melodia</i>	2.85	Route Change	Regional Change	Id Tips
<u>Chestnut-col. Longspur</u> <i>Calcarius ornatus</i>	32.75	Route Change	Regional Change	Id Tips
<u>Rose-breasted Grosbeak</u> <i>Pheucticus ludovicianus</i>	0.10	Route Change	Regional Change	Id Tips
<u>Black-headed Grosbeak</u> <i>Pheucticus melanocephalus</i>	0.65	Route Change	Regional Change	Id Tips
<u>Dickcissel</u> <i>Spiza americana</i>	0.05	Route Change	Regional Change	Id Tips

<u>Bobolink</u> <i>Dolichonyx oryzivorus</i>	20.65	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Red-winged Blackbird</u> <i>Agelaius phoeniceus</i>	176.65	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Western Meadowlark</u> <i>Sturnella neglecta</i>	181.95	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Yellow-head. Blackbird</u> <i>Xanthocephalus xanthocephala</i>	33.00	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Brewer's Blackbird</u> <i>Euphagus cyanocephalus</i>	5.35	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Common Grackle</u> <i>Quiscalus quiscula</i>	95.15	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Brown-headed Cowbird</u> <i>Molothrus ater</i>	155.80	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Orchard Oriole</u> <i>Icterus spurius</i>	5.70	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>Baltimore Oriole</u> <i>Icterus galbula</i>	3.50	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>American Goldfinch</u> <i>Carduelis tristis</i>	10.85	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>
<u>House Sparrow</u> <i>Passer domesticus</i>	66.00	<u>Route Change</u>	<u>Regional Change</u>	<u>Id Tips</u>

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Whooping Crane Habitat Review New Frontier Wind Energy Project

Prepared for:

Element Power
222 South Ninth Street, Suite 2870
Minneapolis, MN 55402

Prepared by:

Clayton Derby and Terri Thorn
Western EcoSystems Technology, Inc.
4007 State Street, Suite 109
Bismarck, ND 58503

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TABLE OF CONTENTS

INTRODUCTION.....	1
PROJECT AREA.....	1
METHODS	4
RESULTS.....	4
<i>Croplands, Grasslands, and Other Habitats</i>	4
<i>Wetlands</i>	4
<i>Whooping Crane Migration Corridor and Confirmed Sightings</i>	6
DISCUSSION.....	6
REFERENCES.....	8

LIST OF TABLES

Table 1. Land cover within the Project and review areas.	5
Table 2. Comparison of the number of wetland basins and mean size in the Project and review areas.....	5
Table 3. Wetland regime within the Project and review areas.....	6

LIST OF FIGURES

Figure 1. Location of and confirmed whooping crane sightings around the New Frontier Wind Project.....	2
Figure 2. Elevation and wetlands of the New Frontier Wind Project.....	3

INTRODUCTION

The New Frontier Wind Energy Project (Project) is proposed for development by Element Power in McHenry County, North Dakota. Western EcoSystems Technology, Inc. (WEST) was requested to develop and implement a desktop review and analysis of potential whooping crane habitat resources in the project area and to compare these resources to areas outside of the project boundary to the north, south, east, and west. The habitat review and analysis evaluates whooping crane habitat within the proposed Project and compares it to alternate locations in the surrounding area. From this analysis all parties can then discuss what impacts there may be to whooping cranes from development of the proposed Project.

PROJECT AREA

The Project, currently about 11,082 acres (ac; 48.8 square kilometers [km²]; 17.3 square miles [mi²]), is located in central North Dakota in the southwest corner of McHenry County (Figure 1). The Project lies approximately 25 miles southeast of Minot, North Dakota.

The majority of the Project's landscape is composed of cropland, grassland, and wetland habitats (Table 1). Wetlands vary in size and are scattered throughout the Project with lesser amounts along the northern and eastern boundaries (Figure 2). Most of the Project lies within the Missouri Coteau Level IV Ecoregion with small amounts along the Project's northern and eastern boundaries falling in the Drift Prairie Level IV Ecoregion (USEPA 2010). The north and east reference areas lie within the Drift Prairie ecoregion while the west and south areas are within the Missouri Coteau ecoregion (USEPA 2010). See Derby and Thorn (2011) for a detailed description of the project area.

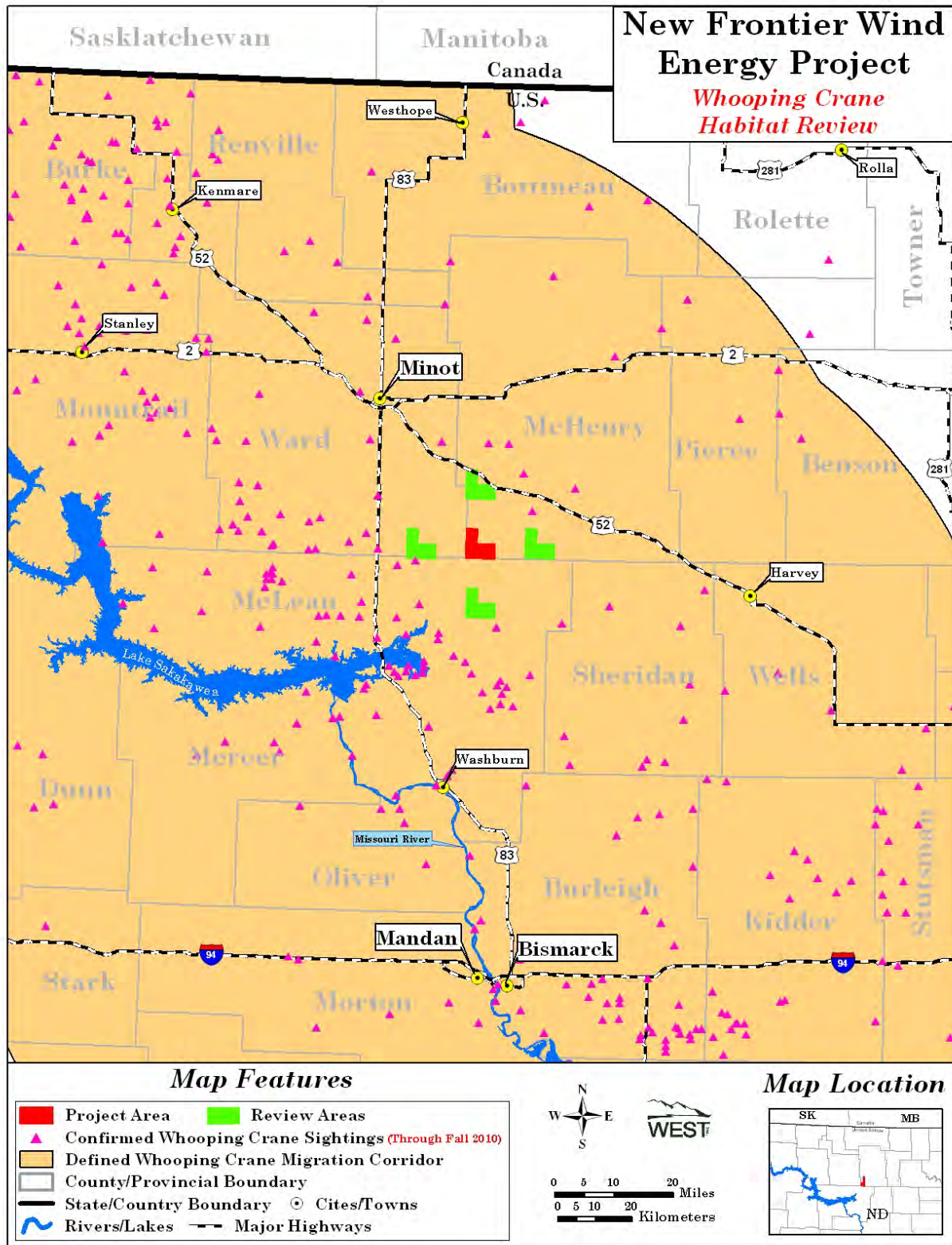


Figure 1. Project location and confirmed whooping crane sightings around the New Frontier Wind Project.

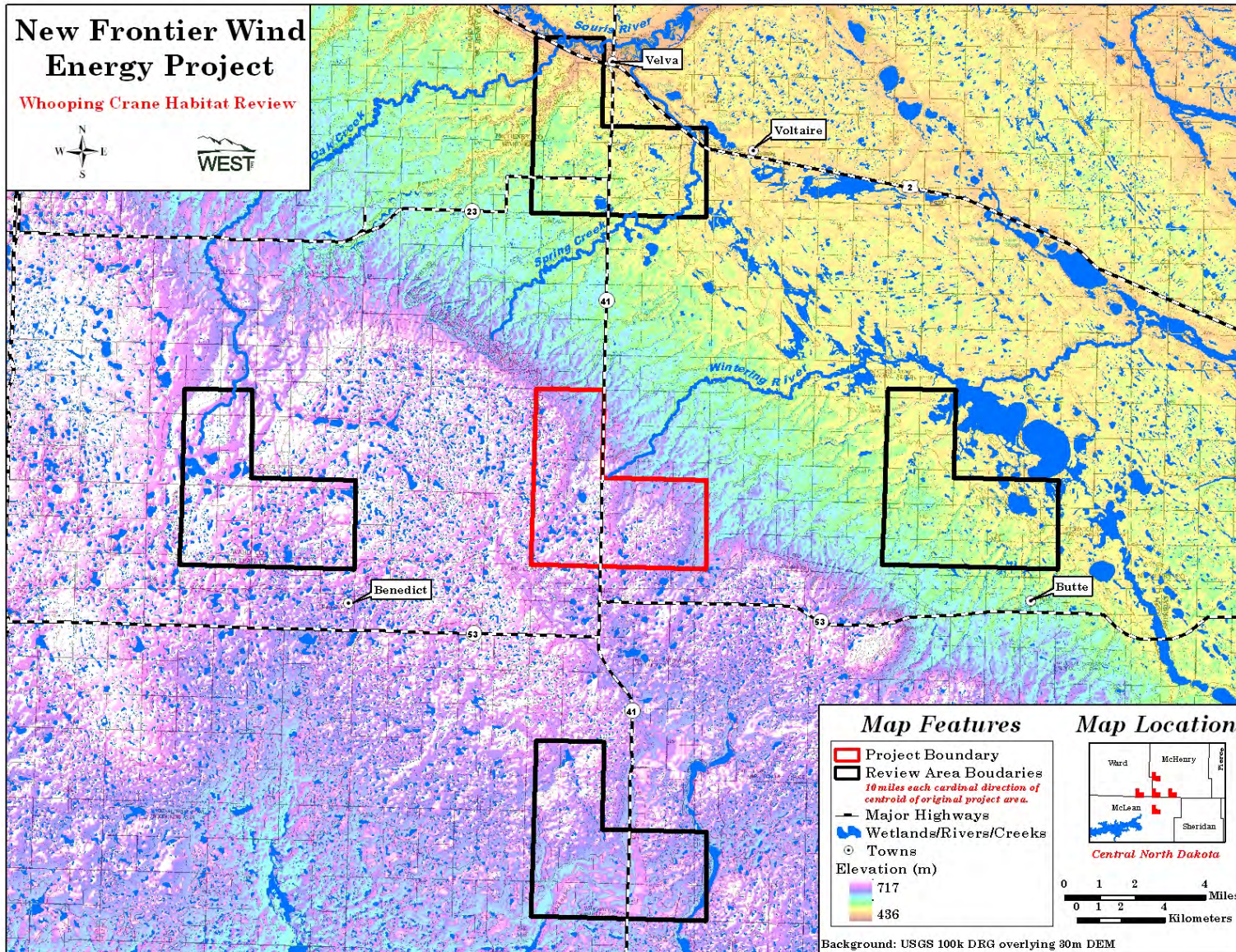


Figure 2. Elevation and wetlands of the New Frontier Wind Project.

METHODS

A desktop review was completed using ArcGIS 10, land cover information from North Dakota Gap Analysis (2004), wetland data from the National Wetland Inventory (NWI; 2010), and the current project boundary as provided by Element Power. A site visit was not completed by WEST for this exercise.

The potential whooping crane (*Grus americana*) habitat analysis included a comparison of land cover types (with wetlands broken down by number and regime of basins) within the proposed Project boundary and four alternate areas of the same dimensions whose centroids were located 16.1 kilometers (km; 10 miles [mi]) in the four cardinal directions from the Project (see Figures 1 and 2).

RESULTS

The Project contains approximately 4,670 ac (42% of total) of cropland, 3,914 ac (36%) of grasslands, and 1,329 ac of wetlands (12%; Table 1). The remaining 10% of the Project is comprised by shrubland, deciduous woodland, sparse or barren areas, and development (Table 1). Similar land cover types are found in the areas to the north and south while the east and west reference areas do not have any developed areas (Table 1).

Croplands, Grasslands, and Other Habitats

The percentage of cropland in the four reference areas ranged from 63% in the north to about 18% in the south (Table 1). The percentage (42%) of cropland in the Project is approximately in the middle of these extremes (Table 1). All cropland has the potential as foraging areas for whooping cranes but crop type could influence the extent of use of a particular field.

Grasslands in the reference areas ranged from about 69% in the south to 20% in the west (Table 1). Again, the percentage (36%) of grasslands in the Project falls approximately in the middle to lower end of the range (Table 1). The influence of grassland habitats on migrating whooping crane behavior is unknown; however, short grasslands (i.e. grazed pasture) adjacent to wetlands may provide loafing areas and cranes may utilize grasslands to some degree for foraging.

The Project contained the highest percentage of shrubland and deciduous woodlands and was tied with the north area with the highest amount of sparsely vegetated or barren lands (Table 1). The most developed land was found in the north area and is represented by the city of Velva (Table 1 & Figure 2). These four habitat types made up 10% or less of the total area of any of the five areas (Table 1).

Wetlands

For this analysis it is assumed that all wetlands are potential whooping crane roosting areas under one water regime or another (e.g., drought, normal, or flood). The Project had the second highest percentage of wetland coverage, about 5% less than the west area. In the other reference areas, percentage of wetlands ranged from approximately 11% to 6% (Table 1). The west area had the highest number of basins (993), followed by the Project (930; Table 2). The number of basins in the other areas ranged from 644 to 575 (Table 2). The largest basins and

corresponding greatest mean sizes were found in the east and west reference areas. Wetlands in the Project averaged one acre in size with the largest basin being only approximately 38.3 ac (Table 2). The highest percentage of wetlands in the Project and west reference area had a semipermanent regime. In the north and south, seasonal wetlands were the most prevalent while in the east area, temporary wetlands dominated (Table 3). Between 21% and 24% of wetlands in the east, west, and south reference areas were lakes. Only about 7% of the Project's wetlands were lakes while the north area did not have any basin classified as lakes (Table 3). However, slightly more than 7% of wetlands in the north were river and intermittent streams; most of which is associated with the Souris River (Table 3; Figure 2). None of the other areas had river or intermittent wetlands (Table 3).

To summarize, the Project has the second highest acreage of wetlands and total basins, while the range in wetland size is the narrowest but mean basin size is in the middle of this range. Finally, wetlands within the Project are more permanent than those in the north, south, and east reference areas overall but are represented by semipermanent wetland regimes and not lakes (Table 1, 2, and 3).

Table 1. Land cover within the Project and review areas.

Habitat Type	Project		North		East		South		West	
	Acres	%	Acres	%	Acres	%	Acres	%	Acre	%
Cropland	4,669.4	42.2	7,004.1	63.0	4,350.8	39.2	1,968.8	17.8	6,563.5	59.3
Grassland	3,913.5	35.5	2,408.0	21.6	5,216.6	47.1	7,647.7	69.1	2,246.4	20.3
Wetland	1,329.0	12.0	643.6	5.8	1,192.5	10.8	649.9	5.9	1,897.3	17.1
Shrubland	678.7	6.1	497.8	4.5	164.0	1.5	711.9	6.4	222.0	2.0
Deciduous										
Woodland	365.0	3.3	299.1	2.7	144.7	1.3	36.8	0.3	68.0	0.6
Sparse/Barren	94.8	0.9	97.5	0.9	16.7	0.2	37.0	0.3	69.0	0.6
Developed	5.5	<0.1	176.0	1.6			14.2	0.1		

Data Source: ND Gap Analysis Land Cover 2004

Table 2. Comparison of the number of wetland basins and mean size in the Project and review areas.

Area	Basins	Mean Size - acres	Range - acres
Project	930	1.0	0.01 – 38.3
North	644	0.7	0.01 – 59.3
South	575	0.8	<0.01 – 70.1
East	576	1.8	<0.01 – 230.4
West	993	1.7	0.01 – 160.4

Table 3. Wetland regime within the Project and review areas.

Regime	Project		North		East		South		West	
	Acres	%	Acres	%	Acres	%	Acres	%	Acre	%
Temporary	151.5	17.0	98.5	21.1	541.0	51.4	59.2	12.6	322.8	21.6
Seasonal	280.1	31.5	279.1	59.8	186.8	17.7	281.2	59.7	251.1	16.8
Semipermanent	396.9	44.6	56.0	12.0	69.6	6.6	33.9	7.2	601.4	40.3
Lake	61.8	6.9			255.4	24.3	97.1	20.6	315.6	21.2
River			32.0	6.9						
Intermittent			0.8	0.2						

Whooping Crane Migration Corridor and Confirmed Sightings

The Project and all four review areas are located within the defined (95% of confirmed sightings) whooping crane migration corridor (CWCTP 2009; Figure 1). No whooping cranes have been documented within the Project. The closest confirmed sightings (through fall 1010) are approximately 13 km (8 mi) to the west/southwest and northeast (Figure 1). Each of the four review areas had at least one confirmed sighting within 8 km (5 mi; Figure 1). Scattered, confirmed whooping crane observations have been made around the project area, with more to the west, nearer the migration corridor centerline (Figure 1). It should be noted that reported whooping crane observations are mostly random events by the public or focused around refuges and other areas of management interest and not the result of a systematic search. Therefore, just because an area has no documented whooping crane sightings, does not mean that birds do not use the area.

DISCUSSION

Whooping cranes are currently listed as endangered (32 FR 4001, 1967 March 11) except where nonessential experimental populations exist (66 FR 33903-33917, 2001 June 26; 62 FR 38932-38939, 1997 July 21; and 58 FR 5647-5658, 1993 January 22). In the US, the whooping crane was listed as threatened with extinction in 1967 and endangered in 1970 – both listings were “grandfathered” into the Endangered Species Act of 1973 (ESA 1973). The peak 2009-2010 winter population was 263 birds (T. Stehn, pers. comm.). This is 16 more individuals compared to the 2008-2009 winter counts. Whooping cranes typically migrate from their breeding grounds in Wood Buffalo National Park, Canada to their wintering areas in Aransas National Wildlife Refuge, Texas. During the migration, most birds pass through central North Dakota, where the proposed New Frontier Wind Energy project is located.

The US Fish and Wildlife Service (USFWS) defined a migration corridor for whooping cranes based on the historical sightings of whooping cranes from the early 1960’s through 2009 (CWCTP 2009). This corridor encompasses approximately 95% of the observations. The Project lies within a subset of this corridor which contains approximately 75% of confirmed sightings (CWCTP 2009). The Project is approximately 32 km (20 mi) from the migration centerline (Figure 1). The USFWS has expressed concern with wind and other above ground developments (e.g., transmission lines) that are built anywhere within the defined corridor, but with more emphasis placed on those projects within the region that encompasses 75% of the observations.

The potential exists for whooping cranes to fly through the area during migration. Whooping cranes generally migrate at 1,000-6,000 ft altitudes, well above turbine height (Stehn 2007), and thus for the most part are unlikely to collide with turbines. However, as whooping cranes ascend and descend during takeoff and landing, or migrate during inclement weather, they may fly at lower altitudes and may fly at altitudes corresponding to the rotor-swept areas. No whooping cranes have been reported as being killed or injured by wind turbines (NWCC 2004), but one sandhill crane (*Grus canadensis*) was reported at the Altamont wind energy facility in California (Smallwood and Karas 2009), it is unclear if this was a result of turbine collision or collision with a powerline. It appears that cranes are not overly susceptible to collision with turbines.

Besides direct mortality, concern has also been raised regarding potential displacement impacts that wind facilities may have on whooping cranes. For example, if whooping cranes avoid wind facilities, the likelihood of impacts with turbines is further decreased but the availability of habitat in the project area may be diminished, causing cranes to have to fly further to find suitable habitat to roost and forage. To date, no or very little quantitative data is available to help address displacement impacts on whooping cranes or sandhill cranes. A before-after control-impact (BACI) study looking at crane use (would be mostly sandhill crane use) of a wind resource area before and after construction would help identify if and to what degree wind facilities displace cranes from the area. Although this project is located within the whooping and sandhill crane migration pathways, its relative small size may preclude a meaningful study on the degree of displacement (if any) because of a probability of small sample size. It is likely only a presence/absence question could be answered.

In Stehn (2008), the point was made that suitable wetlands for overnight roost sites are available throughout the migration corridor in the Dakotas and Nebraska (Stahlecker 1997a, 1997b in Stehn 2008) and there are abundant croplands for foraging. However, in analyzing the potential for significant impacts from wind development on whooping crane stopover habitat, Stehn also suggests assessing whether there is “lots of suitable stopover habitat in the general area ... or is the proposed wind farm site the only suitable whooping crane stopover habitat for miles around”. This issue was investigated by comparing the potential whooping crane stopover habitat (using wetlands as this indicator) in the project area compared to surrounding areas. To complete this analysis, the exact project area was moved 16 km (10 mi) in each of the four cardinal directions. GIS was used to calculate the amount of various habitats and in the case of wetlands, number of individual basins and their regime, in each of the areas compared to the proposed Project (Tables 1, 2, and 3). This analysis shows that habitat for migrating whooping cranes exist in and around the Project. Both roosting (i.e. wetlands) and foraging (i.e. croplands) habitats are plentiful in the Project and alternate areas. Whether whooping cranes would prefer one are over another could not be answered with this analysis but to answer the question posed by Stehn (2008), the Project does not contain “the only suitable whooping crane stopover habitat for miles around”.

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