Crocker Wind Farm

Draft Environmental Assessment

Crocker Wind Farm

Clark County, South Dakota

March 14, 2018

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ACRONYMS

Acronym/Abbreviation	Definition
ADLS	Aircraft Detection Lighting System
ADT	average daily traffic
APE	Area of Potential Effect
APLIC	Avian Power Line Interaction Committee
AWEA	American Wind Energy Association
AWWI	American Wind Wildlife Institute
BA	Biological Assessment
BBCS	Bird and Bat Conservation Strategy
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BO	Biological Opinion
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
C&I	commercial, industrial, and institutional
Crocker	Crocker Wind Farm, LLC
CUP	Conditional Use Permit
CWA	Clean Water Act
dBA	A-weighted decibels
DOC	United States Department of Commerce
DOE	United States Department of Energy
DOJ	United States Department of Justice
EA	Environmental Assessment
ECPG	Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2
EIA	United States Energy Information Administration
ECD	Erosion Control Device
ELF	extremely low frequency
EMF	electromagnetic field
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency

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Acronym/Abbreviation	Definition
FSA	Farm Service Agency
g	units of acceleration due to gravity
GAP	Gap Analysis Program
GE	General Electric
Geronimo	Geronimo Energy, LLC
GHG	greenhouse gas
GIS	Geographic Information System
GPA	Game Production Area
GW	gigawatts
IPAC	Information, Planning and Consultation
HAP	hazardous air pollutant
HUC	Hydrologic Unit Code
ITC	Interstate Telecommunications Cooperative, Inc.
JEDI	Jobs and Economic Development Impact
kV	kilovolt
kV/m	kilovolt per meter
kW	kilowatts
Lazard	Lazard Levelized Cost of Energy Analysis (version 10.0)
LBNL	Lawrence Berkeley National Laboratory
L_{EQ}	total sound energy
LiDAR	Light Range Detection and Ranging
m	meters
MBTA	Migratory Bird Treaty Act
mG	milligauss
MISO	Midcontinent Independent System Operator
mph	miles per hour
m/s	meters per second
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NOAA	National Oceanic and Atmospheric Administration
NLEB	northern long-eared bat
NPDES	National Pollutant Discharge Elimination System

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Acronym/Abbreviation	Definition
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
PEIS	Final Upper Great Plains Wind Energy Programmatic Environmental Impact Statement
PFYC	Potential Fossil Yield Classification
Project	Crocker Wind Farm Facility and Transmission Facility
Project Area	29,331-acre Project boundary
PSD	Prevention of Significant Deterioration
RES	Renewable Electricity Standards
ROI	Region of Influence
rpm	rotations per minute
SARC	South Dakota Archaeological Research Center
SCADA	Supervisory Control and Data Acquisition
SDCL	South Dakota Codified Law
SDDENR	South Dakota Department of Environment and Natural Resources
SDDLR	South Dakota Department of Labor and Regulation
SDDOA	South Dakota Department of Agriculture
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Game, Fish and Parks
SDGS	South Dakota Geologic Survey
SDPUC	South Dakota Public Utilities Commission
SDSHS	South Dakota State Historical Society
SDSU	South Dakota State University
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SoDAR	Sonic Detection and Ranging
SPCC	Spill Prevention, Control, and Countermeasures Plan
SPP	Southwest Power Pool, Inc.

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Acronym/Abbreviation	Definition
SSURGO	Soil Survey Geographic Database
SWAP	State Wildlife Action Plan
SWPPP	Stormwater Pollution Prevention Plan
Tetra Tech	Tetra Tech, Inc.
UGP	Upper Great Plains
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	volatile organic compound
WEG	Wind Energy Guidelines
WES	Wind Energy System
WEST	Western Ecosystems Technology, Inc.
Western	Western Area Power Administration
WIA	Walk-In Area
WHO	World Health Organization
WMD	Wetland Management District
WNS	White Nose Syndrome
WPA	Waterfowl Production Area
WRA	Wind Resource Area
WTS	Wind Turbine Syndrome
v/m	volt per meter

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1.0 INTRODUCTION

1.1 Background and Project Location

Crocker Wind Farm, LLC (Crocker), a wholly-owned subsidiary of Geronimo Energy, LLC ("Geronimo"), proposes to construct the Crocker Wind Farm ("Project"), a wind energy facility in Clark County, South Dakota. The Project is located within an approximately 29,331-acre Project boundary on privately owned land ("Project Area"), approximately 8 miles north of Clark, South Dakota (Figure 1). The proposed Project includes up to 120 wind turbines, up to 4 permanent meteorological towers, associated access roads and temporary crane paths, temporary laydown/staging area, an operations and maintenance ("O&M") facility, collector and communication systems, and a new Project substation ("Wind Farm Facility"). The Transmission Facility includes a 345-kilovolt ("kV") transmission line, temporary staging area, and switchyard. The 5.2 miles of overhead transmission will run from the Project substation to the switchyard. At the switchyard, the power will transfer to the Basin Electric Groton-to-Watertown 345 kV transmission line, part of the Southwest Power Pool, Inc. ("SPP")/Western Area Power Administration ("Western") Transmission line portfolio. The Project would generate utility scale electric power for residential, commercial, and industrial consumers.

Crocker is proposing to place 14 turbines and associated facilities on land protected with United States Fish and Wildlife Service ("USFWS") grassland easement (Figure 2). The Project will not permanently impact any USFWS-protected wetland basins. Crocker is also proposing to place up to 14 transmission poles on USFWS grassland easement land (Figure 3).

Table 1-1 lists the counties, townships, sections, and ranges that are included in the Project Area.

Table 1-1: Project Location

County Name	Township Name	Township	Range	Sections
Wind Farm				
Clark	Spring Valley	119N	58W	3-10, 15-19, 25-26,30-31, 33-36
Clark	Warren	119N	59W	23-27, 34-36
Clark	Ash	118N	59W	1-3, 10-15
Clark	Woodland	118N	58W	1-12, 14-16, 21-23, 26, 34
Clark	Cottonwood	119N	57W	29-32
Transmission Line				
Clark	Spring Valley	119N	58W	9-10, 15-19, 30

1.1 Federal Action

Due to impacts to USFWS-owned grassland and wetland easements the Project would require actions from the USFWS. A grassland easement is a perpetual legal contract that pays landowners to keep land in grass. Protected grass may not be altered or disturbed; although mowing, haying, and grass seed harvesting is allowed after July 15. This allows grassland nesting birds to complete their nesting before the grass is disturbed. Grazing is not restricted.

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Similarly, the perpetual wetland easement program pays landowners to protect wetland basins. Protected wetlands cannot be drained, filled, leveled, or burned. When these wetlands dry up naturally, they can be farmed, grazed, or hayed. The wetland easement protects only the wetland basin; the upland outside the wetland is not protected. The USFWS easements help provide crucial habitat for many types of wildlife including waterfowl and other migratory birds. Note that easements may not protect all wetlands on a property. These are perpetual contracts between the USFWS and all present and future landowners (USFWS, 2010a and b). For the purposes of this EA, because wetland basins on wetland easements within the Project Area are known, they are referred to as "wetland basins."

The placement of proposed Project infrastructure on private lands with USFWS grassland and wetland easements requires a USFWS easement exchange which is a Federal Action under the National Environmental Policy Act ("NEPA"). Western and the USFWS prepared the Upper Great Plains ("UGP") Wind Energy Programmatic Environmental Impact Statement ("PEIS") (Western and USFWS, 2015a) to evaluate the impacts of wind energy development in Western's UGP Region (Iowa, Minnesota, Montana, Nebraska, North Dakota, and South Dakota), and on the USFWS's grassland and wetland easements in North Dakota, South Dakota, Montana, and Minnesota. The PEIS assesses environmental impacts associated with wind energy development and identifies management practices to mitigate impacts. As detailed in the Executive Summary of the PEIS, as long as wind energy project developers are willing to implement the applicable evaluation process, best management practices ("BMPs"), and conservation measures identified in the PEIS, the NEPA evaluation for the wind energy project may tier off the analyses in the PEIS. Applicable material from the PEIS is incorporated by reference in this Environmental Assessment ("EA") in accordance with 40 Code of Federal Regulations ("CFR") §§ 1502.20 and 1508.28. The analysis in this EA is Project-specific and focuses on site-specific issues that are not already addressed in sufficient detail in the PEIS. This EA is intended to be read in conjunction with the PEIS, and the EA and PEIS together comprise the NEPA compliance for this action. Crocker is committed to implementing the applicable BMPs and conservation measures described in the PEIS to allow for tiering (see http://plainswindeis.anl.gov/).

The easement exchange requires at least a 1:1 replacement of permanent physical easement impacts. It also requires a Crocker to post a bond so that land with permanent easement impacts can be restored and returned to easement protection at the end of the life of the Project. Crocker has offered a 2:1 replacement.

1.2 Purpose and Need for Proposed Action

1.2.1 Crocker's Purpose and Need

Crocker started when a group of local landowners identified wind energy as the best method for maximizing and diversifying their land assets. Crocker Wind Farm, LLC is not a public utility, so does not possess and did not use eminent domain powers to acquire wind easements for the Project. All Project facilities for the wind energy facility and associated transmission line would be located on properties that have been obtained through voluntary agreements with landowners.

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The proposed Project would install wind generating capacity in South Dakota that would contribute to satisfying utilities' and consumers' demands for renewable energy, and meet utility renewable requirements or individual sustainability goals.

As an independent power producer, Crocker is not limited to the needs of one region and is able to bid into multiple wholesale markets across the region. Continuous study of the wind resource since 2010 has proven this Project Area to be one of South Dakota's premier wind development sites thereby allowing the proposed Project to compete.

Crocker is actively marketing the sale of electricity to third parties, including utilities and large power consumers/marketers, and is currently in discussions with three potential off-takers. The Project may sell power in the form of a power purchase agreement or could be utility owned.

South Dakota is one of the top seven states in wind potential. It is already ranked second in the nation in the amount of net electricity generation provided by wind with approximately 26 percent in 2016 (EIA, 2017). The DOE's WIND Exchange platform indicates that South Dakota has approximately 417,879 MW of total potential wind capacity; however, only 977 MW of wind energy generation has been installed as of the second quarter of 2017 (DOE, 2017).

In February of 2008, South Dakota enacted legislation establishing an objective that 10 percent of all retail electricity sales in the state be obtained from renewable and recycled energy by 2015 with reporting required through 2017 (South Dakota Codified Law ["SDCL"] 49-34A-101). According to the 2016 South Dakota Public Utilities Commission's ("SDPUC's") Annual Report, only seven out of 12 utilities in the state had met this objective (SDPUC, 2016). South Dakota has additional regulatory policies, financial incentives, and technical resources aimed at encouraging energy efficiency and the expanded use of renewable sources for electricity generation in the state such as property tax incentives and alternative taxation calculation. A list of these programs/policies: http://programs.dsireusa.org/system/program?fromSir=0&state=SD&

The Project also could help meet the RES of neighboring states. For example, Minnesota has an RES of 25 percent by 2025 for all utilities except Xcel Energy, which has an RES of 30 percent renewable energy by 2020.

1.2.2 Agency Purpose and Need

Placement of proposed Project infrastructure on USFWS easements would require an easement exchange. The exchange would be a Federal Action under NEPA. USFWS needs to evaluate if Crocker has avoided, minimized, and mitigated the easement impacts. USFWS would also need to issue a Special Use Permit for any temporary disturbances to easements from the Project.

The USFWS has 5,473 acres of grassland easement and 17,418 acres of wetland easement which contains many protected wetland easement basins within the Project Area.

The layout presented in this EA has been modified several times as turbines on grassland easement were removed from earlier layouts. The 14 turbines now located on grassland easement are necessary in order to connect the collection system to off easement turbines. Additionally, the northern portion of the Project is necessary to make a project large enough to be viable and due to the density of protected grasslands in this northern area they cannot be avoided. Crocker

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utilized suggestions from USFWS to microsite turbines and collocate associated facilitates to avoid and minimize impacts. Permanent impacts to USFWS grassland easements are required to be offset at a 1:1 ratio. However, Crocker is voluntarily offering a 2:1 replacement of grassland easements to offset and mitigate impacts.

1.3 Alternative Sites and Siting Criteria

The following sections describe the various criteria that were considered in determining the development potential of the site, identifying the appropriate Project Area to develop, and designing the Project's proposed configuration within the Project Area. Included is a summary of how Crocker has voluntarily followed the USFWS Land-Based Wind Energy Guidelines ("WEG") (USFWS, 2012) to minimize risks to species of concerns.

1.3.1 Site Evaluation Process and Project Boundary Refinement

Development of a wind energy project is an iterative process for the development company that involves: 1) site identification; 2) project boundary refinement; and 3) micro-siting of infrastructure within the boundaries. Identifying the Project Area was primarily driven by:

- Available wind energy resource;
- Ready access to transmission interconnection; and
- Land use and environmental compatibility with wind development.
- Landowner support for wind energy development

Each of these factors is discussed further below.

Wind Resource

Wind resource at the Project is significantly better than an average site in the upper Great Plains. Areas with an annual average wind speed at least 6.5 meters per second ("m/s") at 80-m height are generally considered to be suitable for development. DOE reports wind resources within the Project's region range from 8.0 to 9.0 m/s at Crocker's proposed turbine hub heights (80 meters ["m"] to 100 m) (DOE, 2017). Crocker initiated its internal wind resource and energy assessment using data collected by meteorological towers installed in 2010. Long-term data was available from the National Weather Service Automated Surface Observing Systems Network in Sioux Falls, Sisseton and Watertown (South Dakota) stations. This site-specific wind analysis indicates the Project Area has a highly-suitable wind resource for economical, sustainable, and reliable production of power.

Transmission Grid Access

An initial evaluation of the transmission system was conducted to determine where to cost effectively connect new energy generation in South Dakota. The Project's interconnection feasibility and transmission suitability also drew Crocker to the Project Area. The Project is situated to allow economic delivery of power to the electrical transmission system.

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Land Use and Environmental Compatibility

The Project Area was selected following a review of the surrounding land use and regional constraints. Other wind development was underway north of the Project Area, south of the Project Area was eliminated due to uninterested landowners and proximity to the Clark airport, and land to the east and west of the Project Area was not considered due to the lower wind resource and existing leases with other wind companies.

Once the initial site location was selected, the project boundary was modified over time based on landowner interest, and avoidance of some environmental concerns raised by federal, state, and local agencies. As illustrated in Figure 4, major refinements to the Project boundary included:

- Based on discussion with SDGFP, the Project boundary shifted west to avoid Mallard Slough and other large waterbodies that provide migratory habitat to waterfowl;
- Minimize impacts of nearly 23,000 acres of USFWS easement lands including 5,473 acres of USFWS grassland easements and 17,418 acres of land with wetland easements;
- Avoidance of Crocker airport runway approaches and restricted airspace; and
- Avoidance of additional State Game Production Areas ("GPAs").

1.3.2 U. S. Fish & Wildlife Service Land-Based Wind Energy Guidelines

To reduce the potential impacts of wind energy facilities on wildlife species and habitat, the USFWS has developed a set of voluntary guidelines for wind developers called the Land-Based WEG. These voluntary guidelines provide a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development. The USFWS guidelines target "species of concern" and "species of habitat fragmentation concern." The guidelines define a species of concern as "*For a particular wind energy project, any species which 1) is either a) listed as an endangered, threatened or candidate species under the Endangered Species Act, subject to the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act; b) is designated by law, regulation, or other formal process for protection and/ or management by the relevant agency or other authority; or c) has been shown to be significantly adversely affected by wind energy development, and 2) is determined to be possibly affected by the project*" (USFWS, 2012).

The WEG's are founded upon a tiered approach for assessing potential impacts to wildlife and their habitats. This approach is an iterative decision-making process for collecting information in increasing detail, quantifying the possible risks of the proposed project to wildlife and habitats, and evaluating those risks to make siting, construction, and operation decisions. Subsequent tiers refine and build upon issues raised and efforts undertaken in previous tiers. At each tier, a set of questions is provided to help the developer identify potential problems associated with each phase of a project, and to guide the decision process. The tiered approach is designed to assess the risks of project development by formulating questions that relate to site-specific conditions regarding potential species and habitat impacts. The tiers are outlined briefly as:

- Tier 1: Preliminary evaluation or screening of sites (landscape-level screening of possible project sites; generally based on readily available public information);

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- Tier 2: Site characterization (comprehensive characterization of one or more potential project sites; generally based on consulting with the appropriate agencies/authorities and one or more reconnaissance level site visits by a wildlife biologist);
- Tier 3: Field studies to document site wildlife conditions and predict project impacts (site-specific assessments at the proposed project site; quantitative and scientifically rigorous studies; e.g., acoustical monitoring, point count avian surveys, raptor nest surveys, lek surveys, etc.);
- Tier 4: Post-construction mortality studies to evaluate direct fatality impacts; and
- Tier 5: Other post-construction studies to evaluate direct and indirect effects of adverse habitat impacts, and assess how they may be addressed.

This tiered approach allows developers to determine whether they have sufficient information, whether and/or how to proceed with development of a project, or whether additional information gathered at a subsequent tier is necessary to make those decisions. The WEGs indicate that wind energy developers who voluntarily adhere to these guidelines will be undertaking a robust level of wildlife impact analysis, and have a shared responsibility with the USFWS to ensure that the scientific standards of the guidelines are upheld and used to make wise development decisions.

It is important to note that not all the five tiers are recommended or necessary for all projects. If data are deemed insufficient at a tier, more intensive study is conducted in the subsequent tier until sufficient data are available to decide whether to abandon the project, modify the project, or proceed with or expand the project (USFWS, 2012). Results of the WEG Tier 1, 2, and 3 analysis and baseline avian and bat data are outlined in the Project's Draft Bird and Bat Conservation Strategy ("BBCS"; Appendix A). Crocker will continue to coordinate with USFWS and South Dakota Game, Fish and Parks ("SDGFP") on Tier 3 data and the BBCS.

Tiers 1 through 3 of the Guidelines include actions that have resulted in the shifting of the locations of project infrastructure to avoid impacts to environmentally sensitive features. The following describes Crocker's implementation of Tiers 1 through 3:

Tier 1: Preliminary Site Evaluation

Crocker initiated consultation with the USFWS and the SDGFP in April 2016 to introduce the proposed Project and request information on species of concern. Crocker reviewed Natural Heritage Program records for rare species within the vicinity of the proposed Project, and publicly available landscape data, such as National Wetland Inventory ("NWI") data, land cover data, and federal and state lands data. The USFWS identified species listed in the Endangered Species Act ("ESA") with the potential to occur in the Project Area (whooping crane, rufa red knot, northern long-eared bat ["NLEB"], Dakota skipper and Poweshiek skipperling). No critical habitat areas occur in or in proximity to the Project Area. Bald eagles, Birds of Conservation Concern ("BCC"), and other grassland birds were also identified as having the potential to occur in the Project Area. In addition, SDGFP indicated that there are South Dakota Species of Greatest of Conservation Need ("SGCN") with the potential to occur in the Project Area.

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Tier 2: Site Characterization

Crocker conducted an in-field initial Site Characterization Study in April 2016 to assess the potential presence of species of concern and their habitat within the Project Area. The Site Characterization Study indicated that the majority of the Project Area is grassland, and the majority is managed as either hay or pasture at varying levels of intensity, consistent with the surrounding area. The Site Characterization Study indicated that due to the prevalence of grassland within the Project Area, there was a potential for species of concern to occur, therefore, additional species-specific surveys were recommended.

Tier 3: Field Studies and Impact Prediction

Crocker consulted with the USFWS and SDGFP to design the survey protocols for the biological surveys identified above, including pre-construction avian surveys, grassland bird surveys, Dakota skipper and Poweshiek skipperling habitat assessments and individual surveys, and NLEB acoustic presence/absence surveys. No federal- or state-listed species have been observed in the Project Area to date. Bald eagles have been observed; no nests are located within the Project Area. Crocker has observed some federal BCC and South Dakota SGCN. There are many grassland birds covered by the Migratory Bird Treaty Act ("MBTA"). The results of these surveys are documented in Section 3.6, and potential impacts to these species are described in Section 4.6.

Based on the surveys conducted to date, there were no species identified by Crocker as high concern, meaning that the Project would not pose a significant risk to any resources that could not otherwise be avoided, minimized, or mitigated. Both state and federal wildlife agencies have identified species of conservation concern and indirect impacts to grassland birds and waterfowl. The Project is anticipated to pose a moderate risk to birds protected under MBTA due to the potential for collision of some individuals with the turbines in proposed grassland habitat and near wetlands and avoidance behavior. As discussed above, Crocker modified the proposed Project layout to avoid direct impacts to lakes, and has significantly reduced the number of proposed turbine locations from grassland easements, leaving only 14 turbines on grassland easements (prior layouts proposed 41). To minimize impacts some turbines have been moved to avoid micro-siting bird concerns. There has been no Dakota skipper or Poweshiek skipperling observed in areas of potentially suitable habitat. In addition, no NLEB were detected during surveys. More details on potential impacts to species of concern and proposed minimization or mitigation are in Section 4.6.

Tiers 4 and 5 of the Guidelines include post-construction studies to estimate impacts, and other studies and research. These measures are also discussed, as appropriate, in the Project's BBCS (Appendix A) and Section 4.6.

The SDGFP, in cooperation with the South Dakota Bat Working Group, has also developed siting guidelines for wind energy projects to address potential impacts to natural resources (South Dakota Bat Working Group and SDGFP, Undated). These guidelines are generally consistent with the WEG (USFWS, 2012), but also provide guidance for other non-wildlife resources (e.g., land use, noise, visual resources, soil erosion and water quality).

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1.3.3 Preconstruction Studies and Micro-siting Process

Once the site was selected and secured, Crocker identified preliminary turbine locations based on wind resource analysis, design efficiency, initial site inspection, topography, known environmentally-sensitive areas and cultural resources, and communications with agencies.

Crocker initiated consultations with applicable federal, state, and local agencies in April 2016 to introduce the proposed Project, to identify surveys or studies required for the Project, and the appropriate permits and authorizations. Table 1-2 identifies the current list of permits and authorizations that Crocker is seeking, and their status.

Table 1-2: Permits and Approvals

Regulatory Authority	Permit/Approval	Status
Federal Approvals		
USFWS – Lead Federal Agency, Waubay Wetland Management District	Easement Exchange Program	4th Quarter 2019
	Special Use Permit for temporary impacts to wetland and grassland easements	3rd Quarter 2018
USFWS, Region 6 Ecological Field Office	ESA Section 7 Consultation on threatened and endangered species	2nd Quarter 2018
USFWS in coordination with the South Dakota State Historical Society ("SDSHS") and Tribal Historic Preservation Offices	National Historic Preservation Act ("NHPA") Section 106 Review (Class I Literature Review / Class III Cultural Field Study)	4th Quarter 2017
United States Army Corps of Engineers ("USACE")	Wetland Delineation Approvals	2nd Quarter 2018
	Jurisdictional Determination	2nd Quarter 2018
	Clean Water Act Section 404 and Section 10 Permit(s)	2nd Quarter 2018
United States Environmental Protection Agency ("USEPA") (Region 8) in coordination with the South Dakota Department of Health	Spill Prevention, Control and Countermeasures Plan ("SPCC")	2nd Quarter 2018
Federal Aviation Administration ("FAA")	Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard)	Complete – future revisions may be required depending on layout
	Notice of Actual Construction or Alteration (Form 7460-2)	As required by the FAA
Federal Communications Commission ("FCC")	Non-Federally Licensed Microwave Study	Completed
	National Telecommunications	Completed

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Table 1-2: Permits and Approvals

Regulatory Authority	Permit/Approval	Status
	and Information Administration ("NTIA") Communication Study	
Federal Energy Regulatory Commission	Exempt Wholesale Generator Self Certification	Before operations
	Market-Based Rate Authorization	Before operations
Federal Emergency Management Agency ("FEMA")	Floodplain Designation	1st Quarter 2018
State of South Dakota Approvals		
South Dakota Aeronautics Commission	Aeronautical Hazard Permit	2nd Quarter 2018
SDPUC	Application for Facility Permit	2nd Quarter 2018
SDSHS	Cultural and Historic Resources Review and Review of State and National Register for Historic Places ("NRHP") and Archeological Survey	2nd Quarter 2018
South Dakota Department of Environmental and Natural Resources ("SDDENR")	Section 401 Water Quality Certification	2nd Quarter 2018
	National Pollutant Discharge Elimination System ("NPDES") General Stormwater Permit for Construction Activity	2nd Quarter 2018
	Temporary Water Use Permit for Construction Activities	Ongoing during construction
	Water Rights Permit for Non-irrigation Use	2nd Quarter 2018
	Temporary Discharge Permit	2nd Quarter 2018
	Air Quality Permit	2nd Quarter 2018
South Dakota Department of Transportation ("SDDOT")	Utility Permits on Trunk Highway Right-of-way	2nd Quarter 2018
	Oversize/Overweight Permit for State Highways	Ongoing during construction
	Tall Structure Permit	2nd Quarter 2018
Local Approvals		
Clark County	Right-of-way permits, crossing permits, driveway permits for access roads, building permit for O&M Facility,	2nd Quarter 2018

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Table 1-2: Permits and Approvals

Regulatory Authority	Permit/Approval	Status
	oversize/overweight permits for County Roads, Conditional Use Permit and building permit for Wind Energy System ("WES") and transmission line	
Townships	Right-of-way permits, crossing permits, driveway permits for access roads, oversize/overweight permits for township roads	2nd Quarter 2018

Table 1-3 identifies the pre-construction surveys and studies have been completed or are in progress to confirm the feasibility of the proposed actions and to identify alternatives to avoid or minimize impacts to existing human and environmental resources. Tiers 1 through 3 are intended to acquire site-specific baseline information, including agency coordination, to avoid impacts to sensitive features. Crocker has incorporated information from studies completed in Tiers 1 through 3 into the design to avoid and minimize impacts.

Table 1-3: Summary of Pre-Construction Studies at the Crocker Wind Project

Study	Status
Communication Tower Study	Complete
Microwave Beam Path Study	Complete
Shadow Flicker Assessment	Complete
Noise Compliance Report	Complete
Grassland Avian Use Study	Complete
Avian Use Studies	Ongoing until March 2018
Eagle and Raptor Nest Surveys	Complete
Eagle Monitoring	Ongoing until March 2018
Sharp-tailed Grouse and Greater Prairie Chicken Lek Surveys	Complete
Dakota Skipper and Poweshiek Skipperling Habitat Assessment	Complete
Dakota Skipper Presence/Absence Surveys	Complete
General Bat Acoustic Survey	Complete
NLEB Presence/Absence Acoustic Surveys	Complete
Wetland and Waterbody Delineations	78% complete; to be completed Spring 2018
Natural Community Inventory	78% complete; to be completed Spring 2018
Archaeological and Cultural Studies	80% complete; to be completed Spring 2018

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The data acquired through site-specific studies, as well as agency, landowner, and other feedback received, was incorporated as appropriate into Project layout design. The Project initially started with 219 potential turbine locations. That number has been reduced to the proposed 120 locations. As discussed above, Crocker modified the proposed Project layout to avoid direct permanent impacts to wetlands, and removed 27 proposed turbine locations from grassland easements. Design changes were also made to avoid newly identified cultural resource sites, wetland easement basins, and to account for county and state setback requirements and other constraints. Crocker also aligned linear corridors, such as the access roads, collector system, crane pathways, and transmission lines to follow existing disturbed corridors (e.g., roads, transmission lines, fence rows) to reduce habitat fragmentation.

In addition, Crocker evaluated but rejected a longer overhead electric transmission line that ran approximately 11 miles longer into Day County. This shortening of the route from approximately 16 miles to 5.2 miles reduced impacts to 0.25 miles of grassland easements and four miles of parcels with wetland easements. The Transmission Facility connects the Project substation to the interconnect switchyard in the most direct route while collocated along existing rights-of-way and sited on participating land.

While a limited amount of field survey work is ongoing, the remaining study work is not anticipated to affect the environmental analysis set forth in this EA, or the conclusion that the Project will meet all applicable local, state and federal permitting requirements.

1.3.4 Transmission Facility Alternatives

The Transmission Facility connects the Project substation to the interconnect switchyard in the most direct route while located along existing rights-of-way and on participating land. Therefore, few alternatives were evaluated. However, Crocker evaluated an alternative segment exiting the Project substation (Figure 4), which would add approximately 1 mile of transmission line and up to 19 additional transmission structures. Additionally, the alternative would add 0.4 miles of north-south parallel transmission lines. Conversely, landowners originally favored the alternative route to run the transmission line along a proposed access road but are open to the Preferred Route. The alternative route was evaluated, but it is not preferred due to the increased length, number of additional structures required and additional environmental impacts. The analysis in this EA considers the Preferred Route described in Section 2.1.2.

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2.0 DESCRIPTION OF PROPOSED ACTION & NO ACTION ALTERNATIVES

2.1 Proposed Action

2.1.1 Wind Farm Facility

The Project would consist of up to 120 turbines producing up to 400 MW. The proposed Project configuration is shown in Figure 2 and detailed on Figures 2a-2d. All proposed turbine locations meet applicable state and county setback and noise requirements for all proposed turbine models.

Crocker's layout is based on a detailed analysis of the Project Area and has been sited to avoid or minimize potential impacts. However, a limited amount of field survey work, construction micro-siting, and a geotechnical analysis of the proposed locations will be required to finalize the locations, which could necessitate minor shifts. Any shifts would remain in compliance with specified noise and shadow flicker thresholds at occupied residences, cultural resources and sensitive species habitat will be avoided, and wetland impacts will be avoided to the extent practicable. If turbine shifts do not meet the limitations specified, Crocker would not use the turbine location. USFWS evaluation in this EA is based on the current layout. If the turbine locations, or any facilities are moved USFWS will evaluate changes to assure impacts do not increase. In all cases, the final turbine locations would adhere to all applicable local, state, and federal regulations and requirements.

As a result of final micro-siting, shifts in the access roads and collector system, as well as temporary facilities (e.g., concrete batch plant and laydown/staging areas), may also be necessary to accommodate turbine shifts, avoid identified resources, incorporate landowner input, or to address other factors. Therefore, those facilities would be shifted, as needed, so long as they are located on leased land, cultural resources are avoided, sensitive species habitat is avoided, wetland impacts are avoided to the extent practicable, and all other applicable regulations and requirements are met.

2.1.1.1 Wind Turbines

Wind Turbine Generators

The proposed Project would consist of up to 120 three-bladed, horizontal-axis wind turbines (Figure 2). Crocker has not finalized the specific turbine choice for the Project and will select the turbine model prior to construction. The turbines Crocker is considering for the Project span the energy production range of 2.0 MW to 4.0 MW. The configuration illustrated in Figure 2 would be the same for any of the four turbine models and all locations comply with the state rules and Clark County provisions with respect to setbacks and noise.

Table 2-1 shows the range of characteristics for the four representative turbines.

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Table 2-1: Wind Turbine Characteristics

Characteristic	Turbine			
	Gamesa G126	Vestas V136-3.45	GE 2.5-116	Vestas V110
Nameplate capacity (kW)	2625	3450	2500	2000
Hub height (m)[1]	84	82	90	80/95
Rotor Diameter (m)	126	136	116	110
Total height (m)[2]	147	150	148	135/150
Cut-in wind speed (m/s)[3]	3	3	3	3
Rated capacity wind speed (m/s)[4]	10	10	11	11
Cut-out wind speed (m/s)[5]	25	21	25	20
Maximum sustained wind speed (m/s)[6]	52.5	52.5	52.5	52.5
Wind Swept Area (m^2)	12,469	14,526	10,568	9,503
Rotor speed (rpm)	6.0-11.6	6.6-12.5	8.0-15.7	6-17.0

GE = General Electric
kW = kilowatts
m = meters
m/s = meters per second
rpm = rotations per minute

1 *Hub height = the turbine height from the ground to the top of the nacelle. Tower heights may range from 80 to 95 m.*
2. *Total height = the total turbine height from the ground to the tip of the blade in an upright position.*
3 *Cut-in wind speed = wind speed at which turbine begins operation*
4 *Rated capacity wind speed = wind speed at which turbine reaches its rated capacity*
5 *Cut-out wind speed = wind speed above which turbine shuts down operation*
6 *Maximum sustained wind speed = wind speed up to which turbine is designed to withstand*

All four models have active yaw and pitch regulation and asynchronous generators. The turbines use a bedplate drive-train design where all nacelle components are joined on common structures to improve durability. All four turbine models can operate with adjusted cut-in speeds and full blade feathering.

Wind Turbine Towers

The towers are conical tubular in shape and are painted a non-glare white, off-white or gray. The turbine tower, where the nacelle is mounted, consists of three to four sections manufactured from certified steel plates. Welds are made with automatically controlled power welding machines and

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are ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces are sandblasted, and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower. Within the tower, access to the nacelle is provided by a ladder connecting four platforms and equipped with a fall arresting safety system.

Wind Turbine Foundations

The wind turbines' freestanding tubular towers will be connected by anchor bolts to a concrete foundation. Turbine foundations will use a pad-and-pier tower mounting system consisting of top and bottom templates. These templates consist of anchor bolts and reinforcing steel bar (rebar); they are placed within the excavated portion of the turbine footing and filled with concrete. The anchor bolts protrude from the concrete pad surface and the turbine base is fastened to these bolts. The excavated portion of the concrete turbine pad ranges from approximately 291 to 737 cubic yards depending on soil requirements and turbine size. The turbine pad dimensions are approximately 20 feet in above-ground diameter and typically range in depth from eight to nine feet. An approximate height of one-half to one foot of the turbine pad remains above grade. Geotechnical surveys, turbine tower load specifications, and cost considerations, among other factors will dictate final design parameters of the foundations. A typical turbine foundation is included in Appendix B.

In addition, turbine assembly will require a 40- by 120-foot gravel crane pad extending from the access road to the turbine foundation, which will be graded to a maximum of one percent, and an approximate 260- by 260-foot to 335- by 335-foot area for component laydown and rotor assembly centered close to the turbine foundation, which will be graded to a maximum of five percent. This is a temporary impact and will be restored to its original grade and vegetation that is equal to the quality of current conditions.

Generator Step-up Transformers

At the base, or within each turbine, a step-up transformer will be installed to raise the voltage of the electricity generated by the turbine to the power collection line voltage of 34.5 kV. In some turbine models (e.g., Gamesa G126, Vestas V110, and Vestas V136-3.45), the step-up transformer is located within the nacelle. If external transformers are used (e.g., for the General Electric ["GE"] 2.5-116), then small, concrete slab foundations will be constructed, to support the transformers, within the gravel area at the turbine base. The exact dimensions of the transformers, concrete pad and concrete fill will be dependent upon transformer manufacturer specifications and site-specific engineering requirements.

2.1.1.2 Meteorological Towers

Three temporary meteorological towers were permitted and installed within the Project Area to study the wind resources at the site (one in 2010 and two in 2016). Crocker proposes to construct up to four permanent meteorological towers at hub height with the potential for a Sonic Detection and Ranging ("SoDAR") and/or a Light Range Detection and Ranging ("LiDAR") unit(s). Met towers may be used for monitoring wildlife activity as well as meteorological data.

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The preliminary locations of the four permanent meteorological towers or SoDAR/LiDAR units are shown on Figure 2.

2.1.1.3 Access Roads and Crane Paths

The Project will include permanent all-weather gravel roads that provide access to the wind turbines for maintenance. The access roads will be low-profile to allow farm equipment to cross. Crocker will install temporary culverts and field approaches where needed to access the route and to maintain adequate access and drainage throughout construction. The construction corridor for access roads will be approximately 120 feet wide. Roads will initially be 34 feet wide to accommodate transportation of heavy construction equipment during construction. Once Crocker completes construction of the turbines, the access roads will be reduced to their permanent width of up to 20 feet. Total access road length will be up to approximately 43.6 miles for the overall Project, with approximately 5.3 miles on grassland easements.

Due to the size and weight of the large crane used to install the mid- and top-tower sections of the turbine, the crane cannot drive along public roads. Instead, cross-country paths must be created, called crane paths. Crane paths are designed to use the shortest path between turbine sites, while avoiding significant changes in grade, trees, wetlands, and waterways. Crane paths will be approximately 65 feet wide to accommodate the cranes during construction. Crane paths will utilize access roads to the maximum extent possible. Where use of access roads is not possible, a path will be cleared over dry or frozen ground, or construction mats will be installed as practicable. Once construction is complete, crane paths will be restored by decompacting and re-establishing vegetation. Grading or gravel placement will not occur on crane paths. There are approximately 7.5 miles on grassland easement (20.2 acres of temporary impact) and 0.2 miles in protected basins (0.6 aces of temporary impacts).

Crocker designed the access road and crane path network to serve the Project most efficiently while incorporating landowner input, agency consultation, and other factors on road locations into consideration. Crocker has co-located the access roads and crane network with existing disturbance (e.g., farm roads, fencerows, section lines, utility corridors) as much as possible. Proposed access roads and crane path network are illustrated in Figure 2.

In addition, improvements to existing public and private roads and bridges may be required to allow for the safe and efficient transport of the wind turbine tower, nacelle, and blades by flatbed trucks to the Project site. Existing bridges may need to be replaced or reinforced, and roads widened, graded, and/or graveled. Crocker is identifying the best haul route to the Project site and where existing road improvements may be required. Crocker will work with the appropriate federal, state, and/or local agencies to obtain the permits required for these improvements.

2.1.1.4 Temporary Laydown/Staging Areas/Temporary Concrete Batch Plant

Crocker will grade a temporary laydown/staging area of approximately twelve acres. The preliminary location is in the southeast portion of the Project Area (see Figure 2). If the location of the preliminary laydown/staging area should change, it will be sited to avoid impacts to sensitive resources, USFWS grassland easements and protected basins, and will be located on

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land under lease. The laydown/staging area will serve both the Wind Farm Facility and Transmission Facility construction, and will provide parking for construction personnel, staging area for large equipment deliveries, and potentially maintain an on-site temporary concrete batch plant during construction. It is more efficient to mix concrete on-site and would require a staging area for dry constituents (sand, aggregate) to be hauled to the site from off-site borrow areas. Water will be supplied from municipal or other off-site sources and trucked to the site. The appropriate water appropriation permits will be obtained to source the water. Electrical power for the batch plant will be supplied by portable generators or the local electrical distribution system.

The staging area will be used to conduct maintenance on construction equipment and vehicles, and to store fuel. On-site fuel storage would have secondary containment and would be inspected regularly, with containment being remediated promptly in accordance with the Project's Spill Prevention, Control, and Countermeasures Plan ("SPCC"). Fuel handling-activities and spill remediation would also adhere to the procedures outlined in the Project's SPCC.

2.1.1.5 Operations and Maintenance Facility

An O&M Facility will be co-located with the Project substation and will provide access and storage for Project maintenance and operations. Construction of the approximately 5-acre O&M Facility will require a Clark County building permit. A typical building is approximately 5,000 to 6,000 square feet and houses the equipment to operate and maintain the Project. Ambient conditions within the O&M Facility would need to be maintained to meet equipment operating requirements and/or to support the presence of maintenance personnel. Heating of all occupied structures would be provided by propane stored on site. Although the electric power demands of the O&M Facility and the operating equipment would be supplied from the grid, emergency power generation would also be available on-site via a diesel engine/generator set. The parking lot adjacent to the building is an estimated 3,000 square feet.

2.1.1.6 Electrical Collector System

From the step-up transformers at each turbine, which raise the voltage to 34.5 kV, power will run through an underground and/or aboveground system of collection cables, collector buses, and feeder breakers, referred to as a collector system, and connects to the Project substation. The Project substation will raise the voltage to 345 kV to tie-in to the grid. Up to 157 miles of underground collection will be installed by trenching, plowing, or, where needed, directionally boring the cables to avoid sensitive environmental conditions or meet other requirements for the Project overall, and approximately 23.4 miles on grassland easements (95.3 acres of temporary impact) and 0.6 miles on protected basins (3.1 acres of temporary impact).

Generally, the electrical collection lines will be buried with marking tape and tracer wire per appropriate national electrical code and the Project will register the appropriate underground facilities with the South Dakota One-Call system. Additionally, collector system cabling may go aboveground when conflicts with existing underground utilities or other infrastructure cannot be resolved. Where electrical collectors meet public road rights-of-way, the power collection lines will likely continue underground, or the appropriate collection facilities could be raised as required to become aboveground facilities (if requested by the road authority, or if shallow bedrock, underground utilities or other infrastructure are encountered). The collection lines will

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occasionally require an aboveground junction box when the lines from separate spools need to be spliced together. The proposed collector system layout is shown on Figure 2.

2.1.1.7 Fiber Optic Communication System

When installing the collector system, Crocker will also install fiber optic communication systems that will connect each of the Project's wind turbines to the Project's substation and provide communications between the wind turbines, substation, O&M Facility and electrical grid as part of SCADA (see Section 2.1.4.10). If underground, the electrical and fiber optic cables will be placed in the same trench wherever possible and will include occasional aboveground junction boxes. All the collection circuits will connect to Crocker's substation which will have a fiber optic connection to the O&M Facility and a communication system to the grid operator.

2.1.1.8 Project Substation

The power delivered to the Project's substation via the collector system will be converted to 345 kV. The substation will be designed according to good utility practices and will include a weather protected control structure, power transformers, switches, metering and other equipment needed for safe electrical operations of the Wind Farm Facility. The area around the substation will be graveled and fenced. The substation area once completed will be approximately 500 feet by 500 feet. The Project substation is located on private land with no USFWS easements.

2.1.2 Transmission Facility

2.1.2.1 Configuration of Poles and Conductors

The 5.2-mile long single circuit transmission line will be constructed primarily on steel monopole structures. Crocker anticipates using Type 2-bundle 954 aluminum conductor steel reinforced conductors or conductors of comparable capacity. Monopole structures are generally placed on foundations measuring between 6 to 11 feet in diameter and will typically be between 100 and 120 feet tall. Spacing intervals will be between 400 and 1,000 feet. Diagrams of typical structures to be used on this Project are shown in Appendix C.

Preliminary locations of the transmission line structures are shown on Figure 3. There are 67 preliminary structure locations, 14 of which are on grassland easements (< 0.1 acres). To allow flexibility for final micro-siting (e.g., to avoid impacts to previously unrecorded cultural resources, incorporate geotechnical data, and accommodate potential landowner requests, shifts to structures may be required. If shifts are required, structures will remain within the acquired wind easement (see Section 2.1.1), impacts to cultural resources and sensitive habitat will be avoided, and wetland impacts will be avoided to the extent practicable. Structures will not be in protected basins.

2.1.2.2 Transmission Corridor

The 5.2-mile 345 kV overhead transmission will run from the Project substation in Section 30 of Township 119N, Range 58W to a switchyard located approximately 2 miles north of the town of Crocker in Section 9 of Township 119N, Range 58W, all in Clark County, South Dakota (Figure 3). At the switchyard, the power will transfer to the Basin Electric Groton-to-Watertown 345 kV

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transmission line, part of the SPP/Western Transmission line portfolio. No portion of the Transmission Line will require underground transmission.

The typical transmission easement area for the transmission line corridor is 150-feet-wide plus the adjacent right of way when applicable. Temporary construction impacts along the transmission line corridor are anticipated to be approximately 100 feet wide along the route. Permanent impacts will be limited to the area required for the transmission line structures. Additional temporary construction workspace may be required to allow for access to the easement area, cable-pulling, or stringing the transmission line on the conductors. These additional areas will require USFWS approval if on grassland easement. All temporary construction workspace will be restored once construction is complete. Vegetation in the transmission easement area will be maintained to protect the lines, allow for ground-based inspections, and access to transmission structures when maintenance is required. The construction workspace for the transmission line is 54.2 acres, 12.2 acres of which are on grassland easements. There are 0.4 acres of USFWS wetland basins in the construction workspace where Crocker will further coordinate with USFWS to assure no easement violation.

2.1.2.3 Temporary Laydown/Staging Area

As discussed in Section 2.1.1.4, a preliminary 12-acre temporary laydown/staging area has been identified for use by the Wind Farm Facility and Transmission Facility construction (Figure 2). If the location of the preliminary laydown/staging area should change, it will be sited to avoid impacts to sensitive resources, USFWS grassland easements and protected basins, and will be located on land under lease. The staging area will be required to store equipment and vehicles, and to pre-assemble the pole structures. The laydown/staging area would be temporary and would be restored once construction is complete.

2.1.2.4 Interconnection Switchyard

The interconnecting utility will construct a switchyard that will tie-in the Wind Farm Facility to the existing electrical grid (Figure 2). The switchyard will require a construction workspace of approximately 16.8 acres, with the final fenced in area anticipated area to be approximately 500 feet by 500 feet. Because the switchyard will be constructed by the interconnecting utility, the exact location of the fenced in area is pending. For the purposes of this EA, Crocker conservatively assumed permanent impacts of the 16.8 construction workspace. The switchyard components will be mounted on concrete pads. For electrical and fire safety, the switchyard will be graveled to maintain the area free of vegetation. The area will be fenced to prevent unauthorized entry by individuals and wildlife. Once construction is complete, the switchyard would be maintained and operated by the interconnecting utility. The switchyard is located on private land and avoids USFWS grassland easements and wetland basins.

2.1.3 Land Requirements

Table 2-2 describes both the temporary and permanent land requirements by Project component for the Wind Farm Facility, Transmission Facility, and the Project overall on non-easements, USFWS grassland easements, and wetland basins. Note access roads, collection lines and crane paths are collocated when possible.

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Table 2-2: Summary of Land Requirements for the Crocker Wind Project (Acres)

Facility Component	Non-Easement		Grassland Easement		Wetland Basins		Project Total	
	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm
Turbines Foundations	639.4	19.1	88.5	2.5	7.6	0.0	**735.9**	**21.6**
Access Roads	362.3	91.0	44.2	12.5	1.6	0.0	**408.1**	**103.5**
Crane Path Network	156.8	0.0	20.2	0.0	0.6	0.0	**177.6**	**0.0**
Electrical Collector and Communication Systems	345.7	0.0	95.3	0.0	3.1	0.0	**444.1**	**0.0**
Temporary Laydown/Staging Area	0.0	12.0	0.0	0.0	0.0	0.0	**0.0**	**12.0**
O&M Facility	0.0	5.5	0.0	0.0	0.0	0.0	**0.0**	**5.5**
Project Substation	0.0	9.4	0.0	0.0	0.0	0.0	**0.0**	**9.4**
Meteorological Towers	0.2	< 0.1	0.0	0.0	0.0	0.0	**0.2**	**< 0.1**
Interconnection Switchyard	0.0	16.8	0.0	0.0	0.0	0.0	**0.0**	**16.8**
Transmission Structures	0.0	0.1	0.0	<0.1	0.0	0.0	**0.0**	**0.2**
Construction Workspace	41.6	0.0	12.2	0.0	0.4	0.0	**54.2**	**0.0**
Subtotals	**1,560.6**	**142.0**	**260.5**	**15.1**	**13.4**	**0.0**	**1,832.1**	**157.1**

2.1.4 Wind Farm Facility Construction, Restoration, Operations and Maintenance Procedures

Once Crocker has received all appropriate federal, state, and local permits and approvals, Crocker would initiate construction. Construction is expected to require 12 to 18 months to complete; however, depending upon seasonal or weather-related constraints it may take more or less time. Construction could commence on site as early as second quarter 2018. Per the PEIS BMPs, on USFWS easement land, Crocker will clear outside the nesting season and drive cranes over access roads, on construction mats, or on dry or frozen ground to the extent practicable. Grassland easement crane access on frozen or dry ground is also permitted in some situations.

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Crocker's preliminary construction schedule is summarized below and subject to change. During the 12 to 18-month construction schedule, Crocker will be completing construction activities during one nesting season. While 13 months of construction activities are outlined below, construction may last up to 18 months depending on weather, manufacturers, and other factors. Crocker will coordinate with the USFWS on the construction schedule through the Special Use Permit process.

- Civil Site Work: September – November 2018 and May – September 2019
    - Includes clearing and grading roads and foundation areas
- Collection Substation: September – November 2019 and May – July 2019
    - Includes clearing, grading, pouring foundation for structures and installing equipment
- Collection Line Installation: September – November 2018
    - Includes ploughing in collection lines
- Turbine Foundations: October – November 2018 and May – June 2019
    - Includes excavating a hole for foundation, laying/tying rebar and pouring concrete, backfilling and grading around the foundation
- Turbine Delivery: June and July 2019
    - Turbines will be delivered in sections to each turbine location
- Turbine Erection: June – September 2019
    - Cranes will travel through the Project Area on designated paths for turbine erection
- Transmission Line: June – September 2019
    - Transmission equipment delivered, poles installed, lines strung
- Restoration: September – October 2019
    - Temporary construction areas will be restored through grading to natural contours, soils will be loosened and seeded as necessary

2.1.4.1 Mobilization and Site Preparation

First, the workspace would be surveyed, staked, and prepared for clearing. The workspace would then be cleared and graded, as necessary, to provide construction access and safe movement of equipment and personnel. Silt fence and other erosion control devices ("ECDs") would be installed in accordance with the Project's Stormwater Pollution Prevention Plan ("SWPPP") and applicable permit conditions, and sensitive areas would be marked for avoidance. Appropriate safety measures would be implemented before excavation begins, including notification through the One-Call system to ensure third-party utilities and adjacent pipelines are properly marked. Equipment and vehicles will be transported to the Project Area and staged at the temporary laydown or staging area. During construction activities, dust control measures will be applied to manage dust along access roads, laydown/staging areas, and construction workspaces.

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Crocker will conduct pre-construction surveys of the construction workspace to identify noxious and invasive weeds. A Noxious and Invasive Weed Management Plan will be developed to identify and establish the procedures to prevent the introduction and spread of noxious and invasive weeds during construction and ongoing operations.

Potable water and sanitary facilities will be established to support the construction crews at the Project site. Potable water will be provided from off-site facilities, and sanitary facilities (portable latrines) will be provided by a vendor. Some construction areas and laydown/staging areas will be fenced to prevent access by wildlife or unauthorized personnel as needed.

2.1.4.2 Roadwork

Crocker will build gravel access roads to each turbine location. The construction corridor for access roads will be approximately 120 feet wide. Roads will initially be 34 feet wide to accommodate transportation of heavy construction equipment during construction. Before the access road is graveled, topsoil will be removed and stockpiled in the temporary construction workspace, subsoil will be compacted, and a geotextile matting will be placed. Crocker will install temporary culverts and field approaches where needed to access the route and to maintain adequate access and drainage throughout construction.

After construction is completed, temporary access roads will be converted to narrower, permanent access roads that could be up to 20 feet wide. The temporary portion of the access road will be restored by removing the gravel and geotextile fabric, decompacting the subsoil, and replacing the stored topsoil. Permanent access roads to turbine locations will be maintained to facilitate access to the turbine for ongoing operation and maintenance.

As discussed in Section 2.1.1.3, crane paths will be approximately 65 feet wide to accommodate the cranes during construction. Crane paths will utilize access roads to the maximum extent possible. Where use of access roads is not possible, a path will be cleared over dry or frozen ground, or construction mats will be installed, as practicable. Once construction is complete, crane paths will be restored by decompacting and re-establishing vegetation. Grading or gravel placement will not occur on crane paths.

Public roads may also need improvements to allow for the safe and efficient access of flatbed trailers carrying the turbine tower components to the Project site. Crocker is in the process of identifying the best haul route to the Project site and where existing road improvements may be required. Crocker will work with the appropriate federal, state, and/or local agencies to obtain the permits required for these improvements.

2.1.4.3 Installation of Turbine Foundations

Crocker will next initiate the construction of the wind turbine foundations by clearing, and removing and stockpiling the topsoil and subsoil from each turbine site. Topsoil and subsoil will be stored separately around the foundation. Foundations are constructed by excavating a hole, placing reinforcing steel, and pouring concrete into the hole. Next, the subsoil and topsoil are replaced over the concrete, leaving only the center of the foundation above the surface grade.

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Crocker will clear, grade, and develop a 40- by 120-foot crane pad area extending from the access road to the turbine foundation that will be used to erect the turbine tower. After construction, a 50-foot radius around each turbine will be maintained and graveled to prevent potential damage to the underground foundation and cabling that extends to each turbine. The remaining temporary construction area around each wind turbine will be restored and returned to its pre-construction use.

2.1.4.4 Installation of Electrical Collector and Communication Systems

To install the underground collection lines and fiber optic cables, Crocker would trench, plow, or, where needed, directionally bore the cables underground to avoid sensitive environmental conditions or to address other needs. Trenching and plowing are anticipated to be the primary methods of installation. Typical collector lines will be installed at least 4 feet below grade. Generally, the electrical collection lines will be buried with marking tape and tracer wire per appropriate national electrical code and the project will register the appropriate underground facilities with the South Dakota One-Call system. Lines are typically plowed in using bull dozers and associated plowing equipment. Where trenching is appropriate, topsoil would be segregated according to applicable permit conditions. The cables would be placed into the trench and backfilled. During backfilling, first subsoil would be replaced followed by topsoil.

2.1.4.5 Tower Deliveries and Erection

The first sections of the turbine to be delivered and erected are the base and mid-section of the tower. These will be transported to the Project Area by semi-truck, and then assembled by crane in the crane pad area. The typical process includes the following steps. First, the two tower sections are assembled, and the base is bolted to the foundation. Next, the top tower section is erected, and then the nacelle is raised and bolted to the top. Finally, the blades are connected to the hub, collectively called the rotor assembly, which is then connected to a shaft that passes into the nacelle. Each turbine takes approximately 4 to 5 days to erect from offload to pre-assembly and effecting staging of components. Once installed, Crocker will mark and light the turbines to comply with Federal Aviation Administration (“FAA”) requirements.

2.1.4.6 Construction of Operations and Maintenance Facility

The O&M Facility will require initial civil and grading work to establish the building pad and create positive drainage. Underground foundations will be installed along with below grade mechanicals. The building will be erected, internal finishes will commence, aggregates will be installed in the parking/yard area. Water supply facilities and septic will be installed.

2.1.4.7 Construction of Project Substation

The Project substation area will require initial civil and grading work to prepare for construction and to create positive drainage. The substation would be constructed and all associated safety, electrical and controls equipment would be installed using good utility standards. Power and control cables would be routed, and additional pre-operational testing could begin once the system(s) are energized. Once the Wind Farm is fully operational, all systems would then be re-checked. Final site civil work would be completed.

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2.1.4.8 Installation of Permanent Meteorological Towers

Similar to turbines, the hub height meteorological towers will be erected using a crane with the base being bolted to a foundation. A 75- by 75-foot square of temporary workspace will be required for foundation installation and stacking the meteorological tower. Foundations will be a 15- by 15-foot square. Permanent access roads will not be required. Crocker will paint meteorological towers as required by applicable regulations and best practices to improve visibility and will notify local airports about the Project and new towers in the area. Permanent meteorological towers will be free-standing with no guy wires and equipped with FAA approved lighting/markings.

2.1.4.9 Restoration Procedures

Once construction is complete, the construction workspace will be cleaned up and restoration activities would commence. All temporary construction workspaces, such as the crane paths, temporary access roads, temporary laydown/staging area, and extra workspace areas (e.g., crane pad) will be restored by removing gravel (where applicable), decompacting the subsoil, and replacing stored topsoil to pre-construction conditions to the maximum extent practicable. Temporary and permanent stabilization measures, such as slope breakers, mulching, and seeding with the appropriate seed mix will then be implemented.

Crocker will compensate landowners for damages from Project construction to crops, tile, fences or other property.

2.1.4.10 Operations and Maintenance

The expected life span of the Wind Farm Facility is approximately 30 years (see Section 2.1.7). All proposed turbine models have SCADA communication technology to control and monitor the Project. The SCADA communications system permits automatic, independent operation and remote supervision, allowing the simultaneous control of the wind turbines at all times. An O&M crew will be on-site during normal working hours to monitor turbine operation from the O&M Facility, and to conduct maintenance activities.

All major components of wind turbines will undergo routine maintenance according to the schedules established by the component manufacturer. Examples of such activities include lubrication, filter replacements, and gear oil change outs, adding coolant, greases, paints, or coatings for corrosion control. Over the life of the turbine, some mechanical components may also need repair or replacement.

Other activities will include regrading /graveling access roads, routine electrical inspections, and mechanical or chemical control for noxious and invasive weeds as outlined in the Noxious and Invasive Weed Management Plan. Crocker will conduct routine preventative maintenance testing of on-site emergency power generators, and maintain fuel levels of propane and fuel tanks.

Access doors to individual turbine towers will be secured against unauthorized entry at all times. Doors to the O&M Facility and equipment enclosures will also be locked and physical barriers, such as fences, will be maintained around the Project substation and individual tower transformers to prevent unauthorized entry.

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2.1.5 Transmission Facility Construction, Restoration, Operations and Maintenance Procedures

2.1.5.1 Mobilization, Site Preparation, and Clearing

Construction will begin after applicable federal, state, and local approvals have been obtained, property and rights-of-way are acquired, soil conditions established, and final design is complete. The precise timing of construction will consider various requirements that may be in place due to permit conditions, system loading issues, weather and available workforce and materials.

The transmission corridor has been routed to minimize tree clearing to the extent feasible. Isolated trees may need to be cleared to allow safe operation of the transmission line. Surveyors will stake the construction corridor within the approved construction workspace and the pole locations of the approved alignment in preparation for the construction crew arriving on site. Once the construction crew arrives; they will begin by clearing and grubbing out the workspace to ensure that vegetation meets the standards and that the construction crew will have easy access to the construction site. The crew will use chain saws, lifts, tractors and bulldozers only where needed to clear vegetation. The crew will install temporary culverts and field approaches where needed to access the route and to maintain adequate access and drainage. Silt fence and other ECDs would be installed in accordance with the Project's SWPPP and applicable permit conditions, and sensitive areas would be marked for avoidance. Appropriate safety measures would be implemented before pole foundation excavation begins, including notification through the One-Call system to ensure third-party utilities and adjacent pipelines are properly marked. Equipment and vehicles will be transported to the Project Area and staged at the temporary laydown or staging area. During construction activities, dust control measures will be applied to manage dust along access roads, laydown/staging area, and construction workspaces.

A Noxious and Invasive Weed Management Plan will be developed to identify and establish the procedures to prevent the introduction and spread of noxious and invasive weeds during construction and ongoing operations.

2.1.5.2 Transmission Line Construction Procedures

Transmission line structures are generally designed for installation at existing grades. Typically, structure sites with ten percent or less slope will not be graded or leveled. Sites with more than ten percent slope will have working areas graded level or fill brought in for working pads. Crocker anticipates that only minimal grading will be needed because the route has very little elevation change. Where grading is required, the topsoil will be removed and stored for replacement after construction is complete. If the landowner permits, it is preferred to leave the leveled areas and working pads in place for use in future maintenance activities. If permission is not obtained, the site will be graded back to as close to its original condition as possible, and all imported fill, including temporary culverts and road approaches, will be removed from the site and disturbed areas will be returned to pre-disturbance conditions.

The staging area required for construction of the Transmission Facility will be partially shared with the associated Wind Farm Facility. Staging involves delivering the equipment and materials to construct the new transmission line facilities. Structures are delivered to staging areas, sorted

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and loaded onto structure trailers for delivery to the staked location. The materials are stored until they are needed for the Project. Sufficient rights to use the temporary laydown areas outside of the transmission line right-of-way will be obtained from affected landowners through rental agreements. Insulators and other hardware are attached to the structure while it is on the ground in the laydown area.

When it is time to install the poles, structures are moved from the staging areas, delivered to the staked location and placed within the right-of-way until the structure is set. Typically, access to the transmission line right-of-way corridor is made directly from existing roads or trails that run parallel or perpendicular to the transmission line right-of-way. In all cases where construction traffic and activities are within proximity to roadways, the contractor will coordinate with the governing body on traffic control and safety measures. In some situations, private field roads or trails are used. Permission from the property owner is obtained prior to accessing the transmission line corridor outside of public rights-of-way.

The monopole structures will be secured using concrete foundations. The topsoil and subsoil will be excavated, concrete poured, and pile driven to establish the foundation. The spoils from the excavated foundation will be removed from site unless other arrangements are made with the landowner. The concrete foundation is typically one foot above grade.

2.1.5.3 Switchyard Construction Procedures

The Project has a Generator Interconnection Agreement that specifies that the interconnecting utility will be responsible for constructing the switchyard to interconnect the Project onto the transmission grid.

2.1.5.4 Restoration Procedures

The construction workspace will be disturbed during the normal course of work which can take several weeks in any one location. Crocker will take the steps necessary to lessen the impact of the Transmission Facility on the surrounding environment by restoring areas disturbed by construction in accordance with BMPs and permit conditions. As construction on each parcel of land is completed, disturbed areas will be restored to their original condition as practicable.

Crocker or their contractor will contact each property owner after construction is completed to identify and address any damage that may have occurred as a result of the construction of the Project. If damage has occurred to crops, fences or the property, Crocker will fairly compensate the landowner for the damages sustained in accordance with the terms and conditions agreed upon in the Transmission Easement Agreement entered into by Crocker and the landowner.

In some cases, Crocker may use an outside contractor to restore damaged property to its original condition as practicable. Permanent vegetation that is disturbed/removed during construction of transmission lines will be reestablished to pre-disturbance conditions as practicable. Areas with significant soil compaction and disturbance from construction activities along the route will require assistance in reestablishing the vegetation stratum and controlling soil erosion.

Commonly used BMPs to control soil erosion and assist in reestablishing vegetation that may be used on the Transmission Facility include, but are not limited to: Erosion control blankets with

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embedded seeds; Silt fences; Hay bales; Hydro seeding; and Planting individual seeds or seedlings of non-invasive native species.

2.1.5.5 Operations and Maintenance

Transmission lines are designed to operate for decades. Typically, they require only minimal maintenance, particularly in the first few years of operation. The estimated service life of the proposed Transmission Facility is approximately forty years. However, high-voltage transmission lines are seldom completely retired. Crocker anticipates that the line could potentially, and would likely be broadly integrated into the transmission system over time, ultimately providing wider utility than just interconnecting the Wind Farm Facility.

The principal operating and maintenance cost for transmission facilities is the cost of inspections, which will be performed semi-annually by either truck, utility terrain vehicle, on foot, or by air**.** Inspections will be conducted to ensure that the transmission line is fully functional, and that no vegetation has encroached so as to violate good utility best practice prescribed clearances. Crocker will prune or remove vegetation as required to prevent physical contact between the transmission lines and nearby vegetation that could cause the transmission line to fail.

2.1.6 Post-Construction Monitoring

As outlined in the BBCS (Appendix A), Crocker is committed to one year of post-construction avian and bat mortality monitoring. This monitoring includes weekly mortality surveys during the riskiest time of year (i.e., bird and bat migration periods), searcher efficiency trials, carcass removal trials, and adaptive management. These are detailed in Appendix A.

2.1.7 Project Life Cycle

The PEIS describes activities likely to occur during each of the phases of a typical wind energy project's life cycle. These phases (site testing, monitoring, construction, operation, maintenance, and decommissioning) would occur for this Project. The Project life cycle is 30 years.

2.2 No Action Alternative

Under the No Action Alternative, the USFWS would not approve of the grassland easement exchange for the purposes of constructing the proposed Crocker Wind Farm. For the purpose of impact analysis and comparison, it is assumed that the proposed Crocker Wind Farm would be built on lands adjacent to the USFWS easement lands and while many of the direct environmental impacts associated with construction and operation of the wind farm would not occur, due to the proximity of the Project to the subject easement lands, many of the indirect impacts, both positive and negative, would remain the same.

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3.0 AFFECTED ENVIRONMENT

The following sections provide a description of the existing environment at the time of the draft EA within the 29,331-acre Project boundary for the Wind Farm Facility and Transmission Facility (referred to as the "Project Area"). Additional information is in the PEIS Section 4.0.

Generally, the existing environment of the Project Area described in the following sections is based on publicly available information from agencies and academic studies. Crocker conducted field surveys within an environmental survey corridor that encompasses the construction workspace, proposed access roads, crane pathways, and aboveground facility construction footprints for the Project Area to provide site-specific information on terrestrial resources. The results of these surveys are provided in Section 4.0.

3.1 Land Use and Land Cover

This section describes the general land cover types and various land uses occurring within the Project Area. The PEIS has information on the regional land cover and land use.

3.1.1 Local Land Use and Zoning

The Project Area is predominantly private land. Of the 29,331 acres in the Project Area, only 240 acres are publicly owned (< 1 percent) and include two 80-acre GPAs and one 80-acre South Dakota School and Public land parcels. The USFWS easements are on private lands.

According to United States Department of Agriculture ("USDA") (2017) National Agricultural Services Statistics data, grassland/pasture and cropland compose approximately 87.1 percent of the Project Area (Table 3-1; Figure 5). Site visits and field studies confirm much of the Project Area mapped as prairie and grassland is actively grazed pasture; although, as described in Section 3.6.1, approximately 45 percent (13,260 acres) of grassland within the Project Area is potentially undisturbed, meaning that it has never been mechanically manipulated (e.g., tilled) (Bauman et al., 2016). Developed areas are associated with roads, farms, and concentrated around towns.

Table 3-1: Summary of Land Use in the Project Area

Land Cover Category	Land Cover Type	Total Acres	Percent of Total Cover
Grassland/Pasture	Grassland/Pasture	15,784	53.8%
	Grassland/Pasture Total	**15,784**	**53.8%**
Cropland	Soybeans	4,152	14.2%
	Corn	3,370	11.5%
	Other Hay/Non-Alfalfa	834	2.8%
	Spring Wheat	417	1.4%
	Fallow/Idle Cropland	301	1.0%
	Rye	254	0.9%
	Alfalfa	241	0.8%

Table 3-1: Summary of Land Use in the Project Area

Land Cover Category	Land Cover Type	Total Acres	Percent of Total Cover
	Oats	174	0.6%
	Winter Wheat	29	0.1%
	Sunflower	1	<0.1%
	Sorghum	<1	<0.1%
	Cropland Total	**9,773**	**33.3%**
Open Water/Wetland	Open Water	2,798	9.5%
	Herbaceous Wetlands	110	0.4%
	Open Water/Wetland Total	**2,908**	**9.9%**
Developed	Developed, Open Space	684	2.3%
	Developed, Low Intensity	11	<0.1%
	Developed, Medium Intensity	6	<0.1%
	Developed, High Intensity	1	<0.1%
	Developed Total	**702**	**2.4%**
Deciduous Forest	Deciduous Forest	165	0.6%
	Deciduous Forest Total	**165**	**0.6%**
	Total	**29,331**	**100.0%**

Source: USDA (2017)

Based on the 2012 Census of Agriculture in South Dakota, both the number and average size of farms in Clark County increased by 3 percent and 16 percent respectively from 2007 to 2012. Soybeans, corn, forage-land (hay, grass silage, greenchop), and wheat are the top crops grown in Clark County by acreage. Pasture land in Clark County supports cattle and other livestock operations; cattle and pigs are the top livestock raised in the county by number (USDA, 2012). Pasture/hay areas include areas in which naturally occurring or planted grasses, legumes, or grass-legume mixtures used for livestock grazing or the production of seed or hay crops. Cultivation generally occurs in the flatter outwash plains and on gentler slopes void of rocks (United States Geological Survey [“USGS”], 2011).

There are no irrigated lands (center-pivot), major industries, or areas zoned for residential or commercial land uses in the Project Area. There are 35 residences within the Project Area.

Per the Clark County Zoning Ordinance, a wind energy facility and associated transmission facility located in the Agricultural Zoning District must obtain a Conditional Use Permit (“CUP”). In February 2017, Crocker applied for a CUP with Clark County for the Project and obtained it in April of 2017. Crocker has sought relief in Circuit Court from certain permit conditions, and is also seeking clarification of certain permit terms. Crocker’s current configuration has been designed to comply with county setbacks and other applicable requirements, as outlined in Table 3-2 below and displayed on Figure 6 and detailed on Figures 6a-d. A letter dated December 1, 2017 was transmitted to Clark County indicating Crocker

intends to comply with the setbacks established by the Board of Adjustment as condition of the CUP and wishes to resolve outstanding clarification of permit terms (refer to Section 6.3.1).

Chapter 4.21 of the Clark County Zoning Ordinance, the Wind Energy System ("WES") Requirements, outlines several general provisions including but not limited to: mitigation measures, setbacks, electromagnetic interference, lighting, turbine spacing, footprint minimization, collector lines, towers, noise, etc. Crocker will comply with all provisions and setback requirements. Table 3-2 outlines the local, state, and voluntary Project setbacks.

Table 3-2: Wind Turbine Setback Requirements for the Project

Turbine Setback Requirement	Requirements	Proposed Setbacks
Clark County		
4.21.03 (2)(a) Off-site residences, businesses, churches, & buildings owned and/or maintained by governmental entity	3,960 feet	3,960 feet
4.21.03 (2)(a) Buildings on-site or lessor's residences	500 feet	1,000 feet plus any distance needed to meet noise requirement & shadow flicker commitment
4.21.03 (2)(b) Centerline of public roads	500 feet or 110 percent the height of the wind turbine	550 feet minimum and 110 percent of turbine height should the turbine be taller
4.21.03 (2)(c) Any property line	500 feet or 110 percent the height of the wind turbine, whichever is greater	County requirement for non-participants, setback has been waived for participants
Cemetery setback (CUP condition)	1 mile	1 mile
Noise requirement	Distance from receptors must meet the noise standard of 50 A-weighted decibels ("dBA")	Crocker will site turbines at the distance required to meet the 50-dBA standard
South Dakota		
SDCL 43-13-24 Property lines	The greater of 500 feet or 1.1 times the height of the tower	Turbines are sited to meet this standard
Voluntary		
Shadow Flicker	Not regulated by state, federal or local law	Distance required to meet voluntary commitment of 30 hours or less per year at any residence

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3.1.2 Recreation

Recreational opportunities in the area include hunting, fishing, boating, camping, swimming, horseback riding, snowmobiling, and nature viewing. Baileys Lake and the Reid/Round Lake complex are public fisheries located within or adjacent to the Project Area. The public access sites for these lakes are outside of the Project Area (SDGFP, 2015a and 2015b).

The Clark Area Chamber of Commerce (Undated) describes Clark County as a "sportsman's paradise", with over 20,000 acres of public lands and another 10,000 acres of private Walk-In Areas ("WIAs") available for hunting throughout the county. White-tailed deer are hunted in several different seasons include archery (late September to mid-January), youth and mentored youth (mid-September to mid-January), muzzleloader (early December to mid-January), and East River firearm (late November to early December; late December to early January).

Small game species hunted in Clark County include pheasant, grouse, mourning dove, and partridge. Waterfowl species include various species of duck, Canada geese, light geese (snow and white-front), and tundra swan. Clark County was amongst the counties with the highest reported harvests for tundra swan, duck, Canada goose and light goose in 2015 (Huxoll, 2016). Furbearers, including coyote, red fox, raccoon, muskrat, mink, badger, opossum, striped skunk, and spotted skunk, were also trapped or hunted in Clark County in 2016 (Huxoll, 2017).

Figure 7 shows the locations of lands open for hunting.

USFWS WPAs are managed to protect breeding and migratory habitat for waterfowl or wading birds, such as ducks, geese, herons, and egrets. WPAs provide opportunities for viewing wildlife /intact ecosystems and hunting. WPAs located in the Project vicinity are listed in Table 3-3.

Table 3-3: Waterfowl Production Areas in the Project Vicinity

WPA Name	Distance and Direction from Project Boundary	WPA Area (Acres)
Schmit WPA	3.2 miles Northeast	63.7
Thompson WPA	2.5 miles North	78.8
Graves WPA	2 miles Southeast	147.5
Bristol Grazing Association WPA	2.25 miles North	44.0

South Dakota GPAs are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. There are two GPAs within the Project Area, and two GPAs within the vicinity of the Project Area identified in Table 3-4 and Figure 7.

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Table 3-4: Game Production Areas in the Project Vicinity

GPA Name	Distance and Direction from Project Boundary	GPA Area (acres)
Wagner GPA, Clark County	Within	80
Spring Valley GPA, Clark County	Within	80
Sherwood GPA/WA, Clark County	Adjacent, East	400
Bailey Lake GPA/WA, Clark County	Adjacent, Southeast	32
Crocker GPA, Clark County	Adjacent, North	80
Lily GPA, Day County	1-mile Northeast	480
Cottonwood Lake GPA, Clark County	3.75 miles East	484

Reid Lake State Waterfowl Refuge is located one-half mile southeast of the Project Area.

SDGFP offers public hunting through the WIA Program on private land. There is one 81.2-acre WIA parcel in the northern part of the Project Area adjacent to the Spring Valley GPA. The WIA Program includes walk-in agreements with the landowner that typically last one to three years.

The South Dakota School and Public Lands are available for public hunting and fishing. There is one 80-acre School and Public Lands parcel in the eastern portion of the Project Area.

As an indication of the recreational value of the area 34 percent of the Project Area is land managed for wildlife and hunting activities (easement and GPA).

3.1.3 Conservation Easements

The USFWS has easements on some privately-owned wetland and/or grassland habitat in the Project Area. There are 5,473 acres of grassland easement and 2,439 acres of wetland basins (Figure 8). Due to the quality and abundance of wetland and grassland habitats and their value to migratory birds, there are many easements in the area. USFWS easement acquisition priority is given to areas with greater than 60 duck pairs per square mile. For grassland easements additional priority is given to native prairie and areas modeled by the USFWS Habitat and Population Evaluation Team as high value for grassland birds.

Crocker proposes to construct and operate some facilities on USFWS easements. Therefore, this EA was prepared for the Project and will tier off the PEIS. The EA for the Project will focus on site-specific issues that are not already addressed in sufficient detail in the PEIS.

3.1.4 Transportation

In general, the existing roadway infrastructure in and around the Project Area is characterized by state, county, and township roads that generally follow section lines. Various county and township roads provide access to the Project and include both paved and gravel roads. In the

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agricultural areas, many landowners use private, single-lane farm roads on their property. Roads within and that comprise the Project Area boundary are summarized in Table 3-5.

Table 3-5: Summary of Roadways within the Project Boundary

Road Type	Miles within Project Boundary
Federal Highways	0
State Highways	4.0
County Highways/Roads	17.0
Township Roads	41.7
Total	**62.7**

In 2016, average daily traffic ("ADT") along State Highway 20 in the Project Area was 562 trips, 15 percent of which were trucks (South Dakota Department of Transportation ["SDDOT"], 2016). Traffic on county and townships roads near the Project ranged from 29-108 ADT between 2010 and 2015. Traffic counts on county and township roads are described in the Project vicinity because there are few roads within the Project that have been surveyed for traffic.

3.1.5 Aviation

The Clark County public airport is located approximately 7 miles southeast of the Project Area. The airport has an asphalt runway. There are no other public airports in proximity to the Project Area (SDDOT, 2017). Crocker has not identified any private airstrips within the Project Area; however, there is a private airstrip within one mile to the south.

Air traffic may be present near the Project Area for crop dusting. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation of wind turbine towers in active croplands and installation of aboveground collector lines will create a potential for collisions with aircraft. However, aboveground collector lines are similar to existing distribution lines (located along the edges of fields and roadways) and the turbines themselves would be visible from a distance and lighted according to FAA guidelines. Crocker has received preliminary FAA Determinations of No Hazard for turbine positions.

3.1.6 Telecommunications

Crocker has conducted a microwave beam path analysis, which identified seven paths intersecting the Project Area (Appendix D and Figure 6). Other communication signals licensed by the Federal Communications Commission ("FCC") in and near the Project are listed below.

Table 3-6: FCC Licensed Signals in the Project Vicinity

Communication System Type	Number of Signals
ASR (Antenna Registration System)	3
FM (FM Radio Signals)	0

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Table 3-6: FCC Licensed Signals in the Project Vicinity

Communication System Type	Number of Signals
ASR (Antenna Registration System)	3
Microwave (Radio wave Transmission)	2
Cellular	0
LM broadcast (Land mobile broadcast tower)	4

Source: Comsearch

Crocker submitted a Project notification letter to the United States Department of Commerce ("DOC") National Telecommunications and Information Administration ("NTIA") on March 16, 2016 and November 16, 2017 for a review of potential impacts to federal telecommunications.

Crocker initiated coordination with the Interstate Telecommunications Cooperative, Inc. ("ITC") on April 18, 2016 (see Appendix E). ITC provided shapefiles on October 26, 2016 of the utility's facilities to assist in the design and crossing agreements. ITC expressed concerns with inductive interference, which can happen when collector lines of the wind farm parallel telephone lines.

3.1.7 Other Existing Utility and Right-of-Way Corridors

There is an existing 345 kV Basin Electric transmission line (Groton-to-Watertown) that runs northwest to southeast in the northern portion of the Project.

Other utilities in the Project Area include telecommunications systems, rural water systems (Clark Rural Water), electric distribution lines (East River, Codington Clark Electric Coop), and a natural gas pipeline (Northern Border Pipeline). The Northern Border Pipeline is a natural gas pipeline operated by TransCanada Northern Border, Inc. that commenced operations in 1982 (TC PipeLines, LP, 2017). The pipeline corridor runs northwest to southeast in the center of the Project Area (Figure 6).

3.2 Geologic Setting and Soil Resources

This section describes the physiography, surficial and bedrock geology, geologic hazards, and soil resources within the Project Area. Regional geology is provided in Section 4.2 of the PEIS.

3.2.1 Physiography

Crocker lies entirely within the Central Lowland province, the largest of the physiographic provinces in the U.S. extending from northwestern New York west through Michigan, southern Wisconsin, and south and western Minnesota to the Missouri Escarpment in eastern North Dakota, South Dakota, Nebraska, and Kansas. The province extends south into Ohio, Indiana, Illinois, Iowa, through the northern portion of Missouri, central Oklahoma and into northcentral Texas, with features extending into Canada along its northern boundary (Fenneman, 1916). In South Dakota, the Central Lowland province is further subdivided into the Coteau des Prairies ("Prairie Coteau"), Minnesota Valley, and James Basin divisions. The Project is situated along

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the western margin of the Coteau des Prairies, a broad, flat-iron shaped glacial derived highland exhibiting a gently rolling to undulating surface (Rothrock, 1943).

3.2.2 Geologic Resources

The surficial geology of the Project Area and Clark County consists of glacial deposits associated with the late Wisconsin age drift, which forms an up to 300-foot-thick mantle of primarily till and lesser amounts of stratified drift, such as outwash and lacustrine sediment (Christensen, 1987). Figure 9 illustrates the surficial geology present within the Project Area, which consists of (Martin et al., 2004):

- Stagnation moraine till ("Qlts"): This is a compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature that is characterized by hummocky terrain with abundant sloughs resulting from stagnation of ice sheets. Composite thickness of upper Wisconsin till may be up to 300 feet.
- End moraine till ("Qlte"): A compact, silty, clay-rich matrix with sand- to boulder-size clasts of glacial origin. A geomorphic feature that is characterized by elevated linear ridges with hummocky terrain locally at former ice sheet margins. Composite thickness of upper Wisconsin till may be up to 300 feet.
- Ground moraine till ("Qltg"): A compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature that is characterized by smooth, rolling terrain. Composite thickness of upper Wisconsin till may be up to 300 feet.
- Minor moraine till ("Qltm"): A compact, silty clay-rich matrix with sand- to boulder-size clasts of glacial origin. A geomorphic feature that is characterized by elevated linear ridges including minor, washboard, or recessional moraines. Composite thickness of upper Wisconsin till may be up to 300 feet.
- Undifferentiated outwash ("Qlo"): A heterogeneous mixture of sand and gravel, with minor clay and silt. Deposits of glaciofluvial origin including outwash plains, kames, kame terraces, and other undifferentiated deposits. Thickness up to 30 feet.
- Collapsed outwash ("Qloc"): A heterogeneous mixture of sand and gravel of glaciofluvial origin. Deposited as outwash sediments that collapsed due to melting of buried ice. Thickness up to 90 feet.

Upper Cretaceous age Pierre shale is the first bedrock encountered beneath the glacial deposits within Clark County and the Project Area. Pierre shale is a blue-gray to dark-gray, fissile to blocky shale with persistent beads of bentonite, black organic shale, and light-brown chalky shale. It contains minor sandstone, conglomerate, and abundance carbonate and ferruginous concretions. It extends to a maximum thickness of 1,000 feet (Christensen, 1987; Tomhave and Schulz, 2004). Figures 10a-10b show cross sections depicting the bedrock and surficial geology.

Commercial mineral deposits within the Project Area are limited to sand, gravel and construction aggregate enterprises. Information from the South Dakota Department of Environment and Natural Resources ("SDDENR") Minerals and Mining Program and a review of USGS 7.5-minute quadrangle mapping indicates that two sand and gravel operations run by the Clark County Highway Department are located within the Project Area. Both active sand and gravel

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deposits are in the northern half of Section 10 in Woodland Township (Township 118 North, Range 58 West) in the east-central portion of the Project Area (SDDENR, 2016a) (Figure 9). These sand and gravel operations have a license to operate through December 30, 2020. There are no economic deposits along the Transmission Line Route.

A review of the online information from the SDDENR Oil and Gas Initiative Program Geographic Information System ("GIS") Website reveals that the Project Area does not lie within an oil and gas field; nor have any oil and gas permits been issued or wells developed in Clark County. The nearest identified oil and gas field is the Lantry field located approximately 200 miles due west of the Project (SDDENR, Undated [a]). No other active or historic economic mineral deposits have been identified within the vicinity of the Project.

3.2.3 Geologic Hazards

The risk of seismic activity near the Project Area is extremely low to negligible. According to the USGS 2014 Long-Term Model, the Peak Ground Acceleration with a 2 percent chance of exceedance in 50 years is 0.02 g to 0.04 g ("g" are units of acceleration due to gravity) (Petersen et al., 2015).

According to the South Dakota Geologic Survey ("SDGS"), no earthquakes have been recorded in Clark County, South Dakota from 1872 to 2013 (SDGS, 2013). A review of the geologic mapping and information provided by the USGS Earthquake Hazards Program indicate that there are no active or inactive faults near the Project (USGS, 2016a).

The potential for subsidence within the Project Area is negligible. The Pierre Shale bedrock is buried beneath an approximately 300-foot-thick layer of till across the entire Project vicinity (Christensen, 1987). Additionally, the bedrock does not exhibit karst topography or contain subsurface geologic layers or members that are identified as susceptible to dissolution by water (Schultz et al., 1980). Crocker is not aware of any documented historic underground mining operations within the Project vicinity, which could indicate a potential subsidence risk.

3.2.4 Soil Resources

Soil characteristics within the project area were assessed using the Soil Survey Geographic Database ("SSURGO"; Soil Survey Staff, Natural Resources Conservation Service ["NRCS"], USDA, 2017). The SSURGO database is a digital version of the original county soil surveys developed by NRCS for use with GIS. It provides a detailed level of soils information for natural resource planning and management. Most of the details were gathered at a scale of 1:12,000. Soil maps are linked in the SSURGO database to information about the component soils and their properties (Soil Survey Staff, NRCS, USDA, 2017).

Soil types located within the Project Area are displayed on Figure 11.

3.2.4.1 Prime Farmland

Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops, and is also available for these uses (the land can be cropland, pasture, woodland, or other lands). Urbanized land and open

water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent or prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating).

The NRCS also recognizes farmlands of statewide importance, which are defined as lands other than prime farmland that are used for production of specific high-value food and fiber crops. Farmlands of statewide importance have the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Farmland of statewide importance is similar to prime farmland but with minor shortcomings such as greater slopes or less ability to store soil moisture.

Approximately 37 percent of the Project Area is classified as “not prime farmland,” and approximately 36 percent of the Project Area is classified as “prime farmland.”

Approximately 22 percent of the Project Area is classified as “farmland of statewide importance”. The remaining 5 percent of the Project Area is considered “prime farmland if drained” or “prime farmland if irrigated”.

3.2.4.2 Drainage Class

The drainage class identifies the natural drainage condition of the soil. It refers to the frequency and duration of wet periods and provides a guide to the limitations and potentials of the soil for field crops, forestry, range, wildlife, and recreational uses. The class roughly indicates the degree, frequency, and duration of wetness, which are factors in rating soils for various uses (Soil Survey Staff, NRCS, USDA, 2017). Approximately 75 percent of the Project Area is classified as well drained.

3.2.4.3 Erosion by Wind and Water

Erosion is a natural process where surface soils are worn away, generally resulting from water and wind forces that can be accelerated by human disturbance. Factors that influence the magnitude of erosion include soil texture, soil structure, length and percent of slope, existing vegetative cover, and rainfall. The most erosion-prone soils are generally bare or sparsely vegetated, non-cohesive, fine textured, and situated on moderate to steep slopes. Soils on steep, long slopes are much more susceptible to water erosion than those on short slopes because the steeper slopes accelerate the flow of surface runoff. Soils more resistant to erosion include those that are well-vegetated, well-structured with high percolation rates, and situated on flat to nearly level terrain.

Soils most susceptible to water erosion are typified by bare or sparse vegetative cover, non-cohesive soil particles, low infiltration rates, and/or moderate to steep slopes. Soils more typically resistant to water erosion include those that occupy low relief areas, are well vegetated, and have high infiltration capacity and internal permeability. The potential for soils to be eroded by water was evaluated based on the K factor, where available, and slope. The K factor represents a relative quantitative index of the susceptibility of bare soil to particle detachment

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and transport by water, and is one of the factors used in the Revised Universal Soil Loss Equation to calculate soil loss. K factor values range from 0.02 to 0.69. Soils with a slope greater than 15 percent or soils with a K value of greater than 0.35 and slopes greater than 5 percent are considered highly erodible by water. Using these criteria, approximately 20 percent of the Project Area is classified as water erodible.

Susceptibility to wind erosion is less affected by slope angles and is more directly influenced by physical soil factors including moisture, texture, calcium carbonate content, and organic matter; and landform and landscape conditions including soil roughness factors, unsheltered distance, and vegetative cover. Wind Erodibility Groups are a direct indicator of the inherent susceptibility of soils to wind erosion. Wind Erodibility Groups may range from 1 to 8, with 1 being the highest potential for wind erosion, and 8 the lowest (Soil Survey Staff, NRCS, USDA, 2017). Soils with Wind Erodibility Groups of 2 or less are considered highly erodible due to wind. Less than 0.1 percent of the Project Area is classified as wind erodible.

3.2.4.4 Compaction Prone Soils

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. Construction equipment traveling over wet soils could disrupt the soil structure, reduce pore space, increase runoff potential, and cause rutting. The degree of compaction depends on moisture content and soil texture. Fine-textured soils with poor internal drainage that are moist or saturated during construction are the most susceptible to compaction and rutting.

Soils classified as having somewhat poor to very poor drainage classes and surface textures of clay loam and finer are considered to have a high potential for compaction. Based on SSURGO data, approximately 9 percent of the Project Area would be considered compaction prone.

3.2.4.5 Revegetation Concern

Well drained to excessively drained soils with a coarse surface texture (i.e., fine sand or coarser) may be difficult to revegetate. Drier soils contain less water to aid in the germination and eventual establishment of new vegetation. Coarser textured soils also have a lower water holding capacity, which could result in moisture deficiencies in the root zone, creating unfavorable conditions for many plants.

The land capability classification is a system of grouping soils primarily based on their capability to produce common cultivated crops and pasture plants without deteriorating over a long period of time (Soil Survey Staff, NRCS, USDA, 2017). The capability class ranges from 1 to 8, with 1 having the fewest limitations and 8 having very severe limitations that restrict their use for crops and pasture plants. Soils with a non-irrigated land capability classification of 4 or greater are characterized as having poor revegetation potential. Approximately 39 percent of the Project Area could have revegetation concerns.

3.2.4.6 Steep Slopes

The slope gradient of a soil influences several characteristics such as the ability of a soil to retain water and the potential for accelerated erosion or subsidence (Soil Survey Staff, NRCS, USDA,

2017). The slope gradient of a soil is used to assess soils with high water erosion potential and is a factor used to identify soils that may have revegetation concerns.

Maximum constructed slopes for constructability typically range from 3:1 to 4:1. Slopes beyond this range have soil stability, revegetation and stabilization concerns. The Project layout was developed in consultation with Westwood Professional Services civil engineers to identify slopes that would present construction challenges to avoid placing facilities in those areas. Steep slopes were identified from aerial topography and will be verified through geotechnical studies.

3.3 Hydrologic Setting and Water Resources

This section describes the hydrogeology, groundwater protections zones, watersheds, surface water resources (including waterbodies and wetlands), water uses, floodplains, National Park Service ("NPS") Nationwide Rivers Inventory ("NRI") resources, and impaired waters within the Project Area. Regional hydrologic setting and water resources is in Section 4.3 of the PEIS.

3.3.1 Hydrogeology Resources

The Project Area is located within the Northern Great Plains aquifer system. The aquifer system extends more than 300,000 square miles, underlying most of North Dakota and South Dakota, and parts of Montana and Wyoming. Five major aquifers comprise the permeable rocks of the aquifer system, including: lower Tertiary, upper Cretaceous, lower Cretaceous, upper Paleozoic, and lower Paleozoic (USGS, 1996).

According to Hamilton (1986), the principal aquifers within the Project Area are Prairie Coteau 1 and Altamont Aquifer 2. The Prairie Coteau 1 aquifer is the shallowest of the three aquifers on the Coteau des Prairies, with a depth range of 0-40 feet, an aerial extent of 80 square miles, and a storage of 200,000 acre-feet of water. The Altamont Aquifer 2 is located at a lower altitude and has a depth range of 10-480 feet, aerial extent of 630 square miles, and storage of 3,230,000 acre-feet of water. Recharge of both aquifers is from infiltration of precipitation and lateral inflow. Groundwater in both aquifers generally contains more than 1,000 milligrams per liter of dissolved solids, such as calcium, magnesium, sodium, bicarbonate, and sulfate, with the Altamont Aquifer showing higher readings (Hamilton, 1986).

Jensen (2001) developed a detailed map for the County that identifies areas underlain by aquifer material based on Hamilton (1978, 1986), Christensen (1987), Schroeder (1977), and SDGS lithologic logs database. This map indicates that the majority of the Project Area is underlain by sand and gravel, with first occurrence of aquifer material generally greater than 100 feet below land surface; although it may not be uniform in depth and thickness. There are areas of shallow aquifer material in the north of the Project Area between Twin Sloughs and Lone Tree Lake, which is underlain with sand and gravel, with land surface being the first occurrence of aquifer material. Eastern portions of the Project Area running generally north and south from Round Lake to Baileys Lake are also underlain by these shallow aquifers (Jensen, 2001) (Figure 12).

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3.3.1.1 Groundwater Protection Zones

The Clark Rural Water System and the Cities of Willow Lake and Clark provide water to all rural and municipal users, excluding those with private wells (Clark County, 2003). The Project Area is not located within any wellhead protection areas, but two shallow aquifer boundaries are in the southeastern portion of the Project Area (Figure 12) that contribute drainage to wellhead protection areas (East Dakota Water Development District, Undated; Clark County, 2003).

3.3.2 Watersheds

The Project Area is located within the Missouri River Basin. The Missouri River Basin consists of sub-region, basin, and sub-basin drainages (Hydrologic Unit Code ["HUC"] 4, 6, and 8 respectively). The Project Area is within the James and Missouri-Big Sioux Sub-Regions (HUC-4), James and Big Sioux Basins (HUC-6), and the Mud, Middle James, and Upper Big Sioux Sub-Basins (HUC-8) (USGS, 2013).

3.3.2.1 Mud Sub-Basin

The northern-most portion of the Project Area is located within the Mud Sub-Basin (HUC-8 1060005) (Figure 13). Topography is undulating within this Sub-Basin, with small lake basins and prairie pothole wetlands, along with an overall northeasterly drainage.

3.3.2.2 Middle James Sub-Basin

The majority of the Project Area, including the Transmission Facility is located within the Middle James Sub-Basin (HUC-8 10160006) (Figure 13). Sub-Basin topography indicates drainage generally flows in a gradual manner from the northeast to the southwest with a series of small lakes and prairie pothole wetlands. In the southwestern portion of the Project Area, topography increases, and a variety of springs and unnamed waterbodies drain off the Coteau des Prairies and join to form Fountain Creek, a tributary to Timber Creek and then the James River.

3.3.2.3 Upper Big Sioux Sub-Basin

The eastern-most portion of the Project Area is located within the Upper Big Sioux Sub-Basin (HUC-8 10170201) (Figure 13). Sub-Basin topography in the Project Area is fairly gentle, and indicates a slight west to east direction of drainage, with a more southwest to northeast drainage in the southeastern-most portion. Small lakes and prairie pothole wetlands are present.

3.3.3 Waterbodies

Waters of the U.S. include unvegetated waterways and other waterbodies with a defined bed and bank, such as drainages, ponds, creeks, rivers, and lakes (Environmental Laboratory, 1987); these other waters are addressed in this section. The United States Army Corps of Engineers ("USACE") has the authority to regulate the discharge of dredged and fill material into jurisdictional waters of the U.S. Impacts to waters of the U.S. are reviewed, permitted, and mitigated through the Clean Water Act ("CWA") Section 404 permitting process.

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The National Hydrography Dataset represents U.S. drainage networks and related features, such as rivers, streams, canals, lakes, and ponds (USGS, 2017). This dataset indicates that there are 38.5 miles of waterbodies in the Project Area, which include 3.6 miles of artificial paths, 34.4 miles of intermittent waterbodies, and 0.6 acres of perennial waterbodies (Figure 13).

Crocker conducted a Project analysis of drainage areas. The analysis highlights flow direction and small watershed areas based on LiDAR contour data. This analysis is in Appendix F.

The vegetation of South Dakota consists mostly of mixed grass prairie and tall grass prairie. One-third of the privately-owned grasslands in South Dakota are grazed by livestock. Significant portions of grassland in South Dakota have also been converted to cultivated crops. High condition grasslands can retain a higher percentage of precipitation, and reduce peak flows relative to low condition grassland and bare ground. Gullies, headcuts, and stream bank erosion are also more prominent in low condition grasslands. Annual soil erosion ranges from 10 to 60 times higher for watersheds predominated with continuous cropping versus perennial grass watersheds (South Dakota Grasslands Coalition, 2007). As described further in Section 3.6.1, 37.5 percent of the Project Area is managed pasture land or hay. An additional 16.6 percent of the Project Area has been converted to cultivated cropland, and developed open space accounts for another 2.3 percent.

3.3.4 Wetlands

Wetlands are defined in the USACE Wetland Delineation Manual, as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Wetlands have the following general diagnostic characteristics: hydrophytic vegetation, hydric soil, and wetland hydrology (Environmental Laboratory, 1987).

The Project Area lies within the 276,000-square-mile Prairie Pothole Region, which extends from Alberta, Saskatchewan, and Manitoba, Canada, south into eastern North Dakota and South Dakota, and extends east and south into Minnesota and Iowa. This region is defined by the abundance of shallow wetlands known as potholes, glacial potholes, kettles, or kettle lakes, which can be temporary or semipermanent (Prairie Pothole Joint Venture, 2005).

Pothole wetlands contain water for various lengths of time; the most ephemeral may hold water for only a few days and other large bodies, such as lakes, are perennial. There are also seasonal wetlands that may hold water from early spring to mid- to late-summer, or semipermanent wetlands that are wet most years in the warmer months. These wetlands are maintained by periods of drought and precipitation; periodic drought facilitates nutrient cycling and results in high productivity when water returns (Johnson, 1995).

Since settlement to 1980, South Dakota has lost approximately 35 percent of historic wetland coverage. Wetlands have been drained to facilitate cultivation. In some cases, several small wetlands (often temporary wetlands) were drained into a larger wetland, resulting in the elimination of the smaller wetlands and altered hydrology of the receiving wetland. Some wetlands were also created through the development of stock-watering dams and dugouts usually along intermittent streams (Johnson, 1995) (refer to Location Notices described in Section 3.3.5).

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According to 2012 USDA census data, 4,717 acres of land were drained by tile in 2012, and an additional 7,379 acres were drained by artificial ditches (USDA, 2016).

Waters of the U.S. within the Project Area were identified by reviewing digital NWI data, which provides data on wetland coverage. NWI data are produced by the USFWS and provide reconnaissance level information including location, type, and size of wetlands.

According to NWI data (USFWS, 2017a), approximately 8 percent of the Project Area is mapped as wetlands (Figure 14). NWI wetlands are classified by type according to the Cowardin Classification System (Cowardin et al., 1979). All wetland types in the Project Area are part of the Palustrine System, distinguished by vegetation cover as described below:

- Palustrine Unconsolidated Bottom Wetlands ("PUB"): wetland bottom with at least 25 percent cover of particles smaller than stones and vegetative cover less than 30 percent.
- Palustrine Aquatic Bed Wetlands ("PAB"): Plants that primarily grow on or below the surface of the water (i.e., submergents) are the uppermost life form layer with at least 30 percent areal coverage.
- Palustrine Emergent Wetlands ("PEM"): Emergent plants (i.e., erect, rooted, herbaceous hydrophytes, excluding mosses and lichens) are the tallest life form with at least 30 percent areal coverage. Usually dominated by perennial plants. During wet years, these can become open water wetlands.
- Palustrine Scrub-Shrub Wetlands ("PSS"): Woody plants less than 6 m (20 feet) tall with at least 30 percent areal coverage. Shrubs can include tree shrubs or saplings, and may represent a successional stage leading to a forested wetland.
- Palustrine Forested Wetlands ("PFO"): Trees (woody plants at least 6 m [20 feet] in height) are the dominant life form with at least 30 percent areal coverage.

The wetland classification and total area of wetlands by type occurring with the Project Area are shown in Table 3-7.

Table 3-7: NWI Mapped Wetlands in the Project Area

Wetland Type (Cowardin Class)	Area (acres)
Palustrine Aquatic Bed Wetland ("PAB")	124.1
Palustrine Emergent Wetland ("PEM")	2,205.6
Palustrine Scrub-Shrub Wetland ("PSS")	12.9
Palustrine Forested Wetland ("PFO")	15.9
All Wetland Types	**2,358.5**

3.3.5 Existing and Planned Water Rights

Crocker reviewed the SDDENR Water Rights, Location Notices, and Well Completion Report databases to identify existing water uses within the Project Area (SDDENR, 2017a, b, and c). Water Right Permits are required for water use exceeding 25,920 gallons per day or a peak pump rate of 25 gallons per minute, or for non-domestic uses. If appropriating from surface waters, a

Water Rights Permit is required for dams that impound more that 25-acre feet of water at the primary spillway elevation, diversions serve some use other than reasonable domestic use, or the proposed dam is on a navigable stream. A Location Notice is required for proposed dams that impound 25-acre feet or less at the primary spill way elevation, the water impounded is used for in-place uses such as stock watering, or fish and wildlife habitat, and the dam is constructed on a dry draw or non-navigable stream (SDDENR, 2017d). There are three Water Rights Permits, 63 Location Notices, and eight wells in the Project Area (Figure 12). This includes cancelled water rights and abandoned (plugged) wells. Domestic water uses that do not exceed 25,920 gallons per day or a peak pump rate of 25 gallons per minute do not require a permit (SDDENR, 2017d); therefore, there may be additional water uses occurring in the Project Area that have not been identified.

Based on a review of SDDENR's Pending Applications to Appropriate Water and Future Use Reviews, there are no pending water right applications in Clark County (SDDENR, 2017e).

3.3.6 Floodplains

Floodplains perform many natural functions, including the storage of excess water and reduction of flow velocity during times of flood, groundwater recharge, provision of habitat, and removal of excess sediment, nutrients, and other pollutants. Placement of fill into floodplains reduces the effectiveness of these functions. The Federal Emergency Management Agency ("FEMA") has not completed a study to determine flood hazards in Clark County, South Dakota (FEMA, 2017).

3.3.7 National Park Service Nationwide Rivers Inventory

Pursuant to Section 5(d) of the National Wild and Scenic Rivers Act, the NPS maintains the NRI, a listing of free-flowing river segments in the U.S. that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance (NPS, 2011). There are no NRI-listed rivers within the Project Area; the closest listed is approximately 23 miles southwest of the Project Area.

3.3.8 Impaired Waters

CWA Section 303(d) requires that each state review, establish, and revise water quality standards for all surface waters within the state. Waters that do not meet their designated beneficial uses because of water quality standard violations are considered impaired.

There are no 303(d)-listed waterbodies within the Project Area. Because the proposed Project does not fit into or impact any mercury sources, the Project will not be restricted by the wasteload allocation or load allocation established in the Total Maximum Daily Load.

3.4 Air Quality and Climate

General air quality and climate conditions for the Region are discussed in PEIS Section 4.4.

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3.4.1 Meteorology

The climate of the Project Area is a typical continental climate. Average wind speeds in the area are 13 miles per hour ("mph") prevailing from the northwest (USFWS, 2002). Average wind speeds across the Project Area are generally between 8.5 and 8.7 m/s (approximately 19 mph) with the highest wind speeds occurring in the southern part of the Project Area.

Table 3-8 provides an overview of the monthly and annual average climate data from the Watertown, South Dakota weather station, located approximately 41 miles SE of Project Area.

Table 3-8: Average Monthly Climate Data for Watertown, SD from 1981-2010

	Annual	J	F	M	A	M	J	J	A	S	O	N	D
Precipitation (inches)	21.8	0.5	0.5	1.1	2.0	2.7	3.5	2.9	2.8	2.6	1.9	0.8	0.5
Snowfall (inches)	35.0	5.0	7.0	6.0	3.0	0.0	0.0	0.0	0.0	0.0	2.0	5.0	7.0
High Temperature (F)	53.6	22	27	39	56	68	77	83	80	71	56	39	25
Low Temperature (F)	32.5	3	8	20	32	45	55	60	57	47	35	21	7

Source: U.S. Climate Data, 2017

3.4.2 Existing Emissions and Air Quality

In accordance with United States Environmental Protection Agency ("USEPA") requirements, the SDDENR operates an ambient air monitoring network with the nearest monitoring location to the Project is in Watertown, approximately 35 miles southeast (SDDENR, 2016b). The primary emission sources that exist within the Project Area include agriculture equipment, and SD Highway 20 traffic. The Project Area is not located within a National Ambient Air Quality Standards ("NAAQS") nonattainment area. The nearest Prevention of Significant Deterioration ("PSD") Class I Area to the Project Area is located approximately 240 miles southwest.

3.5 Acoustic Environment

Crocker has conducted background sound level monitoring throughout the Project Area to quantify the existing sound levels and to identify existing sources. Monitoring was conducted at three locations throughout the Project Area (Appendix G). Daytime sound levels generally ranged between 41 and 50 A-weighted decibels ("dBA"), while nighttime sound levels were generally between 36 and 52 dBA. The range of daytime total sound energy ("L_{EQ}") was 41 to 50 dBA, and the range of nighttime L_{EQ} was 36 to 51 dBA. Common sources of sound included wind rustling through vegetation, roadway traffic, aircraft overflights, occasional farming operations, and biogenic sources such as birds and insects.

Higher sound levels typically exist near roadways and areas with greater human activities such as farming. Areas with higher wind resources generally experience higher sound levels compared to lower wind resource areas.

A variety of construction related equipment will be used at differing times and for various lengths of time, with most activities not occurring at the same time. Crocker expects a maximum

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sound level during construction to range between 85 and 95 dBA at 50 feet for a short duration. Sound levels are expected to be quieter where activities occur at distances greater than 50 feet.

South Dakota has not adopted statewide noise standards. Clark County has noise standards for the operation of WES. The standards set forth in the Zoning Ordinance specifies that noise levels may not exceed 50 dBA, average A-weighted sound pressure from existing off-site residences. Therefore, noise sensitive receptors are limited to participating and non-participating residences.

3.6 Ecological Resources

Ecological resources data were collected from literature searches, federal and state agency reports and consultations, and natural resource databases. Biologists from Western Ecosystems Technology, Inc ("WEST") and Tetra Tech, Inc. ("Tetra Tech") conducted field surveys on behalf of Crocker within an environmental survey corridor that encompasses the construction workspace, proposed access roads, crane pathways, and aboveground facility footprints for both the Wind Farm Facility and Transmission Facility to provide site-specific information on terrestrial resources. Survey results are summarized in Section 4.0.

3.6.1 Plant Communities

The Project Area is located within the Prairie Coteau Level IV Ecoregion of South Dakota (USEPA, 1996). The landscape during European settlement was dominated by tallgrass prairie. Today the landscape is primarily composed of hay fields and pastures grazed by livestock (37.5 percent), grassland communities (20.5 percent), and cultivated crops (16.8 percent). Human activity has altered or interrupted the natural disturbance processes of this tallgrass prairie ecosystem, including suppressing fire and altering historic grazing practices (relative to historic bison herd grazing) (SDGFP, 2014). Fire suppression and the intentional introduction of trees for shelterbelts have increased the amount of woody vegetation in this region; which historically was thought to be limited to river floodplains, east- or north-facing bluffs along streams, and hillsides (Johnson, 1995). Based on USGS (2011) GAP data, ecological systems within the Project Area are summarized in Table 3-9 and displayed on Figure 15. The USFWS easement program prioritizes easement acquisition of lands that may be classified by the GAP data as pasture/hay ecological system or either shrubland and grassland or introduced and semi-natural vegetation classes, as these lands can provide valuable habitat to wildlife.

Table 3-9: Summary of USGS GAP Ecological Systems within the Project Area

Class	Ecological System	Total Acres	Percent of Project Area
Agricultural Vegetation	Pasture/Hay	10,996	37.5%
	Cultivated Cropland	4,869	16.6%
	Managed Tree Plantation	45	0.2%
	Agricultural Vegetation Subtotal	**15,910**	**54.2%**
Shrubland and Grassland	Central Tallgrass Prairie	5,753	19.6%
	Great Plains Prairie Pothole (Wetland)	194	0.7%

Table 3-9: Summary of USGS GAP Ecological Systems within the Project Area

Class	Ecological System	Total Acres	Percent of Project Area
	Eastern Great Plains Wet Meadow, Prairie and Marsh (Wetland)	22	0.1%
	North-Central Interior Sand and Gravel Tallgrass Prairie	16	0.1%
	North-Central Interior Oak Savanna	12	<0.1%
	Northern Tallgrass Prairie	2	<0.1%
	Northwestern Great Plains Mixed Grass Prairie	1	<0.1%
	Shrubland and Grassland Subtotal	**6,000**	**20.5%**
Introduced and Semi Natural Vegetation	Introduced Upland Vegetation – Perennial Grassland and Forbland	3,784	12.9%
	Introduced and Semi Natural Vegetation Subtotal	**3,784**	**12.9%**
Open Water	Open Water (Fresh) (Waterbody)	2,811	9.6%
	Open Water Subtotal	**2,811**	**9.6%**
Developed and Other Human Use	Developed, Open Space	651	2.2%
	Developed, Low Intensity	18	0.1%
	Developed, Medium Intensity	5	<0.1%
	Developed, High Intensity	1	<0.1%
	Developed and Other Human Use Subtotal	**675**	**2.3%**
Forest and Woodland	North-Central Interior Dry Oak Forest and Woodland	86	0.3%
	North-Central Interior Dry-Mesic Oak Forest and Woodland	30	0.1%
	Southeastern Great Plains Floodplain Forest	25	0.1%
	Western Great Plains Dry Bur Oak Forest and Woodland	10	<0.1%
	North-Central Interior Maple-Basswood Forest	<1	<0.1%
	Forest and Woodland Subtotal	**151**	**0.5%**
Project Total		**29,331**	**100.0%**

The Developed and Other Human Use class has vegetation that lacks diversity, consisting largely of invasive/noxious species, or lack vegetation all together (USGS, 2011).

3.6.1.1 Shrubland and Grassland

The pasture/hay category is the most abundant land cover (37.5 percent). From USFWS field observations it is likely this category includes some tallgrass prairie that GAP methodology did not recognize. Central Tallgrass Prairie is the second most abundant land cover type (19.6 percent) in the Project Area (USGS, 2011). Tallgrass prairie is dominated by big blue-stem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorhastrum nutans*), and switchgrass (*Panicum virgatum*). Tallgrass prairie is considered one of the most endangered ecosystems in the U.S. comprising less than 1 percent of its historic range. These prairies are found on deep, rich soils, which have made them ideal for conversion to agriculture (USGS, 2011). South Dakota has retained larger portions of these native prairie remnants relative to neighboring state at approximately 15 percent of historic range. The remaining remnants tend to be scattered and highly fragmented. A floristic inventory study conducted in eastern South Dakota, which included Clark County and sites in proximity to the Project Area, found that remaining prairie tracts had reduced floristic diversity due to extreme fragmentation and intensive use, usually season-long grazing. This study also concluded, however, that these remnants retained a sufficient number of plant species that would enable some rehabilitation (Higgins et al., 2001).

South Dakota State University ("SDSU") conducted a four-phased study that reviewed the Farm Services Agency's ("FSA") data and aerial photography to map undisturbed grassland and woodland. Undisturbed land was defined as lands where the soils have not been mechanically manipulated through cultivation, anthropogenic development and use or extraction of natural resources. Grazing is not considered disturbances for this study (Bauman et al., 2016).

Based on 2013 data, there are 13,260 acres of potentially undisturbed grassland, and 27 acres of potentially undisturbed woodland within the Project Area (45 percent). The USFWS grassland and wetland easement program protect 5,014 acres of potentially undisturbed grassland (37.8 percent of potentially undisturbed grassland in the Project Area), and 3 acres of potentially undisturbed woodland (10.7 percent of potentially undisturbed woodland in the Project Area).

Clark County was assessed during Phase I of this study as part of the Prairie Coteau Region. The first phase of the study used different methodology to assess "go-back" lands, which are lands that have uncertain historic cropping or tillage history. An example is a tract of land that may have been tilled decades ago, but has since gone back to pasture or hay land. Due to the differences in methodology, the "go-back" lands, which are considered disturbed, were not as thoroughly reviewed during Phase I and the totals are likely underreported for Clark County. For this and other reasons, this study recommends that ground-truthing be conducted, in combination with review of historic land use, to more accurately characterize the area in question (Bauman et al., 2016).

As discussed above, the SDSU study (Bauman et al., 2016) included ungraded pasture land as potentially undisturbed grassland as this study focused on actions that would have disturbed the native sod layer, resulting in land conversions and/or alteration of the vegetation community (e.g., increase in non-native grasses). Both grazing and haying are permitted on USFWS grassland easements; thus, the 13,260 acres of protected potentially undisturbed grassland in the Project Area may be grazed. Studies have found that grazing of pasture land can contribute to

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soil compaction, decreased soil infiltration, alteration of the vegetation composition, reduced vegetation structure and biomass, increase in non-native species, which contributes to the decline in grassland bird and upland nesting duck habitat (Salo et al., 2004; Warren et al., 2008; USFWS, 2009a). The negative impacts to grasslands from grazing increase with the intensity of grazing, and can be mitigated through the adoption of designed rotational grazing systems that apply a set number of animal units in a known area-unit of grassland for a set period, mimicking historic bison grazing (Salo et al., 2004; USFWS, 2009a; Wang, 2016). The Salo et al. (2004) study conducted in mixed-grass prairie in south-central North Dakota found that light to moderate grazing can be beneficial to both grassland nesting bird and livestock production. Since academic studies and USFWS EISs conducted in the 1970s and 1980s regarding the adverse impacts of intensive grazing and haying on NWR lands to wildlife (Strassman, 1987), the USFWS has prohibited haying on easements until after July 15 to reduce the loss of ground nesting birds. Furthermore, the Waubay Wetland Management District ("WMD"), which manages the wetland and grassland easements within the Project Area, has actively worked with private landowners to implement rotational grazing programs since 1991 (USFWS, 1996). According to USDA 2012 census data, 55 farmers (17 percent) practice rotation or management-intensive grazing out of approximately 321 farmers that manage permanent pasture, woodland pasture, and rangeland in Clark County (USDA, 2016).

Crocker contracted Tetra Tech to conduct on-the-ground natural community classification and land use assessments of the environmental survey corridor. The assessment evaluated plant species diversity (high, medium, and low), grazing intensity (light, moderate, and heavy), and community composition (native, native and non-native, and non-native) to give each patch an overall quality score. Land use was also noted to reflect the most current uses in the survey corridor. The typical habitat for each quality class is summarized in Table 3-10. Note that as stated above, this analysis was conducted within the environmental survey corridor; therefore, is not extrapolated to the entire Project Area. The results of this survey with respect to the construction- and operation-related impacts are provided in Section 4.6.1.1.

Table 3-10: Tetra Tech Vegetation Community Quality Classification

Quality Score	Quality Class	Typical Habitat
3 to 4	Low	Heavily disturbed/grazed, low diversity, dominated by non-native species
5 to 7	Moderate	Moderately disturbed/grazed, moderate diversity, mixture of native and non-native dominant species
8 to 9	High	Minimally disturbed/lightly grazed, moderate to high diversity, dominated by native species

The USFWS uses a process that prioritizes easement acquisition based on quantity and not quality of habitat. Using USFWS models the area is more beneficial to wildlife based on wetland and grassland densities. Despite economic use of them, grasslands in the Prairie Pothole Region provide important nesting and brood-rearing habitat for the largest and most diverse populations of breeding waterfowl, shorebirds, water birds and grassland songbirds (Batt et al. 1989; Skagen & Thompson 2000; Kushlan et al. 2002; Rich et al. 2004) in North America. In fact, some

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species like western meadowlark, grasshopper sparrow, and savannah sparrow are more likely to occur in shorter and less dense grasslands (Bakker et al. 2002).

3.6.1.2 Forest and Woodland

The Forest and Woodland class comprises approximately 0.6 percent, or 163 acres of the Project Area, and consists of five ecological systems. The most prevalent North-Central Interior Dry Oak Forest and Woodland occurs within larger prairie landscapes. Forests consist of fire-resistant bur oak. Canopy is generally moderately closed to closed depending on time since last fire; fire creates an open canopy structure supporting regeneration. These communities are under increasing pressure from conversion to pasture land (USGS, 2011).

3.6.1.3 Noxious Species (Introduced and Semi-Natural Vegetation)

Noxious weeds are regulated by state (SDCL 38-22) and federal (7 CFR 360) rules and regulations designed to stop the spread of plants that are detrimental to the environment, crops, livestock, and/or public health. According to the South Dakota Department of Agriculture ("SDDOA"), Clark County has 9 noxious weeds (SDDOA, 2017a and 2017b). Three of these species are state listed, and six species are Clark County listed (Table 3-11).

Table 3-11: State and Local Noxious Weeds of South Dakota

Common Name	Scientific Name	State Weed Status	Recorded at Crocker?
Absinth wormwood	*Artemisia absinthium*	Local noxious weed	Yes
Plumeless thistle	*Carduus acnthoides*	Local noxious weed	No
Musk thistle	*Carduus nutans*	Local noxious weed	Yes
Spotted knapweed	*Centaurea stoebe*	Local noxious weed	No
Canada thistle	*Cirsium arvense*	State noxious weed	Yes
Bull thistle	*Cirsium vulgare*	Local noxious weed	Yes
Field bindweed	*Convolvulus arvensis*	Local noxious weed	Yes
Leafy spurge	*Euphorbia esula*	State noxious weed	Yes
Perennial sow thistle	*Sonchus arvensis*	State noxious weed	Yes

Noxious species in the Project Area have likely been introduced and spread through unintentionally anthropogenic disturbances such as the construction and operation of farms, residences, roads and utility corridors. The increase in noxious species reduces the overall biodiversity of a vegetation community by displacing native species and altering the normal ecological processes. This can lead to reduced or unfavorable wildlife habitat quality (SDGFP, 2014; Kjellsen and Higgins, 1990).

In 2017, Crocker conducted plant community surveys within the environmental survey corridor to characterize landscape-level patterns in plant abundances. During the surveys, incidental observations of noxious weeds were recorded. Noxious weeds were primarily observed in roadside ditches, heavily grazed pastures, and in wetlands with little or no water. The most common noxious weeds noted were absinth wormwood and Canada thistle.

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3.6.2 Wildlife

The Project Area is located within Waubay NWR Complex and the USFWS published a 2002 Comprehensive Conservation Plan (CCP). Appendix A of the Waubay NWR Complex CCP (USFWS, 2002) provides a list of wildlife species that are known or have the potential to occur within the Complex. A summary is provided below.

There are approximately 43 species of mammals found in the Complex, which include several rodents (chipmunks, woodchuck, ground squirrels, gophers, mice, voles, and muskrat); several species of shrews and bats, cottontail and jackrabbits, and large ungulates including mule and white-tailed deer and moose. Coyote, red fox, gray fox, raccoons, weasels and mink are also found within the Complex (USFWS, 2002).

This region provides abundant upland nesting cover and wetland habitat to support breeding waterfowl, and prairie to support grassland birds. USFWS estimates there are over 247 bird species regularly occurring within the Complex and 109 species nesting. The Complex and Project Area are within the Central Flyway (USFWS, 2002).

Grassland species are the primary bird species in the Complex and several are in decline because of habitat loss. Sharp-tailed grouse are common in the Complex, and greater prairie chicken historically nested in the region; a small population still occurs in Clark County (USFWS, 2002).

There are 10 species of reptiles known to occur on the Waubay NWR Complex, and an additional 20 species that have the potential to occur, including three species of turtle and several snake species. Eleven species of amphibians, including salamanders, toads, and frogs have the potential to occur (USFWS, 2002).

General wildlife inventory surveys have not been conducted for all potential species within the Project Area; therefore, it is assumed that the species identified as occurring with the Complex have the potential to occur in the Project Area depending on specific habitat requirements of the species. The results of species-specific wildlife surveys that were conducted within the Project Area are summarized in the sections that follow.

Project-specific wildlife surveys began in April 2016 and are ongoing (Table 3-12). Crocker consulted with the USFWS and SDGFP to identify which species and/or habitat surveys were needed and to design the survey protocols. These wildlife surveys satisfy the Tier 3 studies recommended by the WEG (USFWS, 2012). Survey types and dates of surveys are summarized in Table 3-12. Reports of these studies were submitted to the USFWS and SDGFP; these reports include detailed discussion of the methodology and results of the Tier 3 wildlife surveys.

Table 3-12: Summary of Tier 3 Studies at the Crocker Wind Project

Survey Type	Dates
Bird Surveys	
Avian Use Study	**April 2016-March 2018**
Grassland Avian Use Study	June 7-July 4, 2017
2016 Eagle and Raptor Nest Surveys	April 4-5, 2016

Table 3-12: Summary of Tier 3 Studies at the Crocker Wind Project

Survey Type	Dates
2016 Lek Surveys	April 25-May 11, 2016
2017 Eagle Nest Survey	April 13, 14, 18 2017
2017 Eagle Monitoring at Reid Lake	October 27 – December 15, 2017
Bat Surveys	
Bat Acoustic Survey	April 14-October 27, 2016
Threatened and Endangered Species Surveys	
Northern Long-eared Bat Presence/Absence Acoustic Surveys	July 22-27, 2016
Dakota Skipper and Poweshiek Skipperling Habitat Assessment	September 21-22 and 26-28, 2016 May 29 and June 7-11, 2017 June 29-July 13, 2017
Dakota Skipper Presence/Absence Surveys	June 29-July 13, 2017

3.6.2.1 Migratory Birds

The Migratory Bird Treaty Act is the cornerstone of migratory bird conservation and protection. Since 1918 under the MBTA, it is illegal "to pursue, hunt, take, capture, kill … possess, offer for sale, sell … purchase … ship, export, import …transport or cause to be transported… any migratory bird, any part, nest, or eggs of any such bird …" (16 United States Code ["USC"] 703). The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR 10.12). The USFWS maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, wading birds, and passerines (USFWS, 2015).

There are both upland and wetland habitat in the Project Area that support migratory bird species for resting, foraging, or breeding activities. The Prairie Pothole Region provides habitat for high concentrations of both waterfowl and grassland birds. As illustrated in Figure 16, the Project is located to the southeast of the highest concentrations of mapped waterfowl breeding pairs.

During the first year of Avian Use Studies, a total of 124 avian species were observed during fixed-point bird use surveys and one avian species was observed incidentally (Wilson's phalarope) within the Project Area from April 2016 through March 2017 (Table 3-13). Species use was diverse; the most abundant species were red-winged blackbird (8.5 percent) and common grackle (7.3 percent). Raptor use was relatively low. Mean diurnal raptor use was 0.29/raptors/800-m plot/20-minute survey averaged across seasons; season-specific raptor use was 0.48, 0.34, 0.37, and 0.03 raptors/800-m plot/20-minute survey in spring, summer, fall, and winter respectively. The most common type of raptor documented was red-tailed hawk; other raptor species observed included American kestrel, Swainson's hawk, northern harrier, bald eagle, and Cooper's hawk. Season-specific waterfowl use was 21.95, 1.86, 7.94, and 13.37 birds/800-m plot/20-minute survey in spring, summer, fall, and winter, respectively. Six species composed 91 percent of the waterfowl use during the spring: greater scaup, snow goose, Canada

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goose, mallard, lesser scaup, and blue-winged teal. As shown in Table 3-13 there are also many grassland dependent species present.

Table 3-13: Avian Species Observed during Project Surveys and SD Breeding Bird Surveys

Species/Group	Crocker Avian Use Surveys [a]	Presence in Crocker Block of Breeding Bird Atlas [b]	Crocker Grassland Surveys	SD Species of Greatest Conservation Need	Birds of Conservation Concern
Loons/Grebes					
pied-billed grebe	X	Confirmed	X		
western grebe		Probable			
Waterbirds					
American bittern	X	Possible	X		X
American white pelican	X	Observed	X	X	
black-crowned night-heron		Possible	X		
cattle egret			X		
double-crested cormorant	X	Observed	X		
glossy ibis	X		X		
great blue heron	X		X		
great egret	X	Observed	X		
sandhill crane	X				
snowy egret		Observed			
white-faced ibis	X				
Waterfowl					
blue-winged teal	X	Confirmed	X		
bufflehead	X		X		
Canada goose	X	Confirmed	X		
canvasback	X				
common goldeneye	X				
gadwall	X	Probable	X		
greater scaup	X				
green-winged teal	X	Confirmed	X		
hooded merganser	X		X		
lesser scaup	X	Probable	X		
mallard	X	Confirmed	X		
northern pintail	X	Confirmed	X		
northern shoveler	X	Confirmed	X		
red-breasted merganser	X		X		
redhead	X	Probable	X		
ring-necked duck	X		X		
ruddy duck	X	Probable	X		
snow goose	X		X		
tundra swan	X				
wood duck	X	Probable	X		
Shorebirds					
American avocet			X		

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Table 3-13: Avian Species Observed during Project Surveys and SD Breeding Bird Surveys

Species/Group	Crocker Avian Use Surveys [a]	Presence in Crocker Block of Breeding Bird Atlas [b]	Crocker Grassland Surveys	SD Species of Greatest Conservation Need	Birds of Conservation Concern
American golden-plover			X		
greater yellowlegs	X		X		
killdeer	X	Confirmed	X		
lesser yellowlegs	X		X		
marbled godwit	X		X	X	X
piping plover		Observed			
spotted sandpiper		Possible			
upland sandpiper	X	Possible	X		X
willet			X	X	X
Wilson's phalarope	X			X	
Wilson's snipe	X		X		
Gulls/Terns					
California gull	X		X		
black tern			X	X	X
Forster's tern	X		X		
Franklin's gull	X		X		
ring-billed gull	X		X		
Rails/Coots					
American coot	X	Confirmed	X		
Sora		Possible			
Virginia rail			X		
Diurnal Raptors					
Cooper's hawk	X	Possible	X		
red-tailed hawk	X	Probable	X		
Swainson's hawk	X	Probable	X		X
northern harrier	X	Confirmed	X		
bald eagle	X			X	X
American kestrel	X	Possible	X		
Vultures					
turkey vulture	X		X		
Upland Game Birds					
ring-necked pheasant	X	Confirmed	X		
sharp-tailed grouse	X		X		
wild turkey	X	Probable	X		
Doves/Pigeons					
mourning dove	X	Confirmed	X		
rock pigeon	X	Possible			
Large Corvids					
American crow	X	Probable	X		
Passerines					
American goldfinch	X	Confirmed	X		

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Table 3-13: Avian Species Observed during Project Surveys and SD Breeding Bird Surveys

Species/Group	Crocker Avian Use Surveys [a]	Presence in Crocker Block of Breeding Bird Atlas [b]	Crocker Grassland Surveys	SD Species of Greatest Conservation Need	Birds of Conservation Concern
American robin	X	Confirmed	X		
American tree sparrow	X				
Baltimore oriole		Probable			
bank swallow	X		X		
barn swallow	X	Confirmed	X		
black-capped chickadee		Possible			
blue jay	X				
bobolink	X	Confirmed	X		
Brewer's blackbird	X				
brown-headed cowbird	X	Probable	X		
brown thrasher	X	Probable	X		
chestnut-collared longspur	X		X	X	X
chimney swift		Possible			
chipping sparrow	X	Confirmed	X		
clay-colored sparrow	X	Probable	X		
cliff swallow	X	Confirmed	X		
common grackle	X	Confirmed	X		
common yellowthroat	X	Probable	X		
dark-eyed junco	X				
dickcissel	X	Probable	X		X
eastern bluebird	X		X		
eastern kingbird	X	Confirmed	X		
eastern wood-pewee	X		X		
European starling	X	Confirmed	X		
field sparrow	X		X		
grasshopper sparrow	X	Probable	X		X
gray catbird		Possible			
Harris' sparrow	X		X		
horned lark	X	Probable	X		
house sparrow	X	Confirmed	X		
house wren	X	Probable			
Lapland longspur	X		X		
least flycatcher		Possible			
marsh wren	X	Probable	X		
northern rough-winged swallow	X		X		
northern shrike	X				
orchard oriole	X	Confirmed	X		
purple martin	X				
red-eyed vireo	X		X		
red-winged blackbird	X	Confirmed	X		

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Table 3-13: Avian Species Observed during Project Surveys and SD Breeding Bird Surveys

Species/Group	Crocker Avian Use Surveys [a]	Presence in Crocker Block of Breeding Bird Atlas [b]	Crocker Grassland Surveys	SD Species of Greatest Conservation Need	Birds of Conservation Concern
Savannah sparrow	X		X		
sedge wren	X	Possible			
snow bunting	X				
song sparrow	X	Confirmed	X		
swamp sparrow	X				
tree swallow	X	Confirmed	X		
vesper sparrow	X	Possible	X		
warbling vireo	X	Probable			
western kingbird	X	Confirmed	X		
western meadowlark	X	Probable	X		
white-breasted nuthatch		Probable			
white-throated sparrow			X		
willow flycatcher	X	Possible	X		
yellow-headed blackbird	X	Confirmed	X		
yellow-rumped warbler	X				
yellow warbler	X	Probable	X		
Goatsuckers					
common nighthawk	X		X		
Woodpeckers					
downy woodpecker	X	Probable			
hairy woodpecker	X	Possible	X		
northern flicker	X	Probable	X		
Kingfishers					
belted kingfisher	X		X		

[a] *Avian species observed during 20-minute fixed-point bird use surveys in the Project from April 13, 2016 to March 28, 2017*

[b] *Bird observations are categorized as Observed but not breeding, Possible breeding, Probable breeding, or Confirmed breeding, based on a list of standardized criteria within that species' breeding season per the SDGFP protocol (Drilling et al. 2016).*

The online Breeding Bird Atlas provides the results of the second South Dakota Breeding Bird Atlas surveys which took place from 2008-2012 (Drilling et al., 2016; SDGFP, 2017b). The Atlas provides information on which bird species nest in the state, where they are found, and the habitats they utilize during the breeding season. The survey effort required surveyors to visit a pre-selected 3-mile by 3-mile 'block' during the breeding season. All habitats within each block were surveyed for both evidence of breeding and presence of all bird species. Surveyors were asked to make a total of three daytime visits and one evening visit, and spend a total of at least 15 hours surveying a block. Visits were at least 10 days apart, and could be spread over multiple breeding seasons. The goal of the surveys was to document all breeding birds within each block (Drilling et al., 2016). A portion of the Crocker Block overlaps with the northeastern part of the Project Area. Within this block, 28 bird species were confirmed breeders, 26 species were

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considered probable breeders, 18 species were possible breeders, and 5 species were observed, but no evidence of breeding in the block was found (Drilling et al., 2016).

It is anticipated that the species identified during these surveys and the Breeding Bird Atlas are representative of bird use in the Project vicinity. Crocker will continue to conduct avian use studies through March 2018. Results will be provided to the USFWS and SDGFP.

Completed in 2000, the *U.S. Shorebird Conservation Plan* (http://www.fws.gov/shorebirdplan/USShorebird.htm) was developed as a conservation strategy for migratory shorebirds and the habitats upon which they depend (Ruth 2008). Figure 4.6-7 in the PEIS shows Clark County as a Regionally Important Migratory Stopover Sites for Shorebirds.

3.6.2.2 Grassland Birds

Grassland breeding bird surveys were conducted June 7 through July 4, 2017 to gather information on species presence and relative abundance within the Project Area during the breeding and nesting season. Crocker surveyed a random sample of 30 proposed turbine locations where land cover (USGS, 2011) was dominated by grassland and hay/pasture; 30 percent of the surveyed areas were located on land identified as Potentially Undisturbed Lands by Bauman et al. (2016). In total, 48 species were identified during 176 transect surveys (Table 3-12). Eight species comprised 74 percent of the observations: grasshopper sparrow (BCC), western meadowlark, bobolink, dickcissel (BCC), brown-headed cowbird, clay-colored sparrow, red-winged blackbird, and chestnut-collared longspur (BCC).

3.6.2.3 Birds of Conservation Concern

The 1988 amendment to the Fish and Wildlife Conservation Act mandates that the FWS "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA of 1973." As a result, the USFWS created the BCC list (USFWS, 2008). The goal of the list is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions and coordinating consultations in accordance with Executive Order 13186. Nine BCC for the Prairie Potholes were documented during avian use surveys: marbled godwit, upland sandpiper, American bittern, black tern, Swainson's hawk, bald eagle, chestnut-collared longspur*, dickcissel*, and grasshopper sparrow*. In addition, six BCC for the area were documented during grassland bird surveys: upland sandpiper, marbled godwit, Swainson's hawk, chestnut-collared longspur*, dickcissel*, and grasshopper sparrow* (Table 3-13). Species with asterisks were the eight most common species observed in the Project Area.

3.6.2.4 Prairie Grouse Leks

Aerial lek surveys were conducted throughout the Project Area during two separate survey periods from April 14 through May 12, 2016 to evaluate the potential for impacts to greater prairie-chicken and sharp-tailed grouse from Project construction and operation. No greater prairie-chicken or sharp-tailed grouse leks were documented within the Project Area. SDGFP records showed ten leks located 1 to 5 miles to the south and southwest of the Project Area.

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3.6.2.5 Eagles

Under authority of the Bald and Golden Eagle Protection Act ("BGEPA") (16 USC 668–668d), bald and golden eagles have additional legal protection. The BGEPA prohibits the take, sale, purchase, barter, offer of sale, purchase, or barter, transport, export or import, at any time or in any manner of any bald or golden eagle, alive or dead, or any part, nest, or egg thereof (16 USC 668). The BGEPA also defines take to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb" (16 USC 668c), and includes criminal and civil penalties for violating the statute. The term "disturb" is defined as agitating or bothering an eagle to a degree that causes, or is likely to cause, injury to an eagle, or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior (50 CFR 22.3).

Wind energy developers requested specific guidance to help make wind energy facilities compatible with eagle management and the laws and regulations that protect eagles. The USFWS has developed the Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2 ("ECPG") (USFWS, 2013) to specifically address impacts to bald eagles from wind energy facilities. The ECPG suggests specific questions should be considered to help place a prospective project into the appropriate risk category. These questions are addressed in the Project's BBCS (Appendix A).

Bald eagles were recorded during fixed-point avian use studies; eagle observations were recorded for a 60-minute sampling period using an 800-m-radius plot. Between April 2016 and November 2017, 16 bald eagles were recorded during 542 hours of survey for a combined total of 37 flight minutes, 25 of which were documented within the 800-m plot and were below 200 m in height. The other 12 flight minutes of bald eagle observation were observed outside of the 800-m plot or above 200 m in height. No golden eagles were documented. Crocker anticipates that bald eagle use during April 2016-November 2017 is representative of future eagle use in the Project Area. Crocker is continuing to record eagle use in the Project Area through March 2018.

In addition to these survey observations, Crocker conducted surveys at two sites at Reid Lake to determine bald eagle use of the lake during fall migration in 2017. Zero to 13 bald eagles were documented per site during each survey visit between October 27 and December 15 (Table 3-14). Most bald eagles observed were perched in trees on the east and north portions of the lakeshore. Birds observed at different sites on the same date may represent the same eagles.

Table 3-14: Bald Eagle Observations at Reid Lake During 2017 Fall Migration

Date	Site 1		Site 2	
	Number Observed	Survey Length (min)	Number Observed	Survey Length (min)
10/27/2017	1	30	3	30
10/31/2017	0	30	0	30
11/5/2017	0	30	1	30
11/14/2017	2	30	13	30
11/17/2017	6	60	6	60

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Table 3-14: Bald Eagle Observations at Reid Lake During 2017 Fall Migration

Date	Site 1		Site 2	
	Number Observed	Survey Length (min)	Number Observed	Survey Length (min)
11/20/2017	0	30	1	60
11/28/2017	0	30	3	60
12/1/2017	1	30	0	30
12/8/2017	1	30	1	30
12/15/2017	0	30	0	30

Aerial survey for bald eagle nests were conducted on April 4 - 5, 2016 and April 13 - 14 and 19, 2017 to document bald eagle nests within 10 miles of the Project. No bald eagle nests were identified within the Project Area during either year of surveys. In 2016, two active bald eagle nests were identified within 10 miles of the Project, and in 2017, four active bald eagle nests and one inactive bald eagle nest were documented within 10 miles of the Project Area.

3.6.2.6 Bats

Thirteen bat species are known to occur in South Dakota; they include the hoary bat (*Lasiurus hispidus*), eastern red bat (*Lasiurus borealis*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), NLEB (also referred to as northern myotis) (*Myotis septentrionalis*), tri-colored bat *(Perimyotis subflavus*) and little brown bat (*Myotis lucifugus*) (SDGFP, Undated). Both the silver-haired bat and NLEB are South Dakota SGCN, and the NLEB is also listed as threatened under ESA (Section 3.6.4).

Crocker conducted pre-construction bat acoustic surveys within the Project Area to evaluate the presence or abundance of bats. Bat activity was assessed from April 14 - October 27, 2016. Ground-based (1.5 m) and raised detectors (45 m) were paired at two meteorological towers within the Project Area for a total of four detectors. Bat activity data was collected using full spectrum acoustic monitoring and data logging platforms (Song Meter SM3, Wildlife Acoustics, Inc., Concord, MA, USA).

Throughout the survey period, the paired ground and raised met tower stations recorded a combined mean (± standard error) of 1.84 ± 0.22 bat passes per detector-night. Detectors at fixed ground stations recorded 448 bat passes on 265 detector-nights for a mean (± standard error) of 1.84 ± 0.23 bat passes per detector-night. Raised stations recorded a similar number (455) of bat passes on 265 detector nights for a mean of 1.83 ± 0.24 per detector-night. Bat activity was highest in the fall, peaking in early August. Activity during the standardized fall migration period (July 30 - October 14) was 2.80 ± 0.42 bat passes per detector-night at ground-based stations. It should be noted that migration in SD can begin as early as July 15. Low-frequency bats were the most commonly recorded species (66.8 percent) among all stations, suggesting that these species are relatively more abundant than high-frequency species in the Project Area. Low-frequency species included big brown bats, hoary bats, and silver-haired bats. High-frequency bats composed 33.2 percent of bat passes recorded; high-frequency bat species included tri-colored bats, eastern red bats, and *Myotis* species. Migratory species are found in both frequency groups.

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3.6.3 Aquatic Biota

The Waubay NWR Complex, within which the Project Area is located, supports over 100 species of warmwater freshwater fish. Most species that occupy this area are minnows, carps and suckers, with low numbers of game species such as northern pike, walleye, and yellow perch. Wetlands in the area also support high invertebrate populations including worms, crustaceans, snails, and insects, which provide an important protein food source for waterfowl, water birds, and shorebirds. Common wetland plants that can be found in these aquatic environments including free-floating duckweed, bladderwort, and coontail; submergent plants such as pondweed, water milfoil, and widegongrass; and emergent vegetation such as arrowhead, cattail, common reed, and bulrush. Due to the shallowness of many of the wetlands found in the Project Area, there are amphibious plants that are adapted to both submergent and emergent conditions, and that tolerate temporary dry habitats when the water levels drop. These include yellow water-crowfoot, pepperwort, and water smartweed (USFWS, 2002).

As discussed in Section 3.3.3, most of the streams in the Project Area are intermittent or ephemeral, and the majority of wetlands are emergent wetlands that are only temporary or seasonally flooded; therefore, fishery habitat is limited (Figures 13 and 14). There are approximately 47.8 acres of lake habitat within the Project Area. Baileys Lake and the Reid/Round Lake complex are within or adjacent to the Project Area (Table 3-15).

Table 3-15: Summary of Fisheries in or near Project Area

Waterbody Name	Primary Fish Species	Total Surface Acres
Baileys Lake	Walleye, yellow perch, black bullhead, bluegill, green sunfish, largemouth bass, white sucker	200
Reid/Round Lake Complex	Walleye, yellow perch, black bullhead, green sunfish, northern pike, rock bass	1,280

Source: SDGFP, 2015a and 2015b

The federally listed Topeka shiner has the potential to occur in Clark County, however, suitable habitat for this species is not found within the Project Area.

3.6.4 Federally Listed Species

The ESA directs the USFWS to identify and protect endangered and threatened species and their critical habitat, and to provide a means to conserve their ecosystems. Among its other provisions, the ESA requires the USFWS to assess civil and criminal penalties for violations of the ESA or its regulations. Section 9 of the ESA prohibits take of federally listed species. Take is defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" 16 USC 1532. The term "harm" includes significant habitat alteration which kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering, 50 CFR 17.3. Projects involving federal lands, funding or authorizations will require consultation between the federal agency and the USFWS, pursuant to

Section 7 of the ESA. Because the Project proposes facilities on USFWS easements, a federal nexus will occur.

A Project-specific list of federally listed species that may occur in the Project Area based on the USFWS South Dakota Field Office and information available online from the USFWS Information, Planning and Consultation ("IPAC") system (www.fws.gov/ipac) included the NLEB, Poweshiek skipperling, rufa red knot, and whooping crane (Table 3-16). In addition, the IPAC system also indicated that Topeka shiner may occur in Clark County. Dakota skipper is not included in the list for Clark County, however, this species may occur in Day County, which borders the Project Area. Based on the recommendations of species' experts, surveys were conducted for Dakota skipper in suitable habitat within the Project Area. Designated critical habitat is not present within the Project Area for any species.

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Table 3-16: Federally Listed Species That May Occur in Clark County

Scientific Name	Common Name	ESA Status
Myotis septentrionalis [a,b]	Northern long-eared bat	Threatened
Hesperia dacotae [c]	Dakota skipper	Threatened
Oarisma poweshiek [a,b]	Poweshiek skipperling	Endangered
Notropis topeka [a]	Topeka shiner	Endangered
Calidris canutus rufa [a,b]	Rufa red knot	Threatened
Grus americana [a,b]	Whooping crane	Endangered

[a] *Listed as a species that may occur in Clark County according to the USFWS IPAC (https://ecos.fws.gov/ipac/)*

[b] *Included in the list of species that may occur in the Project Area by the USFWS South Dakota Field Office.*

[c] *Dakota skipper are not documented in Clark County; however, records occur in Day County, adjacent to the Project Area.*

The UGP Wind Energy Programmatic Biological Assessment ("BA"), prepared in conjunction with the PEIS, provides biological and habitat descriptions for the NLEB, Dakota skipper, Poweshiek skipperling, Topeka shiner, rufa red knot, and whooping crane. At the time the PEIS was prepared, the NLEB was proposed for listing; it has since been listed as threatened with a 4(d) rule and associated Programmatic Biological Opinion ("BO") (USFWS, 2016a, 2016b).

Species-specific information and results of the preconstruction evaluations and wildlife surveys, conducted for the Project are reported in the Tier 3 study reports that have been submitted to the USFWS, including the Bat Acoustic Survey Report for the Crocker Wind Farm and Dakota Skipper and Poweshiek Skipperling Habitat Assessment Report.

3.6.4.1 Northern Long-eared Bat

In 2015, the NLEB was listed as threatened under ESA. In 2016 the final 4(d) rule identifying prohibitions that focus on protecting the bat's sensitive life stages in areas affected by White Nose Syndrome ("WNS") was published. (USFWS, 2016a; 2016b). The 4(d) rule allows incidental take of the species resulting from otherwise lawful activities. Under the provisions of the 4(d) rule, incidental take is not prohibited for activities that are located more than 0.25 mile from known hibernacula and more than 150 feet from known maternity roost trees in June and July within areas of the country affected by WNS. With the discovery of a WNS infected hibernacula in Becker County, Minnesota in the winter of 2016/2017, the WNS buffer zone was expanded to include portions of eastern South Dakota, including Clark County.

Acoustic surveys were conducted for NLEB within the Project Area from July 22 to 27, 2016. Surveys were completed at two sites in suitable NLEB habitat. Qualitative analysis of the acoustic data did not detect NLEB. This species is likely absent from the Project Area in the summer.

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3.6.4.2 Dakota Skipper and Poweshiek Skipperling

Dakota skippers and Poweshiek skipperlings are obligates of high-quality prairie habitat that is dominated by native species and is untilled (Royer and Marrone, 1992; Cochrane and Delphey, 2002; USFWS, 2014a). Grassland parcels within the environmental survey corridor were initially assessed using desktop analysis and preliminary field review to evaluate habitat suitability for Dakota skipper and Poweshiek skipperling. The desktop assessment and preliminary field review documented 65 areas of potentially suitable habitat. Ground-based field assessments during the species' flight period assessed these 65 areas of potentially suitable habitat for habitat features required by Dakota skipper and Poweshiek skipperling. Field assessments during the species' flight period indicated that approximately 34 areas of grassland habitat within the environmental survey corridor were suitable for the Dakota skipper or Poweshiek skipperling. Individual butterfly surveys were conducted in these 34 areas between June 29 and July 13, 2017 during the species' flight period. No Dakota skipper or Poweshiek skipperling were documented during these surveys by a qualified lepidopterist.

3.6.4.3 Topeka Shiner

Topeka shiner are found in prairie streams with good water quality and cool temperatures. They are typically found in perennial streams, but may be found in pools of intermittent streams that are maintained by percolation through the stream bed, spring flow, or groundwater seepage when surface water flow ceases in stream reaches (USFWS, 2017b).

Critical habitat has been designated for the Topeka shiner, but is not present in the Project Area. Field surveys were not conducted for this species; a review of the South Dakota Natural Heritage Database did not identify any records of Topeka Shiner in the Project Area and there are no known Topeka shiner streams in the Project Area.

3.6.4.4 Rufa Red Knot

The occurrence of rufa red knots in South Dakota is unpredictable, and the number of migrating shorebirds documented in the interior can vary dramatically due to high inter-annual availability in water levels and habitat quality at mid-continental wetlands. Suitable stopover habitat is present in the Project Area, however, species-specific studies for this species have not been completed (USFWS, 2014b). No rufa red knot were observed during avian studies.

3.6.4.5 Whooping Crane

Whooping cranes do not live year-round in South Dakota; individuals in the Aransas-Wood Buffalo Population are present during their twice-yearly migration between their summer breeding habitat and wintering habitat (Canadian Wildlife Service and USFWS, 2007). Specifically, whooping cranes have been documented migrating through South Dakota between March 24 to May 19 and September 14 and November 18 (Western and USFWS, 2015b). Whooping cranes use wetlands and croplands during migration. The Project Area is 10 miles from the eastern edge of the corridor where 95 percent of the whooping crane sightings have been documented, according to the USFWS (Figure 17). Based on the USFWS Whooping Crane Database, which includes data through Spring 2016, whooping crane have been documented within 20 miles of the Project Area four times:

- In November 2000, 2 adults reported 10.5 miles east of the Project near Garden City;
- In May 1993, 1 adult reported 20 miles west of the Project Area near Brentford;
- In October 1985, 3 adults observed 15 miles southeast of the Project Area near Clark; and
- In April 1973, 4 adults documented 15 miles east of the Project Area near Wallace.

3.6.5 State-Listed Species

Within South Dakota, the SDGFP is the agency responsible for managing game and non-game wildlife and habitat, including species listed under the State Endangered Species Law (SDCL Chapter 34A-8). South Dakota's endangered species law regulates the taking, importation, transportation, and sale of state endangered or threatened species. SDGFP administers the state list of rare, threatened, and endangered species. There is one state-listed species that may be present in Clark County, South Dakota – the northern river otter, which is listed as threatened.

Element Occurrence Records provided by the SDGFP Wildlife Diversity Program on March 14, 2016 indicate no occurrences of state sensitive or tracked invertebrate and/or vertebrate species within the Project Area. State species of concern were documented within two miles of the Project Area; these species are not afforded protections under the state endangered species law statute. The record included a colonial waterbird nesting colony for snowy egret, great egret, great blue heron, and black-crowned night heron.

The SDGFP has developed the South Dakota State Wildlife Action Plan ("SWAP") (SDGFP, 2014), which is a comprehensive planning document that establishes the framework and information for setting conservation priorities for South Dakota. The SWAP identifies and focuses on SGCN and ecosystems that require conservation strategies to avoid future ESA listing. SGCN are not afforded protections under the state endangered species law statute. Seven SGCN were documented during avian and grassland bird surveys in the Project Area: marbled godwit, American white pelican, bald eagle, chestnut-collared longspur, willet, black tern, and Wilson's phalarope (SDGFP, 2014).

3.7 Visual Resources

The term "visual resources" refers to the composite of basic terrain features, geologic features, hydrologic features, vegetation patterns, and anthropogenic features that influence the visual appeal of an area.

NEPA and the Federal Land Policy and Management Act require the management of scenic resources on federal lands and ensure that scenic resources are treated equally with other resources. USFWS grassland and wetland easements would be crossed by the proposed Project, but these lands are still privately-owned. There are no federally owned lands affected.

Private lands crossed by Project are not subject to known federal, state, or county visual management standards. Sensitive viewsheds are generally associated with scenic resources and can include state or national parks, monuments, and recreation areas or historic sites and landmarks. Recreational users in the Project Area and vicinity may include hunters accessing GPAs, WPAs, WIAs, Reid Lake State Waterfowl Refuge, and School and Public Lands, and

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recreationists accessing Bailey, Round, and Reid lakes. There are 35 occupied residences within the Project Area and other scattered rural residences adjacent to, but outside the Project Area (Section 3.1). Travelers through the Project vicinity include local or regional traffic along State Highway 20 or other local roads. There are no designated scenic byways in the Project Area (Federal Highway Administration, Undated).

3.8 Paleontological Resources

As discussed in Section 4.8 of the PEIS, the bedrock of UGP Region is composed predominantly of sedimentary rocks that have significant fossil yield potential. The geologic character of the Project Area has been scored under the Potential Fossil Yield Classification ("PFYC") system, which assigns a numeric score between 1 and 5, where 1 represents the lowest potential and 5 represents the highest. The entire Project Area is underlain by Late Cretaceous Pierre Shale bedrock which has been cited as having a PFYC rating between 3 and 4. The Pierre Shale bedrock is overlain with a mantle of Late Pleistocene/Early Quaternary Glacial sediments (see 3.2.2). The thickness of the glacial deposits within the Project Area range from approximately 150 feet in the west to approximately 350 feet in the east (Murphey and Daitch, 2008). The glacial deposits are potential sources for archaeological materials and do not have a PFYC rating.

3.9 Cultural Resources

Section 4.9 of the PEIS describes the regulatory framework for management of cultural resources under Section 106 of the National Historic Preservation Act ("NHPA"). Cultural resources are the material remains of human activity and can include sites, buildings, districts, and landscapes. Cultural resources are finite and non-renewable. Federal laws and regulations provide the standards for cultural resources identification, evaluation, and mitigation of impacts. If a cultural resource site meets the criteria for listing on the National Register of Historic Places ("NRHP"), it is termed a "historic property". The Project site layout was designed, in part, to consider impacts to cultural resources that may meet these criteria.

Crocker initiated consultation with the South Dakota State Historical Society ("SDSHS") in April 2016; the SDSHS recommended conducting a record search from the South Dakota Archaeological Research Center ("SARC"), Level III Intensive Survey prior to ground disturbance, completing an analysis of the visual effects on cultural resources, and contacting the Tribal Historic Preservation Offices (THPO) for tribes with interests.

As the lead federal agency, USFWS is responsible for considering the potential effect to cultural resources of activities located on its conservation easements. This area of direct and indirect effects is the Area of Potential Effect ("APE"); Project activities off easements are reviewed by the applicable federal and/or state agencies. The USFWS initiated consultation with SDSHS, and 16 local tribes and THPOs in January 2018.

3.9.1 Archaeological Resources

Tetra Tech performed a Level I Records Search of archaeological resources within the environmental survey corridor and a 1-mile buffer around the environmental survey corridor (i.e., the Archaeological Study Area). The file review was received from the SARC in October

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2016 and included identification of sites recorded during previous surveys within the Archaeological Study Area.

The literature review identified one previously recorded archaeological resource within the environmental survey corridor and 12 previously recorded archaeological sites within the Archaeological Study Area. A former Euro-American farmstead, is located within the survey corridor for the proposed Transmission Facility. No proposed transmission poles are in the site boundary, therefore, no direct impacts to the site are anticipated.

The 12 sites consist of three Euro-American and nine Native American sites, including a burial, stone features, artifact scatters and a surface feature.

3.9.2 Architectural Resources

Tetra Tech performed a Level I Records Search of architectural resources within the environmental survey corridor and a 1-mile buffer around all aboveground facilities, including the proposed wind turbines and meteorological tower locations (i.e., Historic Structures Review Area). No previously documented architectural resources were identified in the environmental survey corridor; however, three previously documented architectural resources are documented within the Historic Structures Review Area. The documented resources include a NRHP-listed church and eligible cemetery, and a bridge, not eligible for listing on the NRHP.

3.9.3 Class III Cultural Resources Inventory of Architectural Resources

Through consultation with Ms. Paige Olson of the SDSHS, it was determined that the structures within the Historic Structure Review Area for the Project did not need to be reassessed based on the results of a 2016 county-wide survey. A Findings of Effects Study is recommended to determine potential impacts from the proposed Project to the NRHP-listed church and eligible cemetery. This study will be conducted on the APE for visual effects, which is the easements.

Once complete, the Findings of Effects Study will be submitted by Crocker to the USFWS and SDSHS for review.

3.9.4 Class III Cultural Resources Inventory of Archaeological Resources

A Level III Intensive Survey of the environmental survey corridor is underway to identify archaeological resources. The survey is 80 percent complete. The survey documented 97 archaeological resources including 37 Native American Resources, 59 Euro-American resources, and 1 Native American/Euro-American resource. The Native American resources include lithic scatters, suspected cairns, a stone circle, and isolates. The Euro-American resources include 13 sites associated with abandoned farmsteads, dumps, field stone lines and piles, farm machinery isolates, segments of railroad grade associated with Site 39CK2003, a depression with field stones, and an artifact scatter in a former airfield. The Native American/Euro-American site is a lithic scatter mixed with an early twentieth century artifact scatter. Tetra Tech noted modern cultural materials during the survey, including dumps and fieldstone piles which are not considered to represent archaeological sites and thus no site numbers were obtained.

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Of the 97 cultural resources documented during the pedestrian survey, 70 resources and their associated avoidance buffer have been avoided and are no longer within the environmental survey corridor. Of the remaining 27 resources located in the environmental survey corridor, avoidance is not recommended for Euro-American isolated finds, fieldstone piles, and a modern dump. Avoidance is recommended for a Native American lithic scatter 39CK0073, and due to a prominent topographic position, for one Euro-American fieldstone pile (CR_47). A determination of eligibility assessment is recommended for the 5 railroad grade segments in the survey corridor, and shovel testing is recommended for the 10 Native American isolated finds in the survey corridor.

Tetra Tech shovel tested 15 proposed wind turbine locations in October 2017 within portions of the environmental survey corridor located on non-USFWS easement parcels. Subsurface lithic scatters consisting of non-temporally diagnostic materials were documented at 8 of the 15 proposed turbines. All the documented sites have been avoided.

Once complete, the Level III Intensive Survey Report will be submitted to USFWS and SDSHS for review.

3.10 Socioeconomics

At 400 MW, the proposed Project would benefit landowners in the Project Area with average annual lease payments of over $2 million over the first 20 years.

Clark County had an estimated 2016 population of 3,691. Clark County has been experiencing a population loss since 1960, although this annual loss has slowed in more recent years. Population loss in rural communities is attributed to a lack of resident employers, loss of service sector industries, aging population, and out-migration of young adults (Clark County, 2003). The largest city in Clark County, South Dakota is the City of Clark which, in 2010, had an estimated population of 1,139 (U.S. Census Bureau, 2010). Clark is located approximately 7 miles southeast of the Project Area. Crocker, a town of 19 people in 2010 (U.S. Census Bureau, 2010), is located two miles from the Project Area. An additional seven municipalities are located within 10 miles of the Project Area (Table 3-17).

Table 3-17: Populations of Communities in the Project Vicinity

Community, County	2010 Population	Distance and Direction from Project Area
Crocker, Clark County	19	Adjacent
Clark, Clark County	1,139	7 miles southeast
Bradley, Clark County	72	3.5 miles east
Raymond, Clark County	50	8.0 miles southwest
Garden City, Clark County	53	9.5 miles southeast
Lily, Day County	21	5.5 miles northeast
Butler, Day County	17	8.5 miles northeast
Turton, Spink County	61	8.0 miles west
Conde, Spink County	187	9.5 miles northwest

Table 3-17: Populations of Communities in the Project Vicinity

Community, County	2010 Population	Distance and Direction from Project Area

Source: U.S. Census Bureau, 2016

The median household income in Clark County based on 2012 to 2016 American Community Survey 5-Year Estimates was $48,563. Within the County, 15.5 percent of the people are reported living at or below the poverty level. The unemployment rate in Clark County in October 2017 was 3.2 percent. (South Dakota Department of Labor and Regulation ["SDDLR"], 2017).

The Project Area is agricultural (predominantly grassland/pasture and cultivated crops). No commercial, industrial, mining, or institutional land uses are located within the Project Area. In 2012, Clark County's 597 farms encompassed a total of 608,805 acres (average farm size of 1,020 acres) and produced $249.4 million in agricultural products (USDA, 2012). Sixty-four percent of sales were from crop sales, and 36 percent was livestock sales. The majority of crop acreage was soybean or corn. Cattle was the largest livestock component in the County. Clark County ranked 11th of the 66 South Dakota counties in total value of agricultural products sold.

Table 3-18 lists the key measures of economic development applicable to the Project Area. Data is reported for Clark County and South Dakota for the most recent year available. South Dakota has no state income tax.

Table 3-18: Key Measures of Economic Development

Statistic	Clark County	South Dakota	Data Source
Employment	1,847	663,635	U.S. Census Bureau, 2016
Unemployment Rate	3.7%	4.1%	U.S. Census Bureau, 2016
Per Capita Income	$26,291	$27,516	U.S. Census Bureau, 2016
Population	3,691	814,180	U.S. Census Bureau, 2010
Rental Vacancy Rate	9.0%	5.2%	U.S. Census Bureau, 2016
State and Local Sales Tax Revenue	NA	$1.8 billion	U.S. Census Bureau, 2017
State and Local Government Expenditures	NA	$7.4 billion	U.S. Census Bureau, 2017
State and Local Government Employment	259	62,727	U.S. Census Bureau, 2016
State Recreation Sector Income – 2006 Estimate	NA	$763 million	Western and USFWS, 2015a

3.11 Environmental Justice

An analysis of environmental justice issues was compiled for this Project based on guidance provided in both the PEIS and the 1997 Council on Environmental Quality ("CEQ"). For this project, minority populations were identified by determining the percentage of minority residents for the census tract in which the Project Area is located – Clark County. Low-income

populations were identified based on poverty rates for the county population. For that reason, the state was selected as the comparison area for this analysis. However, because the Project borders Day County, the adjacent census tract associated with this area is also included for reference. Based on the CEQ guidance, if the minority or low-income populations of the county exceed 50 percent or exceed state levels by greater than 20 percent (i.e., "meaningfully greater than the general population"), the census tract would be defined as a minority or low-income population. The percentages of minority and low-income residents in the census tract do not exceed 50 percent, nor do they exceed state levels by greater than 20 percent. Therefore, according to CEQ guidance, there are no minority or low-income populations in the Project Area.

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4.0 ENVIRONMENTAL CONSEQUENCES

The following sections provide a description of the potential impacts to the Affected Environment as a result of the construction and operation of both the Wind Farm Facility and Transmission Facility, and the mitigation measures that Crocker would implement to avoid or minimize these impacts. This section also specifically addresses the environmental consequences of the Proposed Action on resources located on USFWS conservation easements. The analysis tiers off the PEIS. Section 5.0 of the PEIS discusses the potential direct and indirect environmental impacts of wind energy development in the UGP Region and identifies BMPs and conservation measures to address the impacts. Site-specific impact information is presented below for each resource, as appropriate.

Crocker conducted field surveys within an environmental survey corridor that encompasses the construction workspace, proposed access roads, crane pathways, and aboveground facility construction footprints for both the Wind Farm Facility and Transmission Facility to provide site-specific information on terrestrial resources. The results are summarized in the applicable sections below. Impacts are quantified where possible based on either publicly available information or field survey data. Temporary construction impacts were calculated based on the following workspace dimensions (note as practicable, features are collocated to minimize impacts):

- 300-foot radius at each turbine location, which includes 40-foot by 120-foot crane pad;
- 120-foot-wide temporary access roads;
- 65-foot-wide crane paths;
- 75-foot-wide construction workspace to install collector and communication systems;
- 12-acre temporary laydown/staging area;
- 75-foot by 75-foot meteorological tower workspace; and
- 100-foot-wide transmission line corridor workspace.

Permanent impacts during the life of the Project were calculated based on the following dimensions:

- 50-foot-radius at each wind turbine location;
- 20-foot-wide permanent access roads;
- 5.5-acre O&M Facility, which includes a building and adjacent parking lot;
- 9.4-acre Project substation footprint;
- 16.8-acre interconnect switchyard footprint;
- 11-foot diameter transmission pole foundation spaced 400 feet between each pole; and
- 15-foot by 15-foot meteorological tower.

Impacts to resources are generally described in terms of magnitude (negligible, minor, moderate, major) and duration (temporary, short-term, long-term, permanent). Negligible impacts to a

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resource would be imperceptible or not detectable. Minor impacts would be slightly detectable or localized within a relatively small area. Moderate impacts would be those that are readily apparent, and major impacts would be substantial, highly noticeable, and/or result in alteration of the environment or resources. In terms of duration, temporary impacts generally occur during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term impacts could continue for up to 3 years following construction. Impacts were considered long-term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the Project. Impacts are also generally characterized as beneficial or adverse (negative).

Each resource section includes a subsection that describes the mitigation measures that Crocker would implement to avoid and minimize impacts to the resources. These mitigation measures include industry standard construction and operations procedures and BMPs, measures identified in the PEIS, typical measures required by federal, state, and/or local permit conditions, and measures recommended by agencies during consultation. Crocker would implement the applicable BMPs, avoidance, and minimization measures for this Project, which are derived from Section 5.0 of the PEIS and the Programmatic BA. Crocker outlines Project-specific mitigation measures and BMPs in each of the resource sections that it has committed to implement. Additionally, general mitigation measures and BMPs are included in the PEIS. Commitment to these measures allows for this EA to tier off the analysis in the PEIS.

4.1 Land Use and Land Cover

This section describes the direct and indirect impacts to general land cover types and various land uses occurring within the Project Area.

4.1.1 Impacts to Local Land Use and Zoning

All Project impacts are on private land; the Project is not sited on publicly owned land. Based on the USDA (2017) National Agriculture Statistics Survey data, Project construction would temporarily impact a total of 687.2 acres of cultivated cropland, and permanently remove 78.1 acres from production for the life of the Project (Table 4-1). Construction would also temporarily impact 1,081.6 acres of grassland/pasture, and permanently remove 74.4 acres from production. In developed areas, construction would disturb 58.9 acres, and permanently occupy 4.4 acres.

Based on USDA (2017) data, permanent land use impacts on grassland easements will be predominately to grassland/pasture (12.9 acres or 85 percent). Developed/open space and cropland will also be permanently impacted (1.4 and 0.6 acres, respectively). Similarly, temporary impacts on grassland easements will be predominately to grassland/pasture (93 percent). Temporary impacts to USFWS wetland basins are predominately grassland/pasture and cropland.

There are 35 occupied residences within the Project Area, one of which is a participating residence on a grassland easement. The closest participating residence to a turbine is 1,045 feet; the closest non-participating residence to a turbine is 3,962 feet. The closest residence to the Transmission Facility is nearly 2,180 feet or 0.4 miles. The construction corridors and placement of facilities are industry standard to protect the health and welfare of residences and businesses.

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Table 4-1: Summary of Wind Farm Facility & Transmission Facility Impacts to Land Use

Land Use Type	Crop Type	Overall Project		Grassland Easements		Wetland Basins
		Perm Impacts (acres)	Temp Impacts (acres)	Perm Impacts (acres)	Temp Impacts (acres)	Temp Impacts (acres)
Wind Farm Facility						
Cropland	Soybeans	31.5	282.0	0.0	0.3	1.3
	Corn	16.7	237.4	<0.1	0.1	2.6
	Other Hay/Non-Alfalfa	6.2	69.1	0.6	3.4	0.2
	Spring Wheat	2.5	30.5	0.0	0.2	0.0
	Rye	1.9	19.8	0.0	0.0	0.5
	Alfalfa	1.7	31.6	<0.1	0.3	<0.1
	Oats	0.7	8.2	0.0	0.0	0.0
	Winter Wheat	0.2	1.2	0.0	0.0	0.0
	Fallow/Idle Cropland	0.0	<0.1	0.0	0.0	0.0
	Cropland Subtotal	**61.4**	**679.8**	**0.6**	**4.3**	**4.6**
Pasture land	Grassland/Pasture	74.3	1,045.7	12.9	231.5	8.0
	Pasture land Subtotal	**74.3**	**1,045.7**	**12.9**	**231.5**	**8.0**
Deciduous Forest	Deciduous Forest	<0.1	0.8	0.0	0.0	0.0
	Deciduous Forest Subtotal	**0.0**	**0.8**	**0.0**	**0.0**	**0.0**
Developed	Developed/Open Space	4.2	48.6	1.4	12.2	<0.1
	Developed/Low Intensity	<0.1	0.1	<0.1	0.1	0.0
	Developed Subtotal	**4.2**	**48.7**	**1.4**	**12.3**	**<0.1**
Open Water[1]	Open Water	0.1	2.5	0.0	0.2	0.4
	Herbaceous Wetlands	0.0	0.4	0.0	0.0	0.0
	Open Water Subtotal	**0.1**	**2.9**	**0.0**	**0.2**	**0.4**

Table 4-1: Summary of Wind Farm Facility & Transmission Facility Impacts to Land Use

Land Use Type	Crop Type	Overall Project		Grassland Easements		Wetland Basins
		Perm Impacts (acres)	Temp Impacts (acres)	Perm Impacts (acres)	Temp Impacts (acres)	Temp Impacts (acres)
Wind Farm Facility Subtotal		**140.1**	**1,777.9**	**15.1**	**248.3**	**13.0**
Transmission Facility						
Cropland	Soybeans	0.5	2.1	0.0	0.0	0.0
	Corn	16.3	0.2	0.0	0.0	0.0
	Other Hay/Non-Alfalfa	0.0	5.0	0.0	0.0	0.0
	Fallow/Idle Cropland	0.0	0.1	0.0	0.0	0.0
	Cropland Subtotal	**16.7**	**7.4**	**0.0**	**0.0**	**0.0**
Pasture land	Grassland/Pasture	0.1	35.9	<0.1	10.6	0.2
	Pasture land Subtotal	**0.1**	**35.9**	**<0.1**	**10.6**	**0.2**
Developed	Developed/Open Space	0.2	10.0	<0.1	1.4	0.0
	Developed/Low Intensity	0.0	0.2	0.0	0.2	0.0
	Developed Subtotal	**0.2**	**10.2**	**<0.1**	**1.6**	**0.0**
Open Water[1]	Open Water	0.0	0.7	0.0	0.0	0.2
	Open Water Subtotal	**0.0**	**0.7**	**0.0**	**0.0**	**0.2**
Transmission Facility Subtotal		**17.0**	**54.2**	**<0.1**	**12.2**	**0.4**
Project Total		**157.1**	**1,832.1**	**15.1**	**260.5**	**13.4**

Source: USDA (2017)

Note: there are no impacts to sunflower or sorghum from the Wind Farm Facility; there are no impacts to spring wheat, rye, alfalfa, oats, winter wheat, sunflower, or sorghum from the Transmission Facility.

[1] *Open Water impacts are discussed in Section 4.3.2.*

4.1.1.1 Mitigation Measures for Local Land Use and Zoning

During construction, the construction workspace located on cultivated cropland and grassland/pasture lands would be removed from productivity; however, following construction these would be restored and would return to its prior agricultural use. Fencing or grazing deferment in pasture lands within or adjacent to the construction workspace may also be necessary to prevent livestock from injury by entering the construction area. Crocker will work with landowners on the following issues: installation of gates/cattle guards where access roads cross existing fencelines, access control, signing of open range areas, traffic management (e.g., vehicle speed management), and location of livestock water sources. In addition, Crocker will implement the Agricultural and Grazing Lands BMPs described in Section 5.1.2 of the PEIS.

Crocker has obtained a CUP from Clark County per the Clark County Zoning Ordinance for a wind energy facility and associated transmission facility located in the Agricultural Zoning District. Crocker will comply with all provisions and setback requirements outlined in Table 3-2.

4.1.2 Impacts to Recreation

The Wind Farm Facility and Transmission Facility will avoid direct impacts to GPAs, Reid Lake State Waterfowl Refuge, and School and Public Lands. There is one turbine and associated access road and collector line proposed on the WIA parcel located in the northern portion of the Project Area. Access on this parcel would be temporarily restricted during construction. The road will change the long-term nature of the area but impacts are expected to be minor.

Operation of the wind energy facility could disrupt movements of terrestrial wildlife, particularly during migration. White-tailed deer could be affected if linear rows of turbines intersect migration paths between winter and summer ranges (National Wind Coordinating Committee, 2002). Robling (2011, as cited in SDGFP, 2017c) found that white-tailed deer in Clark County generally demonstrate shorter migration distances relative to other regions of South Dakota due to the high abundance of suitable habitat. Based on the abundance of suitable habitat in the Project Area and non-linear nature of the wind turbine layout, impacts to white-tailed deer are anticipated to be negligible. See Section 4.6.2 for a discussion on the potential impacts of the Project on waterfowl and other bird species that are hunted in the Project Area.

In general, recreational impacts will be visual in nature potentially affecting individuals using public land in the Project vicinity for recreation. This could include people observing birds. Discussions in Section 4.6.2 would apply.

4.1.2.1 Mitigation Measures for Recreation

The Project will avoid placing turbines and associated infrastructure on all publicly owned recreation lands including the GPA, and School and Public Lands. One turbine will be sited on a privately owned WIA. Crocker will ensure that adequate safety measures are established for recreational visitors to the WIA during construction and operation. These may include access control and traffic management. Crocker will work with the landowner of the WIA and SDGFP to address safety issues associated with the WIA.

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4.1.3 Impacts to Conservation Easements

The Project has been designed to avoid permanent impacts to USFWS wetland basins. The Project will temporarily impact 13.4 acres of easement wetlands as follows:

- 300-foot radius around turbines - 7.7 acres
  - This includes the crane pad and rotor assembly area to be mowed
- 75-foot wide collection line corridor – 3.1 acres
  - Collection lines will be ploughed in to the ground. This conservative construction corridor may be mowed prior to ploughing collection cables
- 120-foot wide access road corridor – 1.6 acres
  - This corridor will be mowed to facilitate construction traffic
- 65-foot crane path corridor – 0.6 acres
  - This corridor will be mowed to facilitate crane movement
- 100-foot wide transmission line workspace – 0.4 acres
  - This workspace may be mowed for construction traffic to access transmission structure locations

There are 14 turbines and access roads as well as 14 transmission poles sited on USFWS grassland easements. The Project will permanently impact 15.1 acres and temporarily impact 260.5 acres of grassland easements for construction (Table 4-2). Collection lines and crane paths are collocated on grassland easements. The Project will have physical permanent impacts to less than one percent of grassland easements in the Project Area.

Table 4-2: Impacts to USFWS Grassland Easements and Wetland Basins

Easement Type	Permanent Impacts (acres)	Temporary Impacts (acres)
Wind Farm Facility		
Grassland	15.1	248.3
Wetland	0	13.0
Wind Facility Subtotal	**15.1**	**261.3**
Transmission Facility		
Grassland	<0.1	12.2
Wetland	0	0.4
Transmission Facility Subtotal	**<0.1**	**12.6**
Project Total	**15.1**	**273.9**

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4.1.3.1 Mitigation Measures for Conservation Easements

In fall of 2016 and again in November 2017, Crocker and USFWS discussed minimizing the impacts of turbines and infrastructure on conservation easements. The layout in this EA incorporates design suggestions by the USFWS to the extent practicable, while balancing setbacks, constructability, noise, shadow flicker, cultural resources, and other factors. Design suggestions included collocating access roads, collection lines, and crane paths with existing disturbances, such as roads, utility corridors, and fencerows. The USFWS also suggested many shifts of turbines out of local flyways or closer to grassland edges. Temporary impacts from collector lines and crane paths have been designed in some cases to avoid and minimize potential fragmentation. In some cases, this may have resulted in more impact acres due to a longer route.

Mitigation measures will include avoiding disturbance of soils along crane paths by collocating crane paths with access roads, installing construction mats, or driving cranes over dry or frozen ground as practicable. Crocker will also avoid all clearing on grassland easements during nesting season to the extent practicable.

Upon completion of the NEPA process, Crocker is required to conduct an easement exchange with the USFWS to replace permanent impacts to grassland easements at a 1:1 ratio with funding for the USFWS to purchase grassland easement acres elsewhere. A bond will be provided so at decommissioning of the project the permanent impact acres will be restored to grass and easement protection. Additionally, Crocker has volunteered to mitigate at a 2:1 ratio. The easement exchange acreage is based on the post-construction "As-Built" civil engineering survey, so the easement exchange will be completed post construction.

Temporary impacts on grassland easements and to wetland basins on wetland easements will be authorized through a Special Use Permit from the USFWS. The construction-related impacts authorized by the Special Use Permit will be based on impacts described in this EA. Crocker will comply with the conditions established by the USFWS in the Special Use Permit.

4.1.4 Impacts to Transportation

The Project will require up to 43.6 miles of new access roads. During the construction phase, temporary impacts are anticipated on some public roads within the Project Area. Roads will be affected by the transportation of equipment to and from the Project. Construction traffic will use the existing county and state road system to access the Project and deliver construction materials and personnel. Some roads may also be temporarily expanded along specific routes as necessary to facilitate the movement of equipment. Crocker expects to enter into road use agreements with the county and townships, and to have a bond set by the SDPUC in accord with state law. Construction activities will increase the amount of traffic using local roadways, but such use is not anticipated to result in adverse traffic impacts. Operation and maintenance activities will not noticeably increase traffic in the Project vicinity.

The Project may also temporarily affect traffic numbers in the area due to construction traffic. During the construction phase, several types of light, medium, and heavy-duty construction vehicles will travel to and from the Project Area, as well as private vehicles used by construction

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personnel. Crocker estimates that there will be 375 large truck trips per day and up to 875 small-vehicle (pickups and automobiles) trips per day in the area during peak construction periods.

After construction is complete, traffic impacts during the operations phase of the Project will be minimal. A small maintenance crew driving through the area in pickup trucks on a regular basis will monitor and maintain the wind turbines and transmission lines, as needed. There would be a slight increase in traffic for occasional turbine, substation repair, and transmission line repair, but traffic function will not be impacted as a result.

4.1.4.1 Mitigation Measures for Transportation

Due to the increased road use in the Project Area during construction, Crocker will coordinate with road authorities to establish road use agreements that will be in place prior to construction to ensure the safe and efficient use of roads and to minimize and mitigate the overall impact. Existing roads will be used to the extent possible, but only in safe and environmentally sound locations. In locations where new access roads are necessary, they will be designed and constructed to the appropriate standard necessary to accommodate their intended function (e.g., traffic volume and weight of vehicles) and minimize erosion. Access roads that are not needed during operations will be decompacted, recontoured, and revegetated.

Crocker will develop a Transportation Plan that identifies the measures that will be implemented to comply with federal, state, and county regulations and permit conditions. This will typically address the transport of turbine components, main assembly crane, and other large pieces of equipment. The Plan will also consider specific object size, weight, origin, destination, and unique handling requirements. Included will be a traffic management plan for the Project's access roads to ensure that no hazards would result from increased truck traffic and that traffic flow would not be adversely impacted. This Plan will identify measures that will be implemented to comply with any federal or state department of transportation requirements, such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configurations. Signs will be placed along roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimize impacts to local communities, consideration will be given to limiting construction vehicles on public roadways during the morning and late afternoon commute times.

When the Project is in the process of making road improvements, local traffic will either be directed safely through the work area or around on alternate routes if needed. If practical, roads will be designed to allow two-way traffic so construction and local traffic will be able to use the roads during construction. Some delays or detours are expected during this phase to enable the installation of road improvements. Delays and detours will be similar in nature to what can occur during peak farming operations or road improvements. Additional coordination will occur during peak harvest to ensure farmers are able to utilize the public roads. Local Project management and support staff will be available on-site to address concerns or challenges that occur during construction. The Project will implement the following to minimize any adverse traffic impacts: improved roads to handle two-way traffic during construction, proper signage, speed limits, follow state/local road requirements, dust control, safety personnel on site, and road agreements.

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Project personnel and contractors will be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions to ensure safe and efficient traffic flow. During construction, O&M, and decommissioning phases, traffic will be restricted to designated project roads. Use of other unimproved roads will be restricted to emergency situations.

4.1.5 Impacts to Aviation

The closest airport to the Project is the Clark County airport, approximately 7 miles southeast. Crocker will coordinate with the airport, and SDDOT preconstruction for potential impacts.

The Project has received "Determination of No Hazard" responses from the FAA for the proposed turbine locations up to 499 feet with Aircraft Detection Lighting System ("ADLS") technology. If taller turbines or Project layout changes, the Project will re-file with the FAA.

The installation of wind turbine towers in croplands and installation of aboveground collector lines, if needed, will create a potential collision risk with crop-dusting aircraft. One private airstrip is located outside of the Project Area in Township 118N, Range 58W, Section 18. Crocker will notify local airports about locations of new towers to minimize impacts and reduce potential risks to crop dusters.

4.1.5.1 Mitigation Measures for Aviation

One private airstrip is located outside the Project boundary: T. 118N, R. 58W, Section 18. There are no state/federal protections for private airstrips. Private airstrip owners are responsible for acquiring aviation easements needed for unrestricted airspace use above neighboring land. While not required, Crocker voluntarily eliminated a turbine location in the southeast of T. 118N, R. 59W, Section 13 and shifted another turbine following discussions with the airstrip owner.

Crocker will mark and light the turbines to comply with FAA requirements. Crocker will paint meteorological towers red at the top to improve visibility and will notify local airports about the new towers in the area to reduce risk to crop dusters. Crocker will work with landowners on coordinating crop dusting activity. Permanent meteorological towers will be free-standing with no guy wires and FAA compliant lighting. Temporary meteorological towers have supporting guy wires which will be marked with safety shields (colored balls) for increased visibility.

A condition of the Clark County CUP requested a study to determine the feasibility of installing ADLS. To complete this study Crocker had to re-file the Project with FAA. A Determinations of No Hazard was received. Crocker has been working with a technology vendor to determine the suitability/cost requirements. Crocker has committed to implementing an Aircraft Detection Lighting System for the Project. An analysis will be provided to the County when complete.

4.1.6 Impacts to Telecommunications

Because of their height, modern wind turbines have the potential to interfere with existing communications systems licensed to operate in the U.S. Comsearch conducted a Licensed Microwave Study for the Wind Farm Facility. Turbines have been sited in a manner that avoids

all identified microwave beam paths and communication systems. The construction and operation of the Project will not result in interference to microwave, radio, or navigation signals.

Crocker received a response from NTIA (Appendix E). The agency indicated no federal agencies identified any concerns regarding blockage of their radio frequency transmissions. The USDA and United States Department of Justice ("DOJ") provided responses stating, "No Harmful Interference Anticipated." The DOC and DOE expressed concerns the Project may obstruct radio frequency transmissions or weather radar.

The DOC, which includes National Oceanic and Atmospheric Administration ("NOAA"), provided comments specific to potential weather radar impacts. The DOC noted that a portion of the Project falls within the Notification Zone. Due to the proximity of the Project to the Aberdeen Weather Surveillance Radar–1988 Doppler, NOAA's Radar Operations Center would like to reevaluate when turbines are sited, and track the Project to completion. Turbine placement may impact the radar's precipitation estimates over a portion of the Project Area.

The DOE noted the Project has potential to interfere with DOE Western operations. Western has three paths that run through the Project Area from the Clark Repeater. However, in a later letter, the agency notes the Project will not cause problems for Western.

In consultation with ITC, Crocker modified its collection lines to minimize the distance of paralleling copper telephone lines. Following a second review of the Project's lines, the ITC indicated that the proposed collection routes have the potential to cause inductive interference.

4.1.6.1 Mitigation Measures for Telecommunications

The Project was sited to avoid microwave beam paths, and therefore, no mitigation is proposed.

Crocker will implement the suggested mitigation strategies to reduce impacts to radar listed in the response from the DOC, which includes aligning turbines so that rows of turbines point towards/away from the radar. Crocker will provide a final layout to the agencies for review and implement further mitigation, as necessary. Additional potential mitigation to ensure accurate rainfall measurements could include installing rain gauges or additional weather stations where precipitation estimates may be impacted. Crocker does not anticipate mitigation will include moving turbine locations. The FAA review circulates to the weather radar operators allowing them to map the layout on their radar system to create a mask that then allows them to screen the interference from their forecasting. NOAA does not anticipate impacts to critical tornado detection and, therefore, will not request mitigation.

Crocker is coordinating with DOE and Western on turbine placement to avoid impacts with Western operations and beam paths.

In the event the Wind Farm Facility or its operation causes interference to communication systems, Crocker will take necessary steps to correct the problem. If interference is identified during or after construction of the Project, Crocker will address the interference.

Crocker is in the process of negotiating an agreement with the ITC to ensure any inductive interference will be mitigated through replacing copper with fiber lines. The draft agreement

provided by ITC at the CUP Hearing contains provisions that required further negotiation and clarification. Therefore, Crocker has requested an agreement with ITC be executed once detailed layout design work is complete. The Project's CUP requires an agreement is in place prior to construction. Crocker is committed to an agreement with ITC that protects ITC's customers and appropriately addresses impacts specific to the Project's interactions with ITC's network.

4.1.7 Impacts to Other Existing Utility and Right-of-Way Corridors

The Project will tie-in to the existing Basin Electric Groton-to-Watertown 345 kV transmission line via the interconnection switchyard.

The Project facilities will cross rights-of-way and utilities. Crossings include public road rights-of-way, telecommunications, rural water systems (Clark Rural Water), electric distribution lines (East River, Codington Clark Electric Coop), and the Northern Border Natural Gas Pipeline.

4.1.7.1 Mitigation Measures for Other Existing Utility and Right-of-Way Corridors

The crossings will be designed and installed for no negative impacts to other utilities or rights-of-way at these crossings by utilizing good utility practices and coordination with the other entity involved. Crocker will coordinate with right-of-way authorities and utilities on design details of these crossings and to ensure the appropriate mitigation measures are implemented.

4.2 Geologic Setting and Soil Resources

Potential impacts to geologic and soil resources are within the type and range in the PEIS.

4.2.1 Impacts to Geological Resources and Hazards

Construction of the Wind Farm Facility and Transmission Facility would result in negligible impacts to geological resources. Excavation and trenching would be required to install the wind turbines and associated collection and communications systems. Crocker would also clear vegetation and grade construction workspaces, access roads, and crane paths.

The average depth to bedrock within the Project Area ranges from 30 to 300 feet, therefore, excavation of 4 to 6 feet required for the installation of the wind turbines and collection and communication systems is unlikely to encounter or impact the underlying bedrock.

Operational impacts to bedrock or surface geology are limited to temporary impacts associated with activities that may require excavation. Due to the limited potential for large, seismically induced ground movements, there is minimal risk of earthquake-related impacts to the Project.

Construction and operation of the Project would not interfere with the ongoing operation of the two sand and gravel pit operations located within the Project Area, which are accessed via County Road 2 (421st Avenue) and 161st Street. The closest sand and gravel operation is located approximately 1,000 feet from proposed turbines.

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4.2.1.1 Mitigation Measures for Geological Resources and Hazards

The Project is not anticipated to impact bedrock as the depths of excavation are shallower than the estimated depth of bedrock in the Project Area. Therefore, blasting is not anticipated.

It is not anticipated that the Project will impact the sand and gravel operations in the Project.

Geologic hazards, such as seismicity, is extremely low to negligible in the Project Area. Due to the limited potential for large, seismically induced ground movements, there is minimal risk of earthquake-related impacts to the Project. No additional mitigation beyond designing the Project to currently accepted industry specifications would be required.

4.2.2 Impacts to Soil Resources

Construction activities such as clearing, grading, trench excavation, and backfilling, as well as the movement of construction equipment within the construction workspace, may result in impacts to soil resources. Potential impacts to soil resources include soil erosion, soil compaction, reduction of soil fertility, and changes to other soil characteristics. Clearing removes protective cover and exposes soil to the effects of wind and precipitation, which may increase the potential for soil erosion and movement of sediments into sensitive environmental areas. Grading and equipment traffic may compact soil, reducing porosity and percolation rates, which could result in increased runoff potential. Contamination from release of fuels, lubricants, and coolants from construction equipment could also impact soils. Most of these impacts are temporary and related to construction activities. There would be permanent impacts associated with aboveground facilities.

Table 4-3 provides a summary of the significant soil characteristics identified within the temporary and permanent footprints associated with aboveground facilities, such as the wind turbines, O&M Facility, Project substation, transmission poles, switchyard, and permanent access roads. The 157.1 acres permanently impacted by the installation of these facilities would be converted to impervious surfaces, thereby permanently altering the soil composition at these locations.

On USFWS easements, the Project will permanently impact less than one percent and temporarily disturb less than 2 percent of prime farmland, farmland of statewide importance, water and wind erodible soils, compaction prone soils, and soils with revegetation concern.

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Table 4-3: Summary of Soil Characteristics Affected by the Project

Soil Characteristics	Overall Project		Grassland Easements		Wetland Basins
	Perm Impacts (acres)	Temp Impacts (acres)	Perm Impacts (acres)	Temp Impacts (acres)	Temp Impacts (acres)
Wind Farm Facility					
Prime Farmland [a]	80.2	969.7	6.5	101.6	8.5
Farmland of Statewide Importance [b]	32.4	453.1	4.0	53.9	1.0
Water Erodible [c]	19.5	346.0	3.5	74.1	0.7
Wind Erodible [d]	0.0	0.0	0.0	0.0	0.0
Compaction Prone [e]	0.5	13.3	0.0	3.1	2.7
Revegetation Concern [f]	30.8	563.1	5.4	131.3	3.6
Wind Farm Facility Subtotal	**140.1**	**1,917.9**	**15.1**	**263.3**	**13.0**
Transmission Facility					
Prime Farmland [a]	14.9	36.8	0.0	2.5	0.1
Farmland of Statewide Importance [b]	0.0	8.9	0.0	4.3	0.0
Water Erodible [c]	2.1	14.7	0.0	4.8	0.0
Wind Erodible [d]	0.0	0.0	0.0	0.0	0.0
Compaction Prone [e]	0.0	0.3	0.0	0.0	0.3
Revegetation Concern [f]	2.1	32.6	0.0	5.4	0.4
Transmission Facility Subtotal	**17.0**	**71.2**	**0.0**	**12.3**	**0.4**
Project Totals	**157.1**	**1,989.1**	**15.1**	**275.6**	**13.4**

Note: Sum of addends may not match due to rounding. Soils may have more than one characteristic and therefore the column totals will not equal the project totals presented.

[a] *Includes soils that meet the prime farmland or prime farmland if a limiting factor is mitigated.*

[b] *Includes soils classified as farmland of statewide importance by SSURGO.*

[c] *Includes soils with a slope greater than 15 percent or soils with a K value of greater than 0.35 and slopes greater than 5 percent.*

[d] *Includes soils in wind erodibility group designation of 1 or 2.*

[e] *Includes soils in somewhat poor to very poor drainage classes with surface textures of clay loam and finer.*

[f] *Includes soils with a non-irrigated land capability classification of 4 or greater.*

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4.2.2.1 Prime Farmland Soil and Soils of Statewide Importance

Construction of the Project will temporarily impact 1,006.5 acres of prime farmland soils and an additional 462.0 acres of soils classified as farmland of statewide importance. Areas of prime farmland or farmland of statewide importance that are temporarily impacted and currently in agricultural production will return to that use after construction.

The Project will permanently impact 95.1 acres of prime farmland and 32.4 acres of farmland of statewide importance (both less than one percent of the prime farmland and farmland of statewide importance, respectively, in the Project Area). The Project will temporarily disturb 8.3 percent of the prime farmland and 7.2 percent of the farmland of statewide importance in the Project Area.

The Project will temporarily impact 112.7 acres of prime farmland soils and an additional 59.2 acres of soils classified as farmland of statewide importance that also have USFWS easements. Of these, 6.5 acres of prime farmland and 4.0 acres of farmland of statewide importance will be permanently impacted.

4.2.2.2 Water and Wind Erodible Soils

Based on the K factor and slope designations, 360.7 acres of soils susceptible to water erosion would be temporarily affected by construction. Construction of aboveground facilities and permanent access roads would permanently impact 21.6 acres of water erodible soils. The Project will permanently impact less than one percent and temporarily disturb 6.2 percent of the water erodible soils in the Project Area.

Based on the Wind Erodibility Group designations, none of the soils that would be impacted during construction or operation of the project are considered highly susceptible to wind erosion. Therefore, the Project will not impact wind erodible soils.

The Project will temporarily impact 79.6 acres of soils susceptible to water erosion that are on USFWS easement. 3.5 acres of soils susceptible to water erosion will be permanently impacted.

4.2.2.3 Compaction Prone Soils

Based on the above factors, 13.6 acres of soils prone to compaction would be temporarily affected by constructing the Project. Construction of aboveground facilities and permanent access roads would permanently impact 0.5 acres of compaction prone soils. The Project will permanently impact and temporarily disturb less than one percent of compaction prone soils.

The Project will temporarily impact 6.1 acres of soils prone to compaction that are on USFWS easement. No compaction prone soils will be permanently impacted.

4.2.2.1 Soils with Revegetation Concerns

Based on the above, 595.7 acres of soils with poor revegetation potential would be temporarily affected by Project construction. Construction of aboveground facilities and permanent access roads would permanently impact 32.9 acres of soils with revegetation concerns. The Project will

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permanently impact less than one percent and temporarily disturb 5.2 percent of soils with revegetation concerns.

The Project will temporarily impact 140.3 acres of soils with poor revegetation potential that are on USFWS easement. 5.4 acres with poor revegetation potential will be permanently impacted.

4.2.2.2 Mitigation Measures for Soil Resources

The current layout sites access roads away from steep slopes to the degree possible. The underground collector lines also avoid crossing steep ravines to the extent practicable. Geotechnical soil borings will be conducted at wind turbine foundation and transmission line structure locations prior to construction to determine the soil suitability to support turbine foundations or transmission line structures. This information will help dictate final design parameters of the turbine and structure foundations. The Project design will be modified as necessary to account for soil conditions and discussed with USFWS.

Once construction is complete, Crocker will backfill graded and excavated areas with the stored native material and return surface conditions to pre-construction conditions to the extent practicable. Crocker would also implement ECDs and seed and mulch the construction workspace consistent with the Project's SWPPP. These BMPs and mitigation measures are consistent with those recommended in Section 5.2.3 of the PEIS, and will include:

- During construction, certain activities may be suspended in wet soil conditions. The Contractor will cease work until Crocker determines that site conditions are such that work may continue without damage. Crocker construction management will ultimately decide if wet weather shutdown is necessary in a given location.
- Crocker will strip topsoil in upland areas as specified in the project plans, commitments, and/or permits. Excavated topsoil and subsoil will be stockpiled separately in the approved construction workspace and stored so the area subject to erosion is minimized.
- Temporary ECDs, such as slope breakers, sediment barriers (e.g., silt fences, straw bales, bio-logs), stormwater diversions, trench breakers, mulch, and revegetation will be installed following soil disturbance and maintained until site is restored. The Contractor will maintain erosion and sediment control structures as required in the Project construction documents and as required by all applicable permits. Non-functional ECDs will be repaired, replaced, or supplemented with functional materials within 24 hours after discovery, or as otherwise specified in project permits.
- Temporary ECDs installed across the travel lane may be removed during active daytime construction; however, ECDs will be properly reinstalled after equipment passage, or activities in the area are completed for the day. These ECDs will also be repaired and/or replaced prior to forecasted inclement weather.
- Crocker will develop and implement a Project-specific SPCC to prevent and mitigate potential contaminant spills (e.g., fuels, lubricants). This will include secondary containment requirements and procedures for spill response.
- Following construction, Crocker will reestablish the original grade and drainage pattern of the construction workspace to the extent practicable.

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- During site restoration, Crocker will decompact subsoil, and replace stored soils to the construction workspace, temporary access roads, and crane pathways. The Contractor will implement ECDs, including seeding the site with weed-free native plants in accordance with landowner or local agency requests.
- During operations, Crocker will regularly inspect access roads, utility and transmission line corridors, and tower site areas for damage from erosion, washouts, and rutting. Crocker will initiate corrective measures immediately upon evidence of damage.
- New access roads will be surfaced with aggregate materials where appropriate.

4.3 Water Resources

Potential impacts to water resources from this Project are within the type and range in the PEIS.

There are no NPS NRI or Section 303(d) impaired waters within the Project Area, therefore, these resources are not discussed further in this section.

4.3.1 Impacts to Hydrogeological Resources

Project construction is not anticipated to have long-term impacts to groundwater resources. Disturbances associated with construction activities are primarily limited to the upper 4 to 6 feet, or above the water table of most of the aquifers in the Project Area. Construction activities such as trenching and backfilling and dewatering that encounter shallow surficial aquifers may result in negligible to minor short-term and very localized fluctuations in groundwater levels in the aquifer. Groundwater levels typically recover quickly post construction.

Wind turbines and transmission line structures are typically located at higher elevations where water tables tend to be deeper, so trench dewatering is only anticipated in the two areas of shallow aquifers at the ground surface in the northern and southeastern portions of the Project Area. The introduction of contaminants into groundwater due to accidental release of construction related chemicals, fuels, or hydraulic fluid during construction could have an adverse effect on groundwater quality, most notably near shallow water wells. Spill-related affects are primarily associated with fuel storage, equipment refueling, and equipment maintenance.

Routine O&M are not expected to affect groundwater resources. During operations, potential, negligible to minor, short-term groundwater quality degradation is possible from maintenance equipment, vehicle spills, and maintenance activities that may require excavation. Although there is potential for dewatering of shallow groundwater aquifers and potential changes in groundwater quality (such as increases in Total Suspended Solids concentrations) during trenching, excavation, and backfilling maintenance activities, these changes are expected to be temporary and short term. Shallow groundwater aquifers generally recharge quickly because they are receptive to recharge from precipitation and surface water flow.

There are no Wellhead Protection Areas within the Project Area that would be impacted.

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4.3.1.1 Mitigation Measures for Hydrogeological Resources

Construction dewatering will be conducted in accordance with the General Permit for Temporary Discharge Activities (Permit No.: SDG0700000) and Temporary Permit to Use Public Waters from the SDDENR and through the implementation of industry-accepted BMPs to minimize sediment withdrawal during dewatering activities and erosion and sediment release at the discharge point.

4.3.2 Impacts to Waterbodies

Construction could affect surface waters in several ways. Clearing and grading of stream banks, topsoil disturbance, in-stream trenching, trench dewatering, backfilling, and development of access roads and crane pathways could result in increased sedimentation and erosion, modification to hydrological flow, releases of chemical and nutrient pollutant from sediments, and introduction of chemical contaminants such as fuel and lubricants.

In 2016 and 2017, Tetra Tech conducted wetland and waterbody delineations within the environmental survey corridor according to the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987) and applicable Regional Supplements. Delineations are complete on 78 percent of the corridor. Where surveys are not complete, NWI data are used to calculate impacts. Crocker would temporarily impact approximately 0.1 acre of ephemeral waterbodies on grassland easement and less than 0.1 acres of lacustrine systems (lakes) at the edge of a temporary access road on a USFWS wetland basin (Table 4-4). Construction activities would also temporarily impact lacustrine (lake) systems at the edge of a temporary access road and along the transmission line corridor. The transmission line would span the 0.4-acre delineated lake system, thereby avoiding any permanent impacts.

The clearing and grading of streambanks and lake edges would expose soil to erosional forces and would reduce riparian vegetation along the cleared section of the waterbody. The use of heavy equipment for construction would cause compaction of near-surface soils, an effect that could result in increased runoff into surface waters. The increased runoff could transport additional sediment into the waterbodies, resulting in increased turbidity levels and sedimentation rates in the receiving waterbody. Disturbances to stream channels, streambanks, and lake edges could increase the likelihood of scour after construction. Apart from constructing across waterbodies, the excavation, grading, and exposure of soils along the construction workspace holds the potential to cause sediment runoff and sedimentation in receiving waters during storm events. Erosion also increases with increasing slope angle, slope length, and fragility of the soil.

Construction of the Project will result in up to approximately 157.1 acres of new impervious surfaces (turbine foundations, permanent access roads, Project substation, interconnection switchyard, O&M Facility). The creation of impervious surfaces reduces the ability of soils to infiltrate precipitation to groundwater, potentially increasing the volume and rates of stormwater runoff. Infiltration will be inhibited within these newly created impervious surfaces, and incremental increases in stormwater runoff may be exhibited immediately adjacent to these surfaces.

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Table 4-4: Summary of Impacts to Waterbodies in the Project Area

Source	Wetland Type	Project Overall		Grassland Easements		Wetland Basins
		Perm Impacts (acres)	Temp Impacts (acres)	Perm Impacts (acres)	Temp Impacts (acres)	Temp Impacts (acres)
Wind Farm Facility						
Delineated	Lacustrine (lake)	0.0	<0.1	0.0	<0.1	<0.1
	Subtotal	**0.0**	**<0.1**	**0.0**	**<0.1**	**<0.1**
NWI	Riverine (ephemeral)	0.0	0.1	0.0	0.1	0.0
	Subtotal	**0.0**	**0.1**	**0.0**	**0.1**	**0.0**
Wind Farm Facility Subtotal		**0.0**	**0.1**	**0.0**	**0.1**	**<0.1**
Transmission Facility						
Delineated	Lacustrine (lake)	0.0	0.4	0.0	0.0	0.0
	Subtotal	**0.0**	**0.4**	**0.0**	**0.0**	**0.0**
Transmission Line Facility Subtotal		**0.0**	**0.4**	**0.0**	**0.0**	**0.0**
Project Total		**0.0**	**0.5**	**0.0**	**0.1**	**<0.1**

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4.3.2.1 Mitigation Measures for Waterbodies

Crocker has conducted formal wetland and waterbody delineations within the Project Area in areas of proposed infrastructure. With layout revisions, 78 percent of the final layout reflected in this EA has been field-delineated. Based on this information, the Project has been designed to avoid and minimize wetland and waterbody impacts. The remainder of the Project will be delineated during Spring 2018. Wetlands and waterbodies will be avoided to the extent possible during the construction phase of the Project. If wetland or waterbody impacts cannot be avoided, Crocker will submit a permit application to the USACE for dredge and fill within waters of the U.S. under Section 404 of the CWA.The waterbodies that would be crossed by the collector or communication systems, access roads, or crane pathways are ephemeral drainages that are expected to be dry at the time of construction. Where crossings of streams and drainageways cannot be avoided by access roads, appropriately designed crossings (i.e., culverts, low water crossings) would be constructed to maintain existing drainage. To minimize the Project-related impacts to dry wash crossings during runoff/precipitation events, Crocker would suspend certain activities in wet soil conditions. The Contractor will cease work in the applicable area until Crocker determines that site conditions are such that work may continue. Crocker construction management will ultimately decide if wet weather shutdown is necessary in a given location.

Crocker would grade the banks of ephemeral washes into the adjacent upland and place excavated trench material on the outer edges of the construction right-of-way. Trench spoil would be stored so as not to impede flow from within the main channel of the wash. Once the collector and/or communication system has been installed, the trench would be backfilled, and the stream bed and banks restored to preconstruction contours or to a stable angle of repose as approved by the Contractor. Sediment barriers, such as silt fencing, or staked straw bales would be installed following backfill to prevent spoil and sediment-laden water from entering the wash from adjacent upland areas. Water bars or other appropriate ECD would be placed to divert water off the right-of-way into a vegetated area instead of directly into the wash, which would also help reduce potential for headcutting and gully formation.

Following bank stabilization and installation of temporary ECDs, Crocker will seed the site with weed-free native plants in accordance with landowner or local agency requests. Crocker will consult with landowners and USFWS to identify the appropriate seed mixes and application methods to be used. Crocker will also develop and implement a Noxious and Invasive Weed Plan that describes the procedures to be followed to identify and prevent the introduction and spread of noxious and invasive weeds during construction and ongoing operations.

During operations, Crocker will regularly inspect access roads, utility and transmission line corridors, and tower site areas for damage from erosion, washouts, and rutting. Crocker will initiate corrective measures upon evidence of damage.

Project construction will require coverage under the General Permit Authorizing Stormwater Discharges Associated with Construction Activities (Permit No. SDR10000), administered by the SDDENR. One condition of the permit is the development and implementation of SWPPP that identifies potential sources of stormwater pollution at the construction site and specifies the structural and non-structural controls that shall be in place to minimize the negative impacts to receiving waters caused by stormwater discharges associated with the construction activities.

The following are examples of BMPs that would be implemented during construction as required by the Stormwater General Permit Authorizing Stormwater Discharges Associated with Construction Activities:

- Design, install, and maintain effective ECDs to minimize soil erosion and the discharge of pollutant during earth-disturbing activities. ECDs may include silt fence, straw wattles, erosion control blankets, project staging, and other methods to control erosion and sedimentation. ECDs must be designed to function properly and withstand a 2-year, 24-hour precipitation event, and installation of ECDs must be completed before any land disturbing activities occur. Install effective downgradient ECDs and controls for any side slope boundaries to minimize pollutant discharge from the construction site.
- ECDs must be maintained in effective operating condition until final stabilization of the Project site is complete.
- Minimize sediment track-out from the construction site where vehicles leave the site.
- Minimize the generation of dust at the construction site to avoid pollutants from being deposited into surface waters; this can be accomplished through the appropriate application of water or other dust suppression techniques.
- Minimize the disturbance of slopes that are greater than a three horizontal to one vertical ("3:1") slope, unless infeasible.
- Implement ECDs and velocity dissipation devices along the length of stormwater conveyance channels and outlets to minimize erosion of the channel, adjacent stream bank, slope, and downstream waters.
- Control stormwater discharges, including both peak flowrates and total stormwater volume, to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points.
- Minimize soil compaction on the site; restrict vehicle and equipment use to the construction workspace and condition areas of compacted soil prior to seeding.
- Protect stockpiles by locating them outside of natural buffers, installing temporary ECDs, maintain and position stockpiles to minimize dust generation and wind transport of sediment, and minimize stormwater runoff. Stockpiles may not be placed in surface waters.
- Begin soil stabilization measures by the following work day whenever earth-disturbing activities have permanently or temporarily ceased on any portion of the site.
- Vegetative stabilization of the site must provide 70 percent or more of the density of coverage that was provided by vegetation prior to construction activities, provide perennial vegetative coverage, and eliminate the presence of invasive species.
- For stabilization on agricultural land use, final stabilization may be accomplished by returning the disturbed land to its preconstruction agricultural use.
- For non-vegetative stabilization, the controls must provide effective cover to properly stabilize the exposed portions of the site.

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- Design, install, and implement effective pollution prevention measures to minimize the discharge of pollutants at the Project site. Pollutants include wastewater, fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance, waste, garbage, floatable debris, construction debris, sanitary waste, detergents, soaps, solvents, toxic or hazardous substances from a spill or other release.
- Implement measures to minimize the discharge of spilled or leaked materials from areas where vehicle and equipment fueling, maintenance, or washing occurs.
- Properly store, handle, and dispose of any construction products or materials, landscape materials, and wastes (including hazardous materials and wastes).
- Monitor construction dewatering discharge for visible pollutants (suspended solids); if suspended solids are observed, sample discharge daily until solids are no longer visible.

4.3.3 Impacts to Wetlands

Tetra Tech conducted wetland and waterbody delineations within the environmental survey corridor according to the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987) and applicable Regional Supplements in 2016 and 2017. Where surveys have not been completed, NWI data are used to calculate impacts. Prior to construction, the remainder of the corridor will be surveyed for wetlands. Once surveys are complete, Crocker may further refine the Project site layout to avoid wetland features to the extent practicable. Access roads, O&M Facility and Project substation will be designed to avoid impacts to wetlands whenever feasible. Temporary impacts associated with crane paths will also be minimized by collocating with access roads, installing construction mats, or driving cranes over frozen or dry ground in wetland basins as practicable. Installation of underground utilities is expected to avoid impacts by boring under water features as necessary and will minimize impacts to wetlands or where possible make them coincident with other impacts (e.g., crane walks). Crocker will acquire all needed wetland permits from applicable federal and state agencies prior to construction.

Construction would result in temporary impacts and, in a few situations, minor changes in plant species composition. The temporary impacts include: loss of wetland vegetation and wildlife habitat as a result of clearing and other construction activities; soil disturbance associated with clearing, trenching, and equipment traffic; and increases in turbidity and alterations of hydrology as the result of trenching, dewatering, and soil stockpiling activities.

Approximately 23.8 acres of PEM wetland, 0.2 acres of PSS wetland, and 1.6 acres of PUB wetland would be temporarily affected by construction of the Project (Table 4-5). Crocker anticipates no long-term impacts to emergent wetlands. The wetlands would be restored to pre-construction conditions, and the herbaceous vegetation would be allowed to vegetate naturally in these areas. Temporary impacts may also result from construction matting to access certain locations.

Approximately 0.2 acres of PSS wetland would be cleared and temporarily disturbed during construction of the Project. The impacts to scrub-shrub wetlands and forested wetlands would be of a longer duration than emergent wetlands because the woody vegetation would require a longer time to reestablish in the construction workspace after restoration.

Table 4-5: Summary of Impacts to Wetlands in the Project Area

Source	Wetland Type	Project Overall		Grassland Easement		Wetland Basin
		Perm Impacts (acres)	Temp Impacts (acres)	Perm Impacts (acres)	Temp Impacts (acres)	Temp Impacts (acres)
Wind Farm Facility						
Delineated	PEM	0.2	23.7	<0.1	2.3	7.2
	PSS	0.0	0.2	0.0	0.0	0.0
	PUB	0.0	1.6	0.0	0.0	1.2
	Subtotal	**0.2**	**25.5**	**<0.1**	**2.3**	**8.4**
NWI	PEM	0.0	3.8	0.0	0.7	0.3
	Subtotal	**0.0**	**3.8**	**0.0**	**0.7**	**0.3**
Total		**0.2**	**29.3**	**<0.1**	**3.0**	**8.7**
Transmission Facility						
NWI[1]	PEM	0.0	0.1	0.0	0.1	0.0
	Subtotal	**0.0**	**0.1**	**0.0**	**0.1**	**0.0**
Total		**0.0**	**0.1**	**0.0**	**0.1**	**0.0**
Project Total		**0.2**	**29.4**	**<0.1**	**3.1**	**8.7**

[1] *There are no permanent or temporary impacts to delineated wetlands from the Transmission Facility*

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Turbines, step-up transformers, and meteorological towers will be constructed on higher elevation portions of the Project Area to maximize the wind resource, and as such, generally avoid direct impacts to wetlands in lower topographic positions. Similarly, because transmission structure spans will range from 400 feet to 1,000 feet, Crocker anticipates siting structures in upland areas only, avoiding any wetlands along the Transmission Line Route. Construction of these aboveground facilities would result in the permanent impact only 0.2 acres of wetlands.

The Project would permanently impact less than 0.1 acre of wetlands on grassland easements and temporarily impact 11.8 acres of wetlands on USFWS easements.

4.3.3.1 Mitigation Measures for Wetlands

The mitigation measures described in Section 4.3.2.1 would generally apply to wetlands, as well. Crocker will mitigate direct or indirect impacts to wetlands during construction and operation by protecting topsoil, minimizing soil erosion and protecting adjacent wetland resources. Practices may include containing excavated material, use of silt fences, protecting exposed soil, stabilizing restored material, and re-vegetating disturbed areas with non-invasive species. As described in Section 4.1.3, there will be no permanent impacts to wetland basins.

4.3.4 Impacts to Existing and Planned Water Rights

The Project will not appropriate from surface water, will not conduct permanent dewatering, or deep well injection, and water storage, reprocessing, or cooling for either construction or operation of the facilities. Water that will be required for dust control and potentially for the concrete batch plant will be obtained from municipal or other sources outside of the Project Area. Crocker will seek and comply with the conditions of the applicable permits.

A water supply well is required for the O&M Facility. Water usage at the O&M Facility will be similar to a household volume, or approximately 400 gallons per day (USEPA, 2016). Crocker will seek and comply with the conditions of the South Dakota Water Right Permit for the water well. In compliance with the Clark County Zoning Ordinance, a private wastewater treatment system that meets the requirements of the SDDENR would be installed for the O&M Facility.

Based on a review the SDDENR Well Completion Report databases (SDDENR, 2017c), there are 6 wells that are within 1,000 feet of proposed construction workspace or facilities; this includes wells that are outside the Project Area, but within 1,000 feet of Project components (Table 4-6). Because domestic water uses that do not exceed 25,920 gallons per day or a peak pump rate of 25 gallons per minute do not require a permit (SDDENR, 2017d); there may be additional water uses occurring in the Project Area that are not identified in the SDDENR databases. There are no known wells on USFWS easements.

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Table 4-6: Summary of Wells within 1,000 Feet of Project Facilities

Feature ID (FID)	Owner Name	Township, Range, Section	Well Depth (feet)	Use Type	Distance from Project in feet	Type of Facility Component
216	Jhones	118N, 58W, S5	24	Stock Well	8	Collector System
732	Hillcrest Colony	118N, 58W, S23	80	Irrigation	245	Crane Path
247	Hagen	119N, 57W, S31	425	Stock Well	268	Temporary Access Road
726	Hillcrest Colony	118N, 58W, S23	100	Plugged	350	Crane Path
489	Ragels	119N, 59W, S26	342	Domestic	358	Temporary Access Road
545	KXAB TV - Conde	119N, 59W, S23	370	Domestic	712	Temporary Access Road

Source: SDDENR, 2017c

Potential construction-related impacts to wells could include localized decreases in groundwater recharge rates through changes to overland water flow, contamination, decreased well yields, decreased water quality (such as increased turbidity or odor in the water), interference with well mechanics, or complete disruption of the well. These impacts could result from trenching, equipment traffic, or hazardous materials spills. However, Crocker does not anticipate impacting residential domestic wells because wind turbines will be setback a minimum of 3,960 feet from non-participating residences and 1,000 feet from participating residences. Excavation will occur between 4 to 6 feet and known wells are generally drilled deeper than 24 feet (see Table 4-6).

Potential impacts to surface water diversions identified as Location Notices would be similar to the impacts described for waterbodies in Section 4.3.2. Based on a review of SDDENR's Pending Applications to Appropriate Water and Future Use Reviews, there are no pending water right applications in Clark County (SDDENR, 2017e).

4.3.4.1 Mitigation Measures for Existing & Planned Water Rights

Temporary construction dewatering will be conducted in accordance with the General Permit for Temporary Discharge Activities (Permit No. SDG0700000) and Temporary Permit to Use Public Waters from the SDDENR and through the implementation of industry-accepted BMPs to minimize sediment withdrawal during dewatering activities and erosion and sediment release at the discharge point.

Regarding potential impacts to wells, in the case that water supply wells are located near potential construction dewatering locations, provisions would be made to ensure that an adequate supply of water is provided until construction dewatering activities have ceased.

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4.3.5 Impacts to Flood Storage

Clark County floodplains have not been mapped by FEMA. Although the federal government has not officially mapped floodplains in the county, it is unlikely the Project would impact floodplains. Wind turbines, transmission line structures, access roads, the O&M Facility, the Project substation, and interconnection switchyard will be located at higher elevations.

4.3.5.1 Mitigation Measures for Flood Storage

Any potential impacts to floodplains would be temporary in nature, and existing contours and elevations would be restored upon Project completion.

4.4 Air Quality and Climate

Section 5.4 of the PEIS describes potential impacts to ambient air quality and climate that could occur in the UGP Region from wind energy development. Potential impacts to air quality expected from this Project are within the type and range identified in the PEIS. Additionally, operation of the Project would meet an existing energy demand without adding any emissions.

4.4.1 Impacts to Air Quality

Please see PEIS for general information. There would be no direct air emissions from operating wind turbines, because no fossil fuels are combusted. Negligible amounts of dust, vehicle exhaust emissions, and combustion-related emissions from diesel emergency generators would occur during maintenance activities. These emissions would not cause exceedances of air quality standards or have any negative impacts to climate change. Operation of the Project substation and interconnection switchyard could produce minute amounts of ozone and nitrogen oxides emissions as a result of atmospheric interactions with the energized conductors. Impacts to ambient air quality from these minor emissions during operation would be negligible. The Project substation and interconnection switchyard would employ sulfur hexafluoride-filled circuit breakers. Sulfur hexafluoride is a GHG, and therefore, equipment leaks could contribute to air quality impacts. Equipment would undergo routine inspection and preventative maintenance to minimize such leaks, and if leaks did occur, the sulfur hexafluoride would be captured to prevent entering the atmosphere.

Wind power typically displaces generation from fossil fuel power plants, and as a direct result, reduces emissions of criteria pollutants, VOCs, GHGs, and HAPs (American Wind Energy Association [“AWEA”], 2016). Operation of a single 50- to 300-MW wind energy facility would result in avoided air emissions from electric power systems from 4 to 24 percent in South Dakota. Between 1.6 and 9.7 percent sulfur dioxide emissions; and 0.7 to 4.1 percent of nitrogen oxide emissions would be avoided. Note that this proposed Project is an up to 400 MW facility; therefore, the percent of avoided emissions are likely to be higher than those presented here. (Western and USFWS, 2015a).

4.4.1.1 Mitigation Measures for Air Quality

A general air quality permit may be required if a concrete batching plant is installed. Approval of the application typically takes up to 30 days. The permit will be obtained to construction.

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Construction and operation of the Project would not result in a violation to federal, state, or local air quality standards. Operation of the Project would not produce air emissions which would impact the ambient air quality. BMPs will be implemented during construction to suppress fugitive dust emissions to the extent practicable and equipment would undergo routine inspection and preventative maintenance to minimize such leaks, and if leaks did occur, the sulfur hexafluoride would be captured to prevent entering the atmosphere. The following mitigation measures will be implemented during construction and operation, as appropriate:

- Use surface access roads, on-site roads, and parking lots with aggregates or that maintain compacted soil conditions to reduce dust generation.
- Post and enforce lower speed limits on dirt and gravel access roads to minimize airborne fugitive dust.
- The application of dust palliatives will comply with federal, state, and local laws and regulations.
- Ensure that all pieces of heavy equipment meet emission standards specified in the State Code of Regulations.
- Stage construction activities to limit the area of disturbed soils exposed at any time.
- Water unpaved roads, disturbed areas (e.g., scraping, excavation, backfilling, grading, and compacting), and loose materials generated during Project activities as necessary to minimize fugitive dust generation.
- Install wind fences around disturbed areas if windborne dust is likely to impact sensitive areas beyond the site boundaries (e.g., nearby residences).
- Spray stockpiles of soils with water, cover with tarpaulins, and/or treat with appropriate dust suppressants, especially when high wind or storm conditions are likely. Vegetative plantings may also be used to limit dust generation for stockpiles that will be inactive for relatively long periods.
- Train workers to comply with speed limits, use good engineering practices, minimize the drop height of excavated materials, and minimize disturbed areas.
- Cover vehicles transporting loose materials when traveling on public roads, and keep loads sufficiently wet and below the freeboard of the truck to minimize wind dispersal.
- Clean (e.g., through street vacuum sweeping) visible trackout or runoff dirt from the construction site off public roadways.

4.5 Acoustic Environment – Impacts and Mitigation

Section 5.5 of the PEIS discusses the potential impacts to the acoustic environment resulting from wind energy projects in the UGP Region. The expected potential noise impacts of the proposed Project are within the type and range of impacts identified in the PEIS.

When in motion, the wind turbines emit audible sound. The level of this sound varies with the speed of the turbine and the distance of the listener from the turbine. Sound is generated primarily from aerodynamic flow around the blades and secondarily from the mechanical and

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electrical equipment in the nacelle. The most stringent noise restriction, as defined in the Clark County Zoning Ordinance is a 50 dBA, A-weighted sound pressure limit at the perimeter of the principal and accessory structures of existing off-site residences, businesses, and buildings owned and/or maintained by a government entity (Section 4.21.03(13)) (Clark County, 2014).

Crocker has conducted a preliminary noise assessment of the Project in accordance with ISO 9613-2, the international standard for modeling outdoor sound attenuation. The model was developed using a software program called Cadna-A to determine the sound levels at receptors within the Project Area. The monitoring methodologies and results are detailed in Appendix G. The Cadna-A acoustical analysis software is designed for evaluating environmental noise from stationary and mobile sources and was used to calculate the L_{EQ} for all four turbine models for each conceptual layout. Assuming that wind speeds are at the maximum sound power level wind speed for each turbine model and are constant for an entire one-hour period, the L_{EQ} calculated by Cadna-A was compared to the County.

The analysis accounted for all noise generating elements associated with the various proposed wind turbine types and conceptual layouts for the Project. It also accounts for uncertainty both from the turbine manufacturer and internal model error making for an overall conservative sound level estimate for the Project. All proposed wind turbines (noise sources) were modeled in Cadna-A and Project-related sound levels were calculated at 69 noise-sensitive receptors within the Project Area (Appendix G). Table 4-7 presents analysis results. The sound level assessment provided in Appendix G also includes a discussion on low frequency noise and infrasound from wind turbines and a brief summary of low frequency model results.

Table 4-7: Summary of Sound Level Assessment

Turbine Model		Residence Classification		
		dBA Levels at All Residences	dBA Levels at Participating	dBA Levels at Non-Participating
Vestas V110	Avg. L_{EQ} Modeled	40	44	36
	Max L_{EQ} Modeled	49	49	40
	Min L_{EQ} Modeled	30	33	30
GE 2.5-116	Avg. L_{EQ} Modeled	40	44	36
	Max L_{EQ} Modeled	49	49	40
	Min L_{EQ} Modeled	30	33	30
Gamesa 126	Avg. L_{EQ} Modeled	40	44	36
	Max L_{EQ} Modeled	50	50	41
	Min L_{EQ} Modeled	29	33	29
Vestas 136-3.45	Avg. L_{EQ} Modeled	39	43	35
	Max L_{EQ} Modeled	48	48	40
	Min L_{EQ} Modeled	29	32	29

The maximum calculated noise level, based on assumptions incorporated into the Cadna-A model and the turbine layout, results in a 50 dBA L_{EQ} at the nearest noise-sensitive receptor, a participating residence. All non-participating residences are projected at 41 dBA or less. Average Project-related sound pressure levels at residences for all turbine models range from 39 to 40

dBA, on an hourly L_{EQ} basis. As depicted in the multi-turbine constraint maps, all proposed turbine models comply with Clark County noise guidelines (50 dBA) at residential receptors.

Since sound levels are anticipated to be at or below 50 dBA at residences, Crocker does not anticipate that noise mitigation will be necessary. However, Crocker will establish a process for documenting, investigating, evaluating, and resolving Project-related noise complaints. With respect to the short-term construction-related noise, mitigation measures will include maintaining all equipment in good working order in accordance with manufacturer specifications (e.g., suitable mufflers and/or air-inlet silencers will be installed on all internal combustion engines and certain compressor components); and enforcing speed limits for all vehicles and construction equipment traveling within and around the Project Area.

4.6 Ecological Resources

Direct and indirect impacts to ecological resources from wind energy development are discussed in detail in Section 5.6 of the PEIS. Potential impacts to ecological resources expected from the Project are within the type and range of impacts identified in the PEIS.

4.6.1 Impacts to Vegetation

The primary direct impact from construction of Project would be the cutting, clearing, and removal of existing vegetation within the construction workspace. The degree of impact would depend on the type and amount of vegetation affected, the rate at which the vegetation would regenerate after construction, and whether periodic vegetation maintenance would be conducted during operation. There will be direct effect of a local reduction in available wildlife habitat where vegetation is permanently removed.

Secondary effects from disturbances to vegetation could include increased soil erosion, increased potential for the introduction and establishment of invasive and noxious weed species, habitat fragmentation and edge effects, and a local reduction in available wildlife habitat. Other potential effects on vegetation could include the contamination of soils from spills or leaks of fuels, lubricants, and coolants from construction equipment, and dust cloud effects that could reduce survivability of vegetation adjacent to the construction workspace.

Table 4-8 identifies the acreages of USGS (2011) GAP ecological systems that would be directly affected by construction and operation of the Project. Overall, 80 percent of the Project's construction and operations-related impacts would occur in vegetation types that have experienced prior disturbance or alteration, including Agricultural Vegetation, Developed and Other Human Uses, and Introduced and Semi Natural Vegetation classes. Additionally, based on field surveys of the proposed construction workspace, Shrubland and Grassland ecological systems that would be impacted by the proposed Project also have experienced various levels of disturbance and degradation largely related livestock grazing (see Section 4.6.1.1).

Permanent impact acreages are where vegetation will be permanently removed and replaced by wind turbine foundations, meteorological towers, O&M Facility, Project substation,

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transmission poles, permanent access roads, and the switchyard. All temporary impact acreages will be restored following construction, and on easement will be revegetated.

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Table 4-8: Summary of Wind Farm Facility and Transmission Facility Impacts to Ecological Systems

Class	Ecological System	Project Overall		Grassland Easement		Wetland Basin
		Perm Impacts (acres)	Temp Impacts (acres)	Perm Impacts (acres)	Temp Impacts (acres)	Temp Impacts (acres)
Wind Farm Facility						
Agricultural Vegetation	Pasture/Hay	68.2	843.4	8.2	129.1	7.7
	Cultivated Cropland	30.9	326.6	0.1	0.8	2.3
	Managed Tree Plantation	0.1	0.7	0.0	0.0	0.0
	Agricultural Vegetation Subtotal	**99.2**	**327.3**	**8.3**	**129.7**	**10.0**
Shrubland and Grassland	Central Tallgrass Prairie	25.2	357.8	3.5	62.7	1.9
	Great Plains Prairie Pothole (wetlands)	0.0	0.9	0.0	<0.1	<0.1
	North-Central Interior Sand and Gravel Tallgrass Prairie	0.0	0.1	0.0	0.0	0.0
	Shrubland and Grassland Subtotal	**25.2**	**358.8**	**3.5**	**62.8**	**1.9**
Introduced and Semi Natural Vegetation	Introduced Upland Vegetation – Perennial Grassland and Forbland	11.6	203.9	1.7	45.9	1.0
	Introduced and Semi Natural Vegetation Subtotal	**11.6**	**203.9**	**1.7**	**45.9**	**1.0**
Open Water	Open Water (Fresh) (Waterbody)	0.0	1.4	0.0	0.1	<0.1
	Open Water Subtotal	**0.0**	**1.4**	**1.7**		**<0.1**
Developed and Other Human Use	Developed, Open Space	4.1	42.3	1.6	9.5	<0.1
	Developed, Low Intensity	<0.1	0.1	<0.1	0.1	<0.1
	Developed and Other Human Use Subtotal	**4.1**	**42.4**	**1.6**	**9.6**	**<0.1**
Forest and Woodland	North-Central Interior Dry Oak Forest and Woodland	<0.1	0.5	0.0	0.0	<0.1
	Forest and Woodland Subtotal	**<0.1**	**0.5**	**0.0**	**0.0**	**<0.1**

Table 4-8: Summary of Wind Farm Facility and Transmission Facility Impacts to Ecological Systems

Class	Ecological System	Project Overall		Grassland Easement		Wetland Basin
		Perm Impacts (acres)	Temp Impacts (acres)	Perm Impacts (acres)	Temp Impacts (acres)	Temp Impacts (acres)
Wind Farm Facility Subtotal		**140.1**	**1,777.8**	**15.1**	**248.3**	**13.0**
Transmission Facility						
Agricultural Vegetation	Pasture/Hay	3.3	21.4	<0.1	6.3	0.0
	Cultivated Cropland	0.0	1.7	0.0	0.0	0.0
	Agricultural Vegetation Subtotal	**3.3**	**23.1**	**<0.1**	**6.3**	**0.0**
Shrubland and Grassland	Central Tallgrass Prairie	2.0	6.7	0.0	0.5	0.0
	Shrubland and Grassland Subtotal	**2.0**	**6.7**	**0.0**	**0.5**	**0.0**
Introduced and Semi Natural Vegetation	Introduced Upland Vegetation – Perennial Grassland and Forbland	11.1	14.9	<0.1	5.0	0.1
	Introduced and Semi Natural Vegetation Subtotal	**11.1**	**43.0**	**<0.1**	**5.0**	**0.1**
Open Water	Open Water (Fresh) (Waterbody)	0.0	0.7	0.0	0.0	0.3
	Open Water Subtotal	**0.0**	**0.7**	**0.0**	**0.0**	**0.3**
Developed and Other Human Use	Developed, Open Space	0.7	8.8	0.0	0.5	0.0
	Developed, Low Intensity	0.0	<0.1	0.0	0.0	0.0
	Developed and Other Human Use Subtotal	**0.7**	**8.8**	**0.0**	**0.5**	**0.0**
Forest and Woodland	North-Central Interior Dry Oak Forest and Woodland	0.0	0.1	0.0	0.0	0.0
	Forest and Woodland Subtotal	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**
Transmission Facility Subtotal		**17.0**	**54.2**	**<0.1**	**12.3**	**0.4**
Project Total		**157.1**	**1,832.1**	**15.1**	**260.2**	**13.4**

The Project will permanently impact 15.1 acres on USFWS easements, more than half of which are to Agricultural Vegetation (8.3 acres or 55 percent). The Project's remaining permanent impacts are 3.5 acres of Central Tallgrass Prairie, 1.7 acres of Introduced and Semi Natural Vegetation, and 1.6 acres of Developed Land on grassland easements. Similarly, temporary impacts on USFWS easements are predominantly Agricultural (53 percent), followed by Central Tallgrass Prairie (23.7 percent) and Introduced and Semi Natural Vegetation (19 percent). Both temporary and permanent impacts to Central Tallgrass Prairie are predominantly along existing habitat edges where Crocker has attempted to collocate with existing disturbance to avoid further fragmentation.

4.6.1.1 Shrubland and Grassland

As described in Table 4-8, disturbance to grassland easement from construction activities total 275.3 acres (206.2 acres of temporary disturbance; 15.1 acres of permanent disturbance) of 5,473 total grassland easement acreage in the Project area or 5 percent.

The impacts to potentially undisturbed grassland based on the Bauman et al. (2016) data is presented separately in Table 4-9. The SDSU data (Bauman et al., 2016) indicate that 832.1 acres of potentially undisturbed grassland (out of 13,260 acres in the Project Area or 6.3 percent) would be temporarily and/or permanently impacted by the Project. To further characterize the state of the potentially undisturbed grassland impacted by the Project, we intersected the SDSU data with the Tetra Tech Vegetation Community Quality Classification (described in Section 3.6.1.1; Table 3-12), which describes intensity of current land use, species diversity, and native versus non-native species composition based on field verification. By intersecting these data sets, we can more accurately characterize the historic and current land uses, and the quality of the vegetation communities that would be impacted by the Project. There are three meteorological towers and 47 turbines placed on potentially undisturbed grasslands.

Tetra Tech surveys indicate that of the 832.1 acres of potentially disturbed grassland surveyed, 42 percent (351.6 acres) is low quality, meaning it is heavily disturbed or grazed with low species diversity and dominated by non-native species. An additional 52 percent (435.2 acres) is of moderate quality, in a state of moderate disturbance with moderate species diversity and mixture of native and non-native dominant plant species. Less than 1 percent (0.1 acre) of the potentially undisturbed grassland that would be impacted by the Project is high quality grassland; this would be impacted temporarily during the installation of the collector system. Approximately 5 percent (45.3 acres) of potentially undisturbed grassland that would be impacted by the proposed Project have not been field verified.

Similarly, on USFWS easements, the Project will not impact any high quality undisturbed grasslands. Most impacts, 83 percent of permanent impacts and 74 percent of temporary impacts on USFWS easements, will be to areas designated as low quality. The remaining impacts will be to areas designated as moderate quality.

Disturbance of native prairie, defined as unplowed (undisturbed) plant communities or go-back prairie would be considered a permanent adverse impact, and irreversible change extending beyond the life of the Project. Topsoil is one of the most important resources in a functioning

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native prairie ecosystem. Topsoil requires an extensive amount of time to develop, contains the seed bank of native prairie vegetation species, organic material, essential nutrients, and micro-flora and fauna required to promote growth of specially-adapted prairie vegetation. Once the topsoil is disturbed, it becomes subject to erosion, pulverization, and compaction, and is difficult if not impossible to restore to previous conditions (Neville, 2003). Based on the Tetra Tech surveys completed to date, there is only 0.1 acre of high quality native prairie dominated by native species that would be impacted by the Project (Table 4-9).

The remaining 832.0 acres of potentially undisturbed grassland is degraded prairie, dominated by non-native or a mixture of native and non-native species. Clearing of degraded prairie, non-native grassland, or other herbaceous vegetation during construction is anticipated to result in a short-term impact to vegetation. Active revegetation measures and rapid colonization by annual and perennial herbaceous species in the disturbed areas would restore most vegetation cover within the first growing season.

4.6.1.1 Forest and Woodland

Crocker has avoided impacts to 99.6 percent of the Forest and Woodland ecological systems in the Project Area. There are no impacts to Forest and Woodland on USFWS easements. Forested vegetation would be removed for the construction of access road, collector system, wind turbine workspace, and transmission corridor. Woody shrubs and trees would be allowed to recolonize the temporary workspace. Woody vegetation would also be allowed to regenerate where improvements were made to temporary access roads. However, recolonization of disturbed areas by woody shrubs and trees would be slower than recolonization by herbaceous species. As natural succession is allowed to proceed in these areas, the early successional or forested communities present before construction would eventually reestablish.

During Project operations woody vegetation may be periodically removed from along the collector system corridor to prevent the roots from interfering with the system. Similarly, forested vegetation along the transmission line corridor would be trimmed and removed as needed to avoid interruption of service. Therefore, based on the USGS (2011) GAP data, the Project would permanently impact 0.3 acres of North-Central Interior Dry Oak Forest and Woodland (0.2 acres within the Wind Farm Facility, and 0.1 acres along Transmission Line Facility), and 0.2 acres impacted during construction would be allowed to regenerate.

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Table 4-9: Summary of Wind Farm Facility and Transmission Facility Impacts to Potentially Undisturbed Grasslands

Tetra Tech Quality Class [1]	Project Overall		Grassland Easements		Wetland Basins
	Perm Impacts (acres)	Temp Impacts (acres)	Perm Impacts (acres)	Temp Impacts (acres)	Temp Impacts (acres)
Wind Farm Facility					
Low	20.6	316.5	10.5	174.5	4.0
Moderate	24.2	401.5	2.2	61.2	3.1
High	0.0	0.1	0.0	0.0	0.0
Unsurveyed	4.4	34.2	0.0	0.0	0.0
Wind Farm Facility Subtotal	**49.2**	**752.3**	**12.7**	**235.7**	**7.1**
Transmission Facility					
Low	<0.1	14.5	<0.1	3.5	0.4
Moderate	0.1	9.3	0.0	0.0	0.0
High	0.0	0.0	0.0	0.0	0.0
Unsurveyed	<0.1	6.6	0.0	0.0	0.0
Transmission Facility Subtotal	**0.2**	**30.5**	**<0.1**	**3.5**	**0.4**
Total	**49.4**	**782.8**	**12.7**	**239.2**	**7.5**

[1] *Tetra Tech Quality Class descriptions are as follows:*
Low = heavily disturbed/grazed, low diversity, dominated by non-native species
Moderate = moderately disturbed/grazed, moderate diversity, mixture of native and non-native dominant species
High = minimally disturbed/lightly grazed, moderate to high diversity, dominated by native species

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4.6.1.2 Mitigation Measures for Vegetation

Crocker has done some redesign of the site layout to avoid impacts to some high-quality prairie communities, and to realign linear corridors, such as the access roads, collector system, crane pathways, and transmission lines to follow existing disturbed corridors (e.g., roads, transmission lines, fence rows) to reduce fragmentation. will initiate restoration of disturbed soils and vegetation as soon as possible after construction activities are completed. Crocker will restore areas of disturbed soil using weed-free native grasses, forbs, and shrubs, in consultation with land managers and appropriate agencies. Tame grass mixes with no forbs will not be used. The following measures will be used to further avoid and minimize potential impacts to vegetation during siting, construction, and operation to the extent practicable:

- Use existing roads to the maximum extent feasible to access Project Area.
- Minimize the size of areas in which soil would be disturbed or vegetation would be removed.
- Reduce habitat disturbance by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas.
- Construction debris will be removed from the site.
- Disturbed areas will be minimized, and silt fence will be installed at the downgradient edge of disturbed area, prior to disturbance, to limit sediment flow and pollution to natural areas outside the construction zone.
- ECDs must be maintained in effective operating condition until final stabilization of the Project site is complete.
- Regularly inspect access roads, utility and transmission line corridors, and tower site areas for damage from erosion, washouts, and rutting. Initiate corrective measures immediately upon evidence of damage.
- Begin soil stabilization measures by the following work day whenever earth-disturbing activities have permanently or temporarily ceased.
- Initiate restoration of disturbed soils and vegetation as soon as possible after construction activities are complete. Restore areas of disturbed soil using weed-free native grasses and forbs in consultation with land managers and appropriate agencies.
- Vegetative stabilization of the site must provide 70 percent or more of the density of coverage that was provided by vegetation prior to construction activities, provide perennial vegetative coverage, and eliminate the presence of invasive species.
- Access roads, utility and transmission line corridors, and tower site will be monitored regularly for the establishment of invasive species, and weed control measures will be initiated immediately upon evidence of the introduction of invasive species.

Shrubland and Grassland

Crocker has designed the site layout to avoid impacts to high quality native prairie communities within the Project Area by shifting turbine and associated infrastructure

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locations, and collocating infrastructure with existing disturbances (e.g., farm roads, utility corridors). Grasslands would be restored following construction. Crocker would enhance these habitats by developing and implementing a Noxious and Invasive Weed Management Plan which would eradicate invasive species within the construction workspace, and control noxious and invasive weeds within the permanent right-of-way for the life of the Project. Where forbs are present weed control will be mechanical, not chemical. As a Special Use Permit requirement, Crocker will monitor the restoration and provide follow up activities to assure revegetation.

Forest and Woodland

As described in Section 4.6.1.2, woody vegetation would be allowed to regenerate within the temporary workspace (0.3 acres), but may be periodically trimmed or removed from the remaining 0.3 acres along the collector system and transmission corridor.

Noxious and Invasive Weeds (Introduced and Semi Natural Vegetation)

Crocker will develop and implement a Noxious and Invasive Weed Management Plan that will identify and establish the procedures to prevent the introduction and spread of noxious and invasive weeds during construction and ongoing operations. During restoration, Crocker will utilize seed mixes free of noxious and invasive weeds. Crocker will coordinate with SDGFP, USFWS, USDA NRCS, and landowners on seed mixes to be used during restoration. Crocker will monitor the restorations and assure they revegetate. Therefore, the Project may have a beneficial impact in the Project Area by reducing and controlling the spread of noxious and invasive species that is already present.

4.6.2 Impacts to Wildlife

Construction would have direct and indirect, and short-term to permanent impacts to wildlife resources. Direct impacts to wildlife habitat, whether by vegetation removal, conversion of one habitat type to another, alteration of key components, or degradation due to proximity of disturbances, also indirectly affect wildlife populations. Indirect impacts to wildlife may include avoidance of previously used areas. The severity of impacts would depend on factors such as the sensitivity of the species impacted; seasonal use patterns, type, and timing of construction and operation activities; and physical parameters (e.g., topography, cover, forage, climate). It is important to note that the impacts described in this section, except where noted, apply to more common wildlife species and habitat found in the Project Area. Potential impacts to more sensitive wildlife resources, including federally and state-listed species are discussed in Sections 4.6.4 and 4.6.5. Most of the species on the list of conservation concern are grassland dependent, so it should be noted that most of the permanent loss will be to grass habitat (pasture/hayland and native grasslands). Impacts to wildlife on USFWS conservation easements would be the same as the impacts described below in the Project Area.

Construction of the Project would temporarily affect 1,450.4 acres of wildlife habitat. On USFWS easements, construction activities would temporary affect 260.1 acres of wildlife habitat. These calculations remove cultivated cropland and developed and other human uses from the vegetation impacts total; although cultivated cropland may be used as foraging or

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nesting ground for some species, it is regularly disturbed. Furthermore, open water is not considered in this calculation, but impacts to aquatic habitat are discussed in Section 4.6.3.

The impact of the Project to wildlife species and their habitats would vary depending on the habitat requirements of each species and the existing habitat present within the Project Area. Direct impacts from construction could include the displacement of wildlife and direct mortality of some individuals, such as incubating birds, their eggs, and nestlings; small mammals; invertebrates, including their eggs and larvae; and slow-moving reptiles and amphibians, including their eggs. Larger or more mobile wildlife, such as adult bats, birds, and large mammals, could leave the vicinity of the Project Area during construction activities. The influx and increased density of animals in nearby undisturbed areas could also reduce the reproductive success of animals that are not displaced by construction, and increase the risk of predation in the area. These effects would diminish after construction, and some wildlife could return to the newly disturbed areas and adjacent, undisturbed habitats after restoration is completed (Western and USFWS, 2015a).

The cutting, clearing, and/or removal of existing vegetation would also affect wildlife by reducing the amount of available cover, nesting, and foraging habitat. The degree of impact would depend on the type of habitat affected and the rate at which vegetation regenerates after construction. Grassland habitats would be restored to a structural condition similar to preconstruction in a relatively short period of time (i.e., 3 to 5 years). Forested habitat and native prairie, however, could take up to 30 years or longer to recover.

Most adequately-mobile wildlife that would be displaced by construction would likely relocate to similar adjacent habitats; however, some individuals may not be able to relocate to suitable habitat due to a lack of adequate territorial space, or inter- and intra-specific competition, which could result in lower reproductive success, and lower survival success. Impacts to habitat would generally be short-term for species that utilize previously disturbed prairie, non-native grassland, and other herbaceous habitats. Blankespoor (1980) (as cited in Johnson, 1995) found that restored grassland prairies in South Dakota supported breeding populations of grasshopper sparrows, dickcissels, common yellowthroats, and other species 2 to 4 years after planting. Impacts may be long-term to permanent for species that utilize forested and native (undisturbed) prairie habitats. Restoration of forested areas can require decades for tree growth and maturity, and native prairie may require several decades or more to reestablish the topsoil layer (Section 4.6.1.1). Upon successful restoration, some wildlife would be expected to return and colonize herbaceous and agricultural habitats that were affected by construction and restored back to their preconstruction condition (Western and USFWS, 2015a). Grassland bird species richness is significantly higher in native sod prairies than in planted cover types (Bakker and Higgins, 2009).

Constructing the Project may result in mortality of displaced animals, particularly less mobile animals such as small mammals, incubating and nestling birds, reptiles, amphibians, and invertebrates which may be unable to escape the immediate construction area; and disruption of bird courting, breeding, or nesting behaviors on and adjacent to construction work areas. Direct mortality from vehicle collisions could also occur along access roads, especially in wildlife concentration areas or travel corridors. Amphibians are vulnerable to road mortality when they migrate between wetland and upland habitats; reptiles are vulnerable because the use roads for thermal cooling and heating.

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During excavation and trenching activities for the wind turbines or collector and communication systems, there is potential for wildlife to be injured or killed by falling into or being trapped in the open trench.

Construction of the permanent aboveground facilities would permanently impact 121.5 acres of wildlife habitat; this habitat would not be allowed to regenerate after construction. This includes 13.4 acres of permanent wildlife habitat impacts on USFWS grassland easements (see Table 4-8).

Operation of the wind energy facility could disrupt movements of terrestrial wildlife, particularly during migration. Herd animals, such as deer could be affected if linear rows of turbines intersect migration paths between winter and summer ranges (National Wind Coordinating Committee, 2002).

Robling (2011, as cited in SDGFP, 2017c) found that white-tailed deer in Clark County, South Dakota generally demonstrate shorter migration distances relative to other regions of South Dakota due to the high abundance of suitable habitat. Based on the abundance of suitable habitat in the Project Area and non-linear nature of the wind turbine layout, impacts to white-tailed deer are anticipated to be negligible. Mule deer and pronghorn antelope are rare in eastern South Dakota, and therefore impacts would not be anticipated.

Ground squirrels have displayed altered behavior near wind turbines, perhaps due to the noise generated by the turbines (Illinois Department of Natural Resources, 2007).

Herd animals may also demonstrate some avoidance of access roads. The zone of influence on each side of a road for deer has been reported to be 984 ft. (300 m) for motorized trails and closed roads that are open to all-terrain vehicles, 2,950 ft. (900 m) for roads with up to 1 vehicle per 12 hr., 3,280 ft. (1,000 m) for roads with more than 2 to 4 vehicles per 12 hr., and 4,265 ft. (1,300 m) for roads with more than 4 vehicles per 12 hr. (Gaines et al., 2003).

Impacts to birds and bat species are generally the primary concern associated with the construction and operation of wind energy facilities and associated transmission lines. Construction and operation of the Project may result in impacts to grassland birds, as further outlined below. These impacts may be direct, such as those resulting from collision into meteorological towers or wind turbines during operations, or habitat loss, or indirect, including impacts that may result from displacement, avoidance, habitat degradation, or fragmentation. Impacts due to Project construction and operations on bats are expected to be minimal, based on Project-specific survey results and habitat near the Project. The sections below further describe potential impacts to birds and bats with the potential to occur in the Project Area based on recently published research and Project-specific survey results.

4.6.2.1 Birds

Birds may be impacted directly or indirectly as a result of the construction and operation of wind facilities as further described below. Direct impacts may result from collision with operating turbines and from the construction of the Project. Indirect impacts to birds are anticipated to occur through displacement or avoidance of habitat, habitat fragmentation, and edge effects.

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FATALITY – Tower Collision -Studies conducted at other wind energy facilities in the Midwest can be instructive and provide useful comparisons. The purpose of these post-construction studies was to estimate the avian fatality rates. The results summarize post-construction fatality patterns for birds, including waterfowl and grassland birds, at wind energy facilities in North Dakota, South Dakota, and western Minnesota (Figure 20).

- Post-construction mortality monitoring at PrairieWinds ND1 near Minot, North Dakota in 2010 and 2011 found waterfowl mortality per MW to be 0.38 and 0.44, respectively (Derby et al., 2011, 2012a). The Project is in a dense complex of wetlands.
- PrairieWinds SD1 near Crow Lake, South Dakota is located in prairie pothole wetland habitat. Post-construction mortality surveys conducted in 2011-2012, 2012-2013, and 2013-2014 found bird mortality to be 0.45, 0.78, and 0.45 large birds/MW/year, respectively (Derby et al., 2012a, 2012b, 2013, 2014). Estimates for waterfowl fatalities were not calculated; but fewer waterfowl/waterbirds were documented during searches.
- Surveys of spring mortality conducted in 2013 and 2014 at Tatanka Wind Farm in North and South Dakota found waterfowl mortality to be 0.79 birds/MW/study period (Graff, 2015). These studies were conducted in spring only; yearly mortality may be higher.
- Post-construction fatality monitoring was conducted at the Prairie Rose Wind Farm in Rock County, Minnesota during spring (April 15 to June 15) and fall (August 15 to October 31) in 2014 (Chodachek et al., 2015). Post-construction fatality estimates provided for Prairie Rose are defined per study period (i.e., 8 weeks during spring migration and 10 weeks during fall migration) and not extrapolated to per year. Post-construction fatality monitoring in 2014 estimated 0.44 birds/MW/study period.
- Post-construction fatality estimates in 2013 at the Big Blue, Grand Meadow, and Oak Glen Wind Farms in Minnesota were 0.40, 0.53, 0.51 birds/MW/study period (Chodachek et al., 2014). The study period was July through October.
- Studies at Buffalo Ridge Wind Resource Area ("WRA") in Minnesota in 2001 and 2002 (Johnson et al., 2002) estimated avian fatality, while also assessing impacts to grassland breeding birds. Avian mortality appeared to be low in the vicinity of the project area at nearby Buffalo Ridge WRA compared to other wind facilities in the U.S. Researchers found an overall avian mortality of 0.98 birds per turbine per year. Avian mortality was primarily related to nocturnal migrants. Resident bird mortality was very low and involved common species. The researchers stated that "based on the estimated number of birds that migrate through Buffalo Ridge each year, the number of wind plant related avian fatalities at Buffalo Ridge is likely inconsequential from a population standpoint" (Johnson et al., 2002).

In addition to the above post-construction mortality studies, Gue et al. (2013) assessed potential impacts of operating wind turbines on breeding waterfowl at the Tatanka Wind Farm and an adjacent reference site in the Missouri Coteau of the Prairie Pothole Region on the border of North Dakota and South Dakota. The researchers documented one collision among 77 radio-tagged female mallards and no collisions among of 88 radio-tagged blue-winged teals during the 2009 and 2010 nesting seasons. In comparison, 8 female mallards and 15 female blue-winged teal were killed by predators during the same time period. Gue et al. (2013) concluded that

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mortality for female mallards and blue-winged teal due to collision with wind turbines was likely a limited threat.

Most avian fatalities due to wind turbines are small passerines, about 60 percent of avian fatalities in publicly available reports in the U.S. Furthermore, small birds may have lower detection rates so the actual percentage of fatalities due to small passerines is not known and may be greater than 60 percent. Fatality rates of migratory passerines increase in the spring and fall during migration (American Wind Wildlife Institute [AWWI], 2017).

Overall, adjusted fatality rates for all bird species vary between 3 to 6 birds/MW/year for the majority of post-construction fatality studies (AWWI, 2017). Fatality estimates are relatively constant across the country except for in the Great Plains where there appears to be lower avian fatality rates and the Pacific region where there may be slightly higher fatality rates (AWWI, 2017). Based on the post-construction fatality studies outlined above, national averages for post-construction fatalities, and the AWWI's conclusions about geographic trends, Crocker anticipates that collision avian fatalities due to the Project will be below the national average and may result in limited localized impacts to some groups of birds, such as small passerines.

Transmission Line Collisions -Direct impacts to birds may also result from collisions with the transmission line and from electrocution. Mortality of birds from collision and electrocution due to transmission lines is well documented. The risk of collision is related primarily to specific behaviors; in particular, courtship displays, flushing, and aerial displays may increase the risk of collision because the birds are distracted. Risk is also increased if a powerline is between roosting, feeding, or nesting areas. Bird species with poor vision, that are young or less agile, or that are unfamiliar with the area may also be at increased risk of collision with transmission lines. Electrocutions typically result when a bird's wingspan is such that is equal to or greater than the distance between two energized and/or grounded components of a transmission line (Avian Power Line Interaction Committee ["APLIC"], 2012).

Construction - In addition birds may also be directly impacted if clearing and construction of the Project occurs during their nesting season. Direct impacts to birds may occur during construction because of the vulnerability of eggs, chicks, and active nests during the nesting season. Crocker does not anticipate direct impacts to sharp-tailed grouse and greater prairie-chicken leks due to the absence of leks within the Project Area.

INDIRECT EFFECT - Recent research suggests that migratory birds may also be indirectly affected by wind turbines due to displacement and habitat fragmentation. Research results show impacts will differ by year, species, site, and distance from turbines.

Avoidance - In its report "Wind Turbine Interactions with Wildlife and Their Habitats - A Summary of Research Results and Priority Questions" (June 2017), the AWWI summarizes information that is publicly available regarding impacts to wildlife from land-based wind facilities, focusing on research from peer-reviewed journals and publicly available reports that have received technical review from experts. In their 2017 report, the AWWI concluded that indirect impacts to birds from operating wind turbines due to displacement have been documented in a subset of the species studied, but AWWI further noted that these impacts have not been found consistently across studies. The following studies on the potential impacts of

wind turbines on grassland nesting birds illustrate that indirect impacts to grassland nesting birds due to displacement vary across years, species, sites, and distance from turbines:

- Hale et al. (2014) found no evidence that breeding grassland birds were indirectly impacted within 500 to 750 m of wind turbines in the southern Great Plains. These researchers cautioned that research results related to displacement due to turbines may be correlated to other factors such as occurrence of fences, which birds may also avoid (Hale et al. 2014). Johnson (2016) commented that Hale et al. (2014) used inappropriate statistics to analyze the data and that the data from Hale et al. (2016) showed that two of three species studied were potentially displaced. Hale (2016) in turn disagreed with Johnson's (2016) perspective on statistics and his interpretation of the data; she reiterated that research focused on potential displacement effects on grassland birds due to turbines would need to separate turbine effects from other related factors.
- Shaffer and Johnson (2009) showed displacement up to 200 m from turbines for clay-colored sparrow and grasshopper sparrow at two wind facilities in the Great Plains. They found no indirect impacts to chestnut-collared longspur, western meadowlark, and killdeer. Killdeer appeared to be attracted to the areas surrounding the turbines. In personal communication Shaffer indicated this study is included in the 2016 Conservation Biology paper.
- Leddy et al. (1999) assessed the densities of grassland birds on Conservation Reserve Project lands with and without turbines. These researchers observed displacement effects on grasslands within 80 m of turbines, compared to grasslands greater than 180 m from turbines or Conservation Reserve Program lands without turbines.
- Research by Young et al. (2006) at the Combine Hills Turbine Ranch in Oregon suggested that there was a relatively minor impact due to displacement from turbines to other factors that impact grassland nesting birds. Among the species studied, the western meadowlark showed a significant decrease in use near turbine locations after construction. Overall, the authors indicated that other factors may have a greater effect on grassland nesting birds than turbines, such as vegetation type.
- At the Stateline Wind Project in Oregon and Washington, Erickson et al. (2004) showed that use of breeding grassland passerines declined in the first 50-m sub-segment, but was similar in the other sub-segments. Specifically, western meadowlarks and grasshopper sparrows had decreased use within the first 50 m of the turbines, but sample sizes for grasshopper sparrows were very low. Overall, Erickson et al. (2004) concluded that the initial results of this research suggested a relatively minor effect on grassland passerines due to displacement.
- In a post-construction study by Johnson et al. (2000b) at the Buffalo Ridge WRA, 7 of 22 species of grassland nesting birds showed some decrease in use in proximity to turbines, primarily within 100 m of the turbines. The authors concluded that declines in use related to wind facilities were relatively minor; they predicted that declines due to these indirect effects would not have an impact on regional populations.

Strickland in 2004 found studies in the western and Midwestern U.S. consistently showed some small-scale impacts due to avoidance, noting there was still much uncertainty regarding the

extent of indirect impact. Additional research is needed to determine if grassland species will habituate to the turbines over time (AWWI, 2017).

The USFWS Draft Midwest Wind Energy Multi-Species Habitat Conservation Plan (April 2016) concluded that wind facilities may displace some species of grassland birds locally (USFWS, 2016c).

In the 2016 Conservation Biology paper, Effects of wind-energy facilities on breeding grassland bird distributions, by Shaffer and Buhl, seven of nine species of grassland birds showed some displacement up to 300 meters of wind turbines. However, detection of statistical significance varied across species, sites, distances, and time periods. With the exception of the chestnut-collared longspur and grasshopper sparrow, results varied across sites, distances, and time periods. For the chestnut-collared longspur and grasshopper sparrow, there were significant delayed effects (but not immediate effects) up to 300 m at 3 of 3 sites for the sparrow and at 1 of 1 site for the longspur. Western meadowlark use showed a statistically significant decline at one site between 2-5 years after construction but no significant change at the other two sites. Delayed effects represent a sustained effect after the turbines have been in place for 2-5 years. For species such as the Grasshopper Sparrow, Western Meadowlark, Bobolink, and Chestnut-collared Longspur, the effects were usually greater in the 2-5-year time period than in the 1-year time period, indicating a sustained effect.

Indirect impacts due to displacement from wind turbines have also been studied in waterfowl. Loesch et al. (2013) studied changes in the breeding pair density of five species of waterfowl at two wind facilities in the Missouri Coteau of North Dakota and South Dakota. In their research, although densities were lower at 26 of 30 site-year combinations at sites with wind turbines, approximately 50 percent of the site-year combinations (16 out of 30) showed significant difference in breeding pair densities due to indirect impacts between the wind farm sites and reference sites. Negative impacts ranged from 0 to 58 percent. Mallards and Northern Pintails showed the most consistent negative impact (4 of 6 comparisons). The median decreases in proportional change for the 2 species that experienced the largest impact were 18 percent for blue-winged teal and 10 percent for mallard. This study site was in similar habitat as the project and was done over three years.

Fragmentation - Indirect impacts to grassland birds may also result from habitat fragmentation. Habitat fragmentation occurs when large contiguous habitat areas are separated into smaller-sized habitat patches (Johnson and Igl, 2001). Fragmentation occurs when roads are added to intact patches of grass. The impacts of habitat fragmentation can be divided into three categories: patch size, edge effects, and isolation (Johnson and Winter, 1999, as cited in Johnson and Igl, 2001). Impacts related to patch size may result in changes in habitat use and reproduction. Edge effects may include impacts related to increased competition, predation, and brood parasitism. Isolation effects generally relate to dispersal and habitat use as a function of distance among habitat (Johnson and Winter, 1999, as cited in Johnson and Igl, 2001; Johnson and Igl, 2001). Impacts to grassland birds from habitat fragmentation may not only affect distribution and abundance of birds but also demographics such as nesting success (Winter and Faaborg, 1999).

To quantify habitat fragmentation related to the construction of the Project, the “pre-construction scenario” of grassland habitat within the Project Area was compared to potential habitat

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fragmentation occurring with the installation of permanent Project components (e.g., turbines, O&M Facility, Project substation, permanent access roads, transmission line corridor, interconnection switchyard) following restoration of the temporary construction workspace in a "post-restoration scenario". Temporary workspace and buried components (e.g., collector and communication system, crane pathways) would be restored after construction and would not contribute to habitat fragmentation. We used a combination of land cover datasets to identify grassland habitat: the USGS (2011) GAP, USDA (2017) NASS, USGS (2016b) National Agricultural Imagery Program ("NAIP"), and the vegetation community data collected in the field by Tetra Tech within the environmental survey corridor.

We defined grassland habitat for this exercise to include the upland Shrubland and Grassland USGS (2011) GAP classes (Central Tallgrass Prairie, Eastern Great Plains Wet Meadow, Prairie, and Marsh, North-Central Interior Sand and Gravel Tallgrass Prairie North, North-Central Interior Oak Savanna, Northern Tallgrass Prairie, Northwestern Great Plains Mixed Grass Prairie), and the Introduced Upland Vegetation – Perennial Grassland and Forbland, and Pasture/Hay ecological systems found within the Project Area. Using USGS (2011) GAP as a base layer, GIS analysts corrected for potential inconsistencies by removing cultivated lands based on the USDA (2017) NASS layer and Tetra Tech ground-truthed data layer for the environmental survey corridor. GIS analysts also used the USGS (2016b) NAIP imagery and Tetra Tech field survey data to correct inconsistencies in the USGS (2011) GAP data where there was incomplete satellite coverage that resulted in pixelation. After the grasslands in the Project Area were defined, USGS (2016b) NAIP imagery was used to identify and digitize existing features in the Project Area that would have created edges; these included shelterbelts, treelines, and other areas of woody vegetation; lakes; woody wetlands (but not herbaceous wetlands); perennial streams; roads, buildings and other human structures and developments; railroads, and row-cropped agricultural lands. To avoid creating an artificial edge at the Project boundary, the Project Area was buffered by five miles and included the entire area of grassland patches that extended beyond the Project Area, delimiting the outside edge of the grassland patch by one of the edges listed above (e.g., woody vegetation, roads, row crops). GIS analysts then created the post-restoration scenario by merging the pre-construction scenario with permanent Project component footprints. Finally, the GIS analysts calculated the area of grassland patches in both the pre-restoration scenario and post-restoration and restoration scenario for comparison. The results of this analysis showed that average patch size of grasslands that are within or overlapping the Project Area decreased from 83.8 hectares (207.1 acres) to 68.4 hectares (168.9 acres) after Project construction and restoration. Figure 21 shows locations in the Project Area where there were changes in patch size classes between pre-construction and post-restoration scenarios based on the Jenks natural breaks classification method, a technique developed to minimize variance within categories and maximize variance among categories.

Research has suggested that many, but not all species of grassland birds, show area sensitivity (Helzer and Jelinski, 1999; Johnson and Igl 2001; NRCS, Undated). Helzer and Jelinski (1999) researched the impacts of habitat fragmentation on grassland birds near the central Platte River, Nebraska. In their study, the likelihood that the following six species of birds were present was inversely related to perimeter-area ratio: bobolink, grasshopper sparrow, dickcissel, red-winged blackbird, western meadowlark, and upland sandpiper; four of these species showed an inverse correlation with area only. The researchers concluded that a 50-hectare (123.5 acre) area or

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greater with ample interior and no edges maximized species richness. Another study that focused on habitat patch size in western Minnesota, North Dakota, South Dakota, and eastern Montana concluded that Conservation Reserve Program lands 16.2 hectares (40 acres) or larger would be of the greatest benefit to grassland birds (NRCS, Undated). Other grassland management guidance suggests that blocks of habitat 202.3 hectares (500 acres) or larger have the greatest likelihood of supporting a diversity of grassland species (NRCS, Undated). Overall, estimates of the size of habitat area needed by grassland birds varies substantially and can depend on the overall amount of grassland habitat available across the local landscape (NRCS, 1999). Furthermore, the effect of patch size on nest density in grassland birds may vary across species, regions, and years (Winter et al., 2006). In general, management actions that maximize not only the patch size but also the patch interconnectedness and quality will benefit grassland birds (NRCS, 1999).

Other studies present a broader view of fragmentation and its impact on wildlife. Bakker et al in 2002 reported in eastern South Dakota grasshopper sparrow, dickcissels and savannah sparrows all increased in abundance as grassland patch size increased. In another study four species were found to be area-sensitive, in that they were more abundant or occurred more frequently, or both, in larger patches (Davis 2004). These studies support larger tracts of grass support more birds and do not set a minimum size. Additionally, nest predation rates are significantly influenced by habitat fragmentation with predation lowest in tracts that are larger (Herkert et al. 2003).

Habitat Loss -Birds in the Project Area may also be impacted by habitat loss. As described in Table 4-8, 1,230.3 acres and 98.7 acres of shrubland and grassland and pasture/hay ecological systems will be temporarily and permanently impacted, respectively, due to the Project Approximately 27.5 acres and 0.2 acres of PEM wetlands will be temporarily and permanently impacted, respectively. No permanent impacts are anticipated to PSS or PUB wetlands; 0.2 acres of PSS and 1.6 acres of PUB wetlands will be temporarily impacted (Table 4-5).

On USFWS easements, 208.1 acres and 11.7 acres of shrubland and grassland and pasture/hay will be temporarily and permanently impacted, respectively, due to the Project (Table 4-8). Approximately 10.6 acres and less than 0.1 acre of PEM wetlands will be temporarily and permanently impacted on USFWS easements, respectively. Additionally, approximately 1.2 acres of PUB wetlands will be temporarily impacted (Table 4-5).

Overall, there is a moderate risk from the Project on birds related to collision. Given the relative diversity of passerine species documented at the Project, it is anticipated that the Project would result in direct impacts to passerines, likely spread out in relatively low numbers across multiple passerine species. The results of the first year of avian use surveys further indicate that risk to passerines may be higher in the spring and summer, and fatalities would likely include species common to both agricultural and grassland landscapes. There are no known raptor migration routes near the site. Due to the general low raptor use documented in the first year of avian use surveys and typical raptor mortality rates, it is unlikely that significant numbers of raptors would be killed in the Project Area.

Collision risk is generally low for waterfowl and waterbird species because studies and observations indicate that waterfowl and waterbirds can see and avoid turbines during flight. Given the data collected during the survey and the Project's location in the Prairie Pothole

Region, it appears that the Project will have higher use by waterfowl in spring, followed by summer; thus risk to these species may be higher during these seasons. Various studies show differing risk of direct impacts to waterfowl species, and it is possible that post-construction studies at the Project may show that waterfowl comprise a higher percentage of mortalities than at other locations in the Midwest in more agricultural settings. However, Gue et al. (2013) concluded that mortality for female mallards and blue-winged teal due to collision with wind turbines was likely a limited threat. In addition, in Graff (2015) which documented waterfowl as the primary avian fatality in spring migration, the rates (0.79 waterfowl/MW/spring) did not appear to approach levels that would affect populations. The risk to birds related to indirect impacts is anticipated to be low based on the above review of displacement impacts to birds and the calculations of habitat fragmentation due to the Project. Some species of grassland birds and waterfowl may show reductions in breeding densities near turbines, but this impact is not consistent across species, years, and distances.

4.6.2.2 Eagles

Bald eagles may be present year-round in the Project Area. In April 2016 and 2017, Crocker conducted an aerial eagle nest survey in accordance with guidelines provided in the ECPG (USFWS, 2013). In 2016, two active eagle nests were documented, and in 2017, four active nests and one unoccupied nest were documented. One of the eagle nests recorded as occupied in 2016 was also occupied in 2017, and the other eagle nest recorded as occupied in 2016 was inactive in 2017. The nearest bald eagle nest was approximately 3 miles north of the Project Area. The other nests ranged from 4.0 to 9.2 miles from the Project Area.

Based on these results, the inter-nest distance of the bald eagle nests observed is 16.6 miles. The ECPG states that eagle pairs at nests within one-half the mean inter-nest distance, in this case 8.3 miles, may be susceptible to disturbance take and blade strike mortality (USFWS, 2013). The Draft Midwest Wind Energy Multi-Species Habitat Conservation Plan (USFWS, 2016c) lists 1.6 miles as a turbine setback from bald eagle nests, with potential for turbines to be sited closer if evidence shows they are not located within higher use travel corridors.

Data from avian use surveys indicates relatively low use of the Project Area by bald eagles. Between April 2016 and November 2017, 16 bald eagles were recorded during 542 hours of survey for a combined total of 37 flight minutes, 25 of which met the criteria for risk model minutes (i.e., documented within the 800-m plot and below 200 m in height). In addition to the eagles documented during avian use surveys, bald eagles were observed at Reid Lake, 0.2 mile east of the Project Area, during their fall migration in 2017.

Golden eagles are less common in this area and may rarely be found during migration. No golden eagles have been observed during avian use surveys or incidentally during other survey efforts. Crocker will continue to monitor bald eagle use within the Project Area through March 2018 and evaluate the risk to eagles based on the data collected. Conservation measures described below would facilitate the avoidance and minimization of impacts to eagles.

Crocker believes there is a low level of risk for potential bald eagle mortality at the site. Crocker will consult with FWS regarding the need for a Eagle Conservation Plan Model following the completion of eagle use surveys in March 2018. The bald eagle is protected under the BGEPA,

and is a South Dakota SGCN. The Project occurs within the nesting, migration, and winter range of the bald eagle. There are four occupied bald eagle nests within 10 miles of the site as documented in the April 2017 eagle nest survey; no bald eagle nests are located within three miles of the Project Area. Bald eagles were documented using Reid Lake during fall migration in October, November, and early December 2017; however, increased eagle use within the Project Area during the migration was not documented based on avian use surveys.

4.6.2.3 Bats

Crocker conducted pre-construction acoustic surveys for bats in the Project Area from April 14 through October 27, 2016 using full-spectrum SM3 detectors. Throughout the survey period, paired ground and raised meteorological tower stations recorded a combined mean (± standard error) of 1.84 ± 0.22 bat passes per detector-night. Activity during the standardized fall migration period (July 30 – October 14) was 2.80 ± 0.42 bat passes per detector-night at stations. These rates are lower than the average rate of bat activity at most Midwest wind projects (7.29 bat passes per detector-night) and the national median rate (10.52 bat passes per detector-night), recorded by Hein, C. D. et al 2013a with undetermined detector type or 6.97 bat passes per detector-night in the Midwest and 7.68 nationally with Anabat units from WEST experience. Bat activity data collected using SM3 detectors is not directly comparable with activity data from the Anabat-derived studies. The full-spectrum SM3 were used because they have a greater detection distance and detects bats regardless of noise from insects and other sources (Adams, A. M. et al. 2012 and Solick, D. I. et al. 2011), it is assumed that the SM3 detectors would detect more bat calls than Anabat detectors. Therefore, the activity data collected by SM3 detectors provide a conservative risk assessment indicating low bat activity in the Project Area compared to the average rate for most Midwest wind projects and national median. Bat activity measured during pre-construction surveys may be positively correlated to post-construction fatalities, although few studies documenting pre-construction activity and documenting post-construction mortality are available for comparison.

The collision risk of bats in the Project Area may also be estimated using the post-construction fatality rates of wind farms that are located in northeastern South Dakota or southwestern Minnesota. Most of these sites occur in primarily row crop agricultural landscapes and may not be entirely comparable. They include Buffalo Ridge WRA, Buffalo Ridge II, Prairie Rose, Big Blue, Grand Meadow, and Oak Glen. Two sites that occur in mostly grassland landscapes include Wessington Springs and PrairieWinds SD1.

- Fatality estimates for PrairieWinds SD1 range from 1.05 to 1.23 bat fatalities/MW/year (Derby et al. 2012 and 2103). Bat mortalities at Wessington Springs ranged from .41 to 1.48 fatalities/MW/year (Derby et al. 2010 and 2011). If these rates were the same at Crocker it would equate to 82 to 296 fatalities per year.
- Post-construction bat mortality at the Buffalo Ridge WRA in 2001 and 2002 was 2.16 bats/turbine/year (Johnson et al., 2003). Approximately 82 percent of the bat mortality occurred from mid-July to the end of August. The researchers concluded that “both the bat detector and mist net data indicate there are relatively large breeding populations of bats in close proximity to the wind plant that experienced little to no wind plant related collision mortality” (Johnson et al., 2003). Instead, most bat mortality at Buffalo Ridge

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involved migrating bats. Researchers highlighted that bat mortality increased with reduced distance between turbines and wetlands or woodlands.

- The Buffalo Ridge II Wind Facility in Brookings County, South Dakota is located approximately 60 miles from the Project Area. Pre-construction studies estimated bat activity at 1.75 bats/detector-night. Fatality estimates based on post-construction monitoring were 2.81 bats/MW/year (Derby et al., 2012c).
- Post-construction fatality monitoring was conducted at the Prairie Rose Wind Farm in Rock County, Minnesota during spring (April 15 to June 15) and fall (August 15 to October 31) in 2014. Post-construction fatality estimates provided for Prairie Rose are defined per study period (i.e., 8 weeks during spring migration and 10 weeks during fall migration) and not extrapolated to per year. Post-construction fatality monitoring in 2014 estimate 0.41 bats/MW/2014 at the Prairie Rose Wind Farm in Rock County, Minnesota (Chodachek et al., 2015).
- Post-construction fatality monitoring in 2013 at the Big Blue, Grand Meadow, and Oak Glen Wind Farms in Minnesota in 2013 estimated the adjusted bat fatalities as 6.3, 3.1, and 3.1 bats/MW/year, respectively (Chodachek et al., 2014). Bat fatalities appeared to peak twice: in late July/early August and in late August/early September. Fatalities were primarily composed of migratory tree-roosting bats, including the eastern red bat and the hoary bat.

Based on the above data, the land cover types within the Project Area, and the similarity of species composition, the impact of the Project on bats is expected to be similar than the post-construction fatality rates at the above wind facilities. Tree-roosting bats that migrate including the hoary bat, silver-haired bat, and eastern red bat, which were detected during the Project's pre-construction studies, may have the highest risk of collision based on previous bat fatality studies (AWWI, 2017). In general, the fatality rate for bats is highest during fall migration (late summer and early fall) in the northern portion of the U.S. (AWWI, 2017). In South Dakota migration is figured as July 15 –September 30. Overall, there is potential for bat collisions with Project turbines, but those impacts will likely be concentrated during migration and nights with low wind speed. Conservation measures described below would avoid and minimize of impacts to bats due to collision.

Overall, risk of mortality to bats in the Project Area is likely to be greatest on nights during fall migration, when bat migration rates are the highest. During the fall migration, weather conditions that are most conducive to higher mortality rates occur with warm temperatures (greater than 50 degrees Fahrenheit) and low wind speeds (less than 6.5 m/s or 14mph) (Baerwald and Barclay, 2009; Arnett et al., 2011; Good et al., 2011; Cryan and Brown, 2007). In addition, risk is higher on the first night following the passage of a low-pressure system when the prevailing wind shifts from a southerly to a northerly direction (Cryan and Brown, 2007; Good et al., 2011).

Since little is known about migration of bats and the numbers that pass through many of these areas, estimates of <2 fatalities/MW that seem low could proportionally be more damaging overall if populations are low to begin with (Arnett et al., 2008). Combined with cumulative impacts of a growing number of wind farms and little known about population trends of most bat species, it is difficult to predict the future impacts to bats.

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4.6.2.4 Mitigation Measures for Wildlife

Crocker has worked with the USFWS and SDGFP to redesign some of the site layout to avoid impacts to some high-quality prairie habitat, and to realign linear corridors, such as the access roads, collector system, crane pathways, and transmission lines to follow existing disturbed corridors (e.g., roads, transmission lines, fence rows) in an effort to reduce fragmentation. Crocker will avoid clearing during the nesting season (March 1 to July 31) on grassland easements to the extent practicable.

Following construction, Crocker would restore and reseed all temporary construction workspaces, except for actively cultivated croplands, unless approved in writing by the landowner. Use of these areas would temporarily displace wildlife species; however, many displaced wildlife would return to these areas following restoration.

Crocker has also prepared a draft BBCS that will be implemented during construction and operation of the Project (Appendix A). This BBCS consists of Crocker's corporate standards for minimizing impacts to avian and bat species during construction and operation of wind energy projects. The BBCS has been developed to be consistent with the WEG (USFWS, 2012). It includes Crocker's commitments to wind farm siting and transmission route suitability assessments, construction practices and design standards, operational practices, permit compliance, and construction and operation worker training.

The SDGFP and USFWS PEIS guidance for NLEB further suggests during all times of the year, blades be prevented from rotating (i.e. apply braking system and feather blades) at wind speeds below the manufacturer's cut-in speeds and increase cut-in speed to 5.0 m/s during fall migration (beginning on 15 July to 30 September) (Arnett et al., 2013; Arnett et al., 2010; Baerwald et al., 2009) from 0.5 hours before sunset to 0.5 hours after sunrise. In addition, Crocker will implement the following mitigation measures to avoid or minimize potential impacts to wildlife in the Project Area during Project construction, operation, and decommissioning. Crocker continues to consult with the USFWS and SDGFP regarding appropriate mitigation measures for wildlife impacts.

Construction:

- Minimize the size of areas in which soil is disturbed or vegetation removed.
- Minimize some turbine siting in native prairie and native plant communities.
- Avoid or minimize disturbance of individual wetlands during Project construction. Wetland delineations will be conducted prior to construction to identify the limits of wetland boundaries in the vicinity of Project activities.
- Minimize the number of road miles of new road construction needed for the Project.
- Maintain, at a minimum, the 500-foot setback or property line setback (if greater depending on the turbine model selected) from WPAs and GPAs (non-participating parcels) to reduce risk to waterfowl and waterbirds and grassland-associated birds when siting turbines in the Project Area. The closest distance of a turbine to a GPA is 568 feet.

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- Design transmission facilities based on the APLIC guidance to minimize the risk of electrocution and collisions of birds by power lines (APLIC, 2006; 2012). Adequate spacing of the line diminishes the risk of electrocution. The collector system will be placed underground, minimizing the risk of electrocution. In areas with transmission lines, flight diverters and other devices will be employed to reduce collision and electrocution.
- Guy wires will not be used on permanent meteorological towers.
- Construct wind turbines using tubular monopole towers.
- Minimize the amount of lighting installed on Project turbines; all outdoor lighting on Project buildings will be down-shielded.
- Light turbines according to FAA requirements.
- Reduce habitat disturbance by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas.
- Consult with the appropriate natural resource agencies to avoid scheduling construction activities during important periods for wildlife courtship, breeding, and nesting that are applicable to sensitive species within the Project Area. Crocker has committed to no clearing on easements during the nesting season as practicable.
- Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. Pets will not be allowed in the Project Area.
- If site evaluations show that proposed construction activities would pose a significant risk to avian or bat species of concern, establish buffer zones around known raptor nests, bat roosts, and biota and habitats of concern.
- Maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. To minimize erosion during and after construction, BMPs for erosion and sediment control will be used. These practices include silt fencing, temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization.
- Crocker will initiate habitat restoration of disturbed soils and vegetation as soon as possible after construction activities are complete. Restore areas of disturbed soil using weed-free native grasses, forbs, and shrubs, in consultation with land managers and appropriate agencies. On grassland easements, the mix will be USFWS-approved. Crocker will develop a Restoration Plan on grassland easements for USFWS review and approval prior to construction.
- Develop and implement a Noxious and Invasive Weed Management Plan that will identify and establish procedures to prevent the introduction and spread of noxious weeds and invasive plants that could occur because of new surface disturbance activities at the site. The plan will address monitoring, weed identification, weed spread, and methods for treating infestations. Use certified weed-free mulching.

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- Establish a controlled inspection and cleaning area for trucks and construction equipment arriving from locations with known invasive vegetation problems. Visually inspect construction equipment arriving at the Project Area and remove and contain seeds that may be adhering to tires and other equipment surfaces.

Operations:

- Access roads, utility and transmission line corridors, and tower site areas will be monitored regularly for the establishment of invasive species, and weed control measures will be initiated immediately upon evidence of the introduction of invasive species.
- Regularly inspect access roads, utility and transmission line corridors, and tower site areas for damage from erosion, washouts, and rutting. Initiate corrective measures immediately upon evidence of damage.
- Conduct post-construction mortality monitoring for a minimum of one year. The survey will include searcher efficiency and carcass removal trials, and the overall mortality rate will be adjusted based on the trial results. This protocol is based on guidelines from the WEG (USFWS, 2012) and the National Wind Coordinating Collaborative Comprehensive Guide to Studying Wind Energy/Wildlife Interactions (Strickland et al., 2011). Estimates of mortality will follow either the Schoenfeld or Huso method as appropriate per Strickland et al. (2011). Reports will be provided to the USFWS.
- Turn off unnecessary lighting at night to limit attraction of migratory birds. Follow lighting guidelines, where applicable, from the WEG (USFWS, 2012). This includes using lights with timed shutoff, downward-directed lighting to minimize horizontal or skyward illumination, and avoidance of steady-burning, high-intensity lights (especially red lights).
- Increasing turbine cut-in speeds (i.e., prevent turbine rotation at lower wind velocity) in areas of bat conservation concern during times when active bats may be at particular risk from turbines (Arnett et al., 2011).
- Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. Pets will not be allowed in the Project Area.
- In the absence of long-term mortality studies, monitor regularly for potential wildlife problems including wildlife mortality. Report observations of potential wildlife problems, including wildlife mortality, to the USFWS and SDGFP in a timely manner, and work with the agencies to utilize this information to avoid/minimize/offset impacts.

4.6.3 Impacts to Aquatic Biota

The Project would temporarily impact 0.4 acres of lake habitat, 0.1 acres of ephemeral waterbodies, and 1.6 acres of unconsolidated bed/open water (PUB) wetlands. If present, aquatic vegetation would be removed from shallow wetland areas, and lake and stream edges during construction. Ephemeral waterbodies would not provide sustainable aquatic habitat as it only provides seasonal water flow. Similarly, unconsolidated bed wetlands found in the Project Area

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are generally shallow and likely freeze during the winter, causing winterkill of some aquatic species. For other species, the effect will be short term and localized.

The Project would avoid direct impacts to Baileys Lake and the Round Lake/Reid Lake complex; however, construction activities in the vicinity of these waterbodies and wetlands may temporarily increase sedimentation due to erosion, and from changes in runoff patterns and water volumes due to increased impervious surfaces. This could temporarily degrade the water quality and aquatic habitat. Impacts are anticipated to be short term and localized.

4.6.3.1 Mitigation Measures for Aquatic Biota

The mitigation measures described in Sections 4.3.2.1 and 4.3.2.2 for waterbodies and wetlands would also serve to avoid and minimize impacts to aquatic species and their habitat.

4.6.4 Federally Listed Species

As further detailed in the below sections, impacts to federally threatened and endangered species due to Project construction and operations are anticipated to be minimal due to the low likelihood or frequency of species presence in the Project Area and implementation of species-specific conservation measures, as appropriate.

4.6.4.1 Northern Long-eared Bat

Suitable habitat for the NLEB is limited in the Project Area. The species is forest-dependent and requires trees for roosting and foraging in summer. Acoustic surveys did not identify the presence of NLEBs, and the species is considered likely absent during summer. The species overwinters in hibernacula. Desktop analysis did not identify features (i.e., caves or mines) that would provide suitable winter habitat within the Project Area.

A minimal amount of forest vegetation would be removed during construction. In addition, collisions with operating turbines also present a potential risk to NLEBs. However, based on the negative acoustic survey results, it is not likely that NLEBs are roosting in the Project Area; and therefore, would not be harmed by tree clearing or operating turbines. Per the final 4(d) Rule for the NLEB (USFWS, 2016a), the Project will not result in prohibited incidental take because Crocker will not be clearing known maternity roost trees or trees within 150 feet of known maternity roost trees between June 1 and July 31 and will not remove trees within 0.25 mile of a known hibernacula at any time of the year.

4.6.4.2 Dakota Skipper and Poweshiek Skipperling

Crocker conducted desktop assessments and field-based surveys to determine if occupied Dakota skipper or Poweshiek skipperling suitable habitat is present within the environmental survey corridor. Species-specific surveys for individuals were conducted during the species' flight period in 2017 to determine presence or probable absence in areas of suitable habitat. No Dakota skipper or Poweshiek skipperling were documented during these surveys. Thus, no impacts to Dakota skipper and Poweshiek skipperling are expected. Overall, although it is possible that these species are located within the Project Area or in the vicinity of Project, it appears that they are relatively rare or absent, and therefore the risk of impacts is low.

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4.6.4.3 Topeka Shiner

There are no known Topeka shiner streams in the Project Area, and no records of Topeka shiner from the South Dakota Natural Heritage Database. No impacts to Topeka shiner are anticipated.

4.6.4.4 Rufa Red Knot

During migration, the red knot may stop opportunistically to forage and roost; however, their occurrence is infrequent and not predictable. If the species was to occur in the Project Area, it would likely be a few individual migrants stopping at ponds or wetlands to forage and roost (USFWS, 2014b). The Project is unlikely to impact the species due to the location and the small number of migrants utilizing this migration corridor. There are no South Dakota Natural Heritage Database records for the species in the vicinity of the Project, and no rufa red knots have been observed during avian surveys. Thus, impacts to rufa red knot are negligible, and there is a low level of risk for rufa red knots associated with the Project.

4.6.4.5 Whooping Crane

The Project Area is located on the eastern edge of the 95 percent whooping crane migration corridor South Dakota (Figure 17). Land within and surrounding the Project Area is scattered with intermittent wetlands and row crops that may provide stopover habitat and foraging opportunities for whooping cranes. By siting the Project on the edge of the 95 percent migration corridor and away from the more concentrated use areas in the center of the corridor, Crocker significantly reduced the likelihood of whooping crane stopovers and associated potential impacts. Based on the USFWS' database of whooping crane sightings in South Dakota through Spring 2016, only four whooping cranes have been documented within 20 miles of the Project Area within the past 40 years. Thus, the likelihood of a whooping crane using the Project Area as stopover habitat during migration is low. In addition, no whooping crane mortality has been observed at wind energy facilities to date. Based on a three-year study of sandhill crane and whooping crane behavior at a wind facility in South Dakota, the researchers concluded that both species of cranes are at low risk of colliding with turbines because of their ability to fly around, through, and over turbine strings (Nagy et al., 2012). Whooping cranes may visually navigate and avoid obstacles on the landscape such as wind turbines. Yet, if cranes are flying between foraging and roosting sites near wind turbines during migration or in periods of poor visibility, they may not be able to respond in time to avoid a turbine (USFWS, 2009b). If whooping cranes use sites within or near the Project during migration, Crocker will avoid impacts to whooping crane by implementing the general conservation measures for birds and species-specific conservation measures for whooping cranes presented in the Project's BBCS (Appendix A). The PEIS describes the need for monitoring of whooping cranes during migration and shut-downs if sighted. Overall, although it is possible that whooping cranes would use the Project Area during migration, it is not likely due to the location of the Project and the few documented sightings near the Project. Thus, the risk from this Project on whooping cranes is low.

4.6.4.6 Conservation Measures for Federally Listed Species

The mitigation measures outlined in Section 4.6.2.4 for wildlife would also apply to federally listed species in the Project Area. No species-specific conservation measures are currently

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proposed for the NLEB, Dakota skipper, Poweshiek skipperling, Topeka shiner, or rufa red knot because no impacts are anticipated on these species. Species-specific conservation measures for the whooping crane are outlined in the Project's BBCS (Appendix A); these conservation measures are congruent with the conservation measures outlined for the species in the PEIS.

4.6.5 State-listed Species

The northern river otter is the only state-listed species that may occur in Clark County. The species was formerly found in riparian areas throughout South Dakota. The species prefers large rivers with permanent flow and a low gradient (Kiesow and Dieter, 2005). Suitable habitat is not present in the Project Area; as such, impacts to the northern river otter are not anticipated.

Potential impacts to South Dakota SGCN bird and bat species are addressed in Section 4.6.2.

4.6.5.1 Mitigation Measures for State-Listed Species

No state-listed species have been documented in the Project Area. Thus, no mitigation measures specific to state-listed species are necessary. Mitigation measures that would apply to SGCN bird and bat species are described in Sections 4.6.2.4.

4.7 Visual Resources

Direct and indirect impacts to visual resources from wind energy development are discussed in detail in Section 5.7 of the PEIS. Potential impacts to visual resources expected from the Project are within the type and range of impacts identified in the PEIS.

4.7.1 Impacts to Visual Resources

Visual impacts are defined as the human response to visual contrasts resulting from introduction of elements into a viewshed. Contrasts interact with viewer perceptions of the landscape and may cause a negative, positive or neutral response to the changes in the viewed landscape.

Visual impacts associated with the construction workspace would include the removal of existing vegetation and the exposure of bare soils, as well as earthwork and grading scars associated with heavy equipment tracks, trenching, and machinery and tool storage. Other visual effects could result from the removal or alteration of vegetation that may currently provide a visual barrier, or landform changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture. Due to the general lack of development in the immediate Project Area, visual scale is uniform, with little contrast in line, form, color, or texture, and no dominant features. Construction in flat terrains would disrupt and dominate foreground and middle ground views with the introduction of equipment, materials, the trench, and spoil piles.

Vegetation clearing would generally result in short-term effects on visual resources because most of the vegetation in the area is grassland and that would generally be restored within the first growing season.

Visual impacts associated with the development of wind energy facilities in the Project Area include the presence of wind turbine structures, movement of the rotor blades, shadow flicker

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and blade glinting, turbine marker lights, and other lighting on control buildings and other ancillary structures, roads, vehicles, and workers conducting maintenance activities. As discussed in the PEIS, in the UGP Region, it is anticipated that wind turbines approximately 400 feet in overall height could be visible from approximately 25 miles or farther, and could potentially cause large visual contrasts at distances less than 7 to 8 miles, and more moderate impacts up to approximately 15 miles, with smaller impacts beyond 15 miles. Atmospheric haze could reduce turbine visibility (Western and USFWS, 2015a). Operation of the Project will not introduce new visual components into the Project vicinity. There is an existing 345 kV Basin Electric transmission line (Groton-to-Watertown) that runs northwest to southeast in the northern portion of the Project Area with which the Project will connect; and the Project vicinity already includes wind turbines from the Day County Wind Energy Center and the Oak Tree Wind Farm. Crocker has reduced the number of turbines for the Project and the transmission line is sited along roads for the length of the route.

Private lands crossed by Project are not subject to known federal, state, or county visual management standards. Sensitive viewsheds are generally associated with scenic resources and can include state or national parks, monuments, recreation areas, historic sites and landmarks, or other areas where there are large numbers of viewers, long-duration views, or particularly sensitive viewers. There are no scenic byways in the Project Area, and the nearest federally owned land is a WPA 2 miles southeast of the Project Area.

The presence of the proposed Project within the viewsheds of GPAs, WPAs, WIAs, Reid Lake State Waterfowl Refuge, and School and Public Lands, and Bailey, Round, and Reid lakes may diminish the natural quality of those areas and the experience of the persons utilizing those areas, and may be perceived as a negative impact. The operation of the Project will not generate much traffic or noticeable increase in day-to-day human activity.

There are 35 occupied residences within the Project Area. The closest participating residence to a turbine is 1,045 feet; the closest non-participating residence to a turbine is 3,962 feet. Shadow flicker is an issue associated with wind turbine operations and is discussed separately. The closest residence to the 5.2-mile transmission line is nearly 2,180 feet.

Due to the short-term construction-related impacts and presence of existing wind farms in the vicinity of the Project Area, significant adverse impacts to visual resources are not anticipated.

4.7.1.1 Shadow Flicker

The definition of shadow flicker can be found in the PEIA section 5.7.1.1.

The shadow flicker frequency was created using the WindPRO Modeling program (Version 2.9.285) using the typical assumptions for distribution of wind direction and sunshine probability (Tables 4-9 and 4-10). The assumptions are specific to the Project Area.

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Table 4-10: Wind Direction Distribution Assumptions for Shadow Flicker Model

Direction	N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW
Percent Wind in Direction	8.9	6.1	5.3	6.6	8.2	10.7	15.2	8.1	5.1	5.8	9.1	11.0

Table 4-11: Probability of Sunshine Assumptions for Shadow Flicker Model

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sunshine Probability	52%	54%	58%	63%	65%	66%	74%	78%	68%	59%	51%	51%

Shadow flicker frequency calculations for the Project were modeled at 69 residences (receptors) located within and outside of the area using WindPRO 2.9.285. The average and maximum predicted shadow flicker impacts that occurred at each residence for each turbine model are show in Table 4-12. Appendix H provides the full results of the shadow flicker assessment.

Table 4-12: Shadow Flicker Model Results

Hours / Year	Turbine Model			
	Vestas V110	GE 2.5-116	Gamesa G126	Vestas V136-3.45
Average - Participant	5.5	5.9	6.1	6.8
Average – Non-Participant	3.7	3.9	4.1	4.6
Max - Participant	20.6	21.4	24.1	27.3
Max – Non-Participant	12.6	13.7	14.5	16.3

WindPRO 2.9.285 calculates the number of hours per year as well as the maximum minutes per day during which a given receptor could realistically expect to be exposed to shadow flicker from nearby wind turbines.

An analysis of potential shadow flicker impacts from the Crocker Wind Farm on nearby receptors indicates that the effects are expected to be minor and well within tolerances that do not present concerns for nuisance. No residences are expected to experience over 30 hours per year of shadow flicker.

At a distance of 3,960 feet or greater for non-participants and 1,000 feet or greater for participants, receptors will typically experience shadow flicker only when the sun is low in the sky, and only when the factors described above are present. If a receptor does experience shadow flicker, it most likely will be only during a few days per year from a given turbine, and for a total of only a fraction (typically less than 1 percent) of annual daylight hours.

Shadow flicker from the proposed turbines is not harmful to the health of photosensitive individuals, including those with epilepsy. The frequency of shadow flicker due to wind turbines is a function of the rotor speed and number of blades, and it is generally no greater than approximately 1.5 hertz (i.e., 1.5 flashes per second). The Epilepsy Foundation has determined

that generally, the frequency of flashing lights most likely to trigger seizures is between 5 and 30 flashes per second (Epilepsy Foundation, 2006).

4.7.1.2 Mitigation Measures for Visual Resources

Crocker has collocated linear Project features such as access roads, crane paths, and collector and communication systems with existing disturbances to the extent practicable. This is consistent with the mitigation measures outlined in the PEIS and the South Dakota Bat Working Group's and SDGFP's (Undated) Siting Guidelines for Wind Power Projects in South Dakota. In addition, Crocker will implement the following mitigation measures for visual resources:

- Wind turbines will exhibit visual uniformity in the shape, color, and size of rotor blades, nacelles, and towers.
- Collection cables or lines on the site will be buried in a manner that minimizes additional surface disturbance (e.g., collocating them with access roads, where feasible).
- For ancillary buildings and other structures, low-profile structures will be chosen whenever possible to reduce their visibility.
- Turbine foundations and roads have been designed to minimize and balance cuts and fills.
- Facilities, structures, and roads will be located in stable fertile soils to reduce visual contrasts from erosion and to better support rapid and complete regrowth of vegetation.
- Lighting for facilities will not exceed the minimum required for safety and security, and full-cutoff designs that minimize upward light pollution will be selected. Crocker will install lights that are off until aircraft approach.
- Commercial messages and symbols on wind turbines will be avoided.

Crocker has considered shadow flicker when siting wind turbines to minimize impacts to area residents. Flicker mitigation will be addressed in unlikely situations where a residence is experiencing inordinately more flicker than anticipated in the modeling. If shadow flicker concerns are reported to Crocker, the following procedures will be implemented:

- Log the contact in Crocker's complaint database to track resolution efforts;
- Prepare site-specific assessment of shadow flicker impacts, noting the time of day, season, and expected duration of future flicker impacts;
- Meet with the landowner to discuss site-specific assessment, inform landowners on mitigation strategies (e.g., modification of interior lighting) and discuss concerns;
- Assess the residence to determine if on-site mitigation measures, including but not limited to, installation of exterior or interior screening, are appropriate for the level of impact and effectively address the concern;
- Work with the landowner to develop a mitigation plan; and
- Implement the mitigation plan.

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4.8 Paleontological Resources

Section 5.8 of the PEIS discusses the potential of wind energy development to impact paleontological resources.

4.8.1 Impacts to Paleontological Resources

Construction activities involving ground disturbance has the greatest potential to impact paleontological resources. The Pierre Shale, underlying the Project Area, has a PFYC of 4. The risk for impacts to paleontological resources from the Project, however, is low, as the Pierre Shale is buried beneath 150 to 350 of Late Pleistocene to Early Quaternary till deposits. The construction of turbine foundations and other infrastructure are not anticipated to excavate to a depth to which such potential fossil-bearing formations would be buried.

4.8.1.1 Mitigation Measures for Paleontological Resources

An Unanticipated Discovery Plan will be prepared for the Project outlining the procedure to follow in order to address any unanticipated discoveries of paleontological resources.

4.9 Cultural Resources

Section 5.9 of the PEIS describes the wind energy development activities with a potential to affect cultural resources.

4.9.1 Impacts to Cultural Resources

4.9.1.1 Architectural Resources

A Findings of Effect Study is underway to determine if one NRHP-listed resource will be adversely visually impacted by the Project. If an adverse effect is found, Crocker will work with the USFWS and the SDSHS to develop an appropriate mitigation plan.

4.9.1.2 Archaeological Resources

Crocker is committed to avoidance of all archaeological resources eligible or potentially eligible for listing in the NRHP, sites deemed culturally sensitive, or sites that have not been evaluated for eligibility following the guidelines outlined by SDSHS. Avoidance buffers will be placed around archaeological resources in these categories to ensure that the Project exerts no adverse impacts to these resources.

4.9.1.3 Mitigation Measures for Cultural Resources

Any known sites will be fenced along the avoidance buffer perimeter to reduce potential that they would be inadvertently disturbed during construction. An Unanticipated Discovery Plan will be prepared outlining the procedure to follow in order to address discoveries of cultural resources, including previously unknown archaeological sites and possible human remains. This plan will provide direction to on-site personnel and their contractors to follow if discoveries occur. No significant impacts to cultural resources are anticipated.

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If human remains are identified during construction of the Project, work would immediately halt within a minimum of 100 feet of the site, and it would be protected until SDSHS and the SARC are consulted, in addition to any involved Tribes that express interest in the proposed Project.

If confirmed or potential human skeletal remains are discovered, the Clark County Sheriff's office will be contacted. If the remains are determined not to be part of an active crime scene or investigation, the South Dakota Chief Archaeologist will be contacted. If mitigation measures are planned or unanticipated discoveries occur on USFWS easements, the USFWS will be contacted.

4.10 Socioeconomics

Section 5.10 of the PEIS describes the direct and indirect socioeconomic impacts produced from construction and operation of wind energy facilities in the UGP Region.

4.10.1 Impacts to Socioeconomics

The Project is anticipated to provide positive short-term and long-term impacts to the local economy. The impacts described in this section are based on the Project at 400 MW. Construction activities for the Project would be limited to short-term effects. Increased patronage of local commercial businesses, such as restaurants, grocery stores, hotels, and gas stations, will result in increased business from construction related workers. Local contractors and suppliers will be used for portions of the construction. Total wages and salaries paid to contractors and workers in Clark County will contribute to the total personal income of the region. Additional personal income will be generated for residents in the county and state by circulation and recirculation of dollars paid out by Crocker for business expenditures and for state and local taxes. Expenditures made for equipment, fuel, operating supplies, and other products and services benefit businesses in the county and the state.

4.10.1.1 Jobs

Construction crews would include a diverse workforce of skilled and unskilled laborers. The increased labor force would be necessary for the installation of the various Project components. Based on the JEDI model and internal projections, construction of the 400 MW Wind Farm and associated transmission line is estimated to generate approximately 250 jobs during construction (~200 jobs for Wind Farm, ~50 jobs for Transmission) at peak demand. The Project will provide new temporary job opportunities for the local work force, however the percent of jobs filled by state and local residents is unknown at this time. Current unemployment in the area is low, however jobs created by the Project may enable people who work in these fields to work closer to home during construction. The JEDI model estimates labor will cost approximately $15.8 million and includes hourly wages plus other employer costs.

Crocker anticipates that a majority of the short-term construction positions would be filled by a labor force outside the local community as there would not be sufficient trained local labor to fill the jobs available. A significant portion of the construction workforce would likely originate from within 55 miles of the Project. It is anticipated that many of the short-term construction laborers would commute so limit the need for additional temporary or permanent housing.

The JEDI model projects that during operation and maintenance the Project will create approximately 18 full time jobs paying $1.1 million per year. The model projects approximately 80 percent of the permanent operation and maintenance jobs will live within 50 miles. The Project hopes to benefit from SD wind energy technician education program graduates and provide job opportunities for South Dakota residents. It is anticipated that the O&M will require specially trained individuals that will move to the project vicinity to be in driving distance.

4.10.1.2 Economic Impact

Long-term beneficial impacts to the state and local tax base as a result of the operation of the Project will contribute to improving the local economy. In addition to the creation of jobs and personal income, the Project will pay capacity and production taxes which will benefit the State of South Dakota, School Districts, Clark County, and townships with wind turbines.

The Project will also provide significant income opportunities for local residents. Based on the National Renewable Energy Laboratory's Jobs and Economic Development Impact ("JEDI") model and internal projections, construction of the 400 MW Wind Farm and associated transmission line is anticipated to generate approximately 250 construction related jobs at peak demand and JEDI projects 18 permanent O&M positions. The Project has already created significant landowner payments along with consulting, management, and environmental work. Crocker has announced and is committed to creating an independently directed community fund and providing that fund with $200 per MW per year for 20 years (400 MW Project would generate $80,000 per year). The Crocker Community Fund, a 501(c)(3) organization, is advised by a local board nominated by landowners. Its purpose is engaging in, assisting with, and contributing money to exclusively charitable activities and opportunities within the communities of South Dakota connected to the Project.

Direct Project Economic Impacts over 20 years of Operation (based on 400 MW project):

- Landowners Payments: approximately $46 million over 20 years ($2.3 million per year)
- Capacity and Production Tax: approximately $36 million over 20 years($1.8million/year)
- Community Fund: $1.6 million over 20 years ($80,000 per year)
- Full-Time Jobs: approximately 15-20 full time jobs total up to $24 million over 20 years

A review of academic literature pertaining to wind project and transmission line development and its impact on property values was completed in the PEIS.

4.10.2 Mitigation Measures for Socioeconomics

The Project will positively impact the economics of the local community, so no mitigation measures are proposed.

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4.11 Environmental Justice

No minority or low-income populations are identified in the Area, so no disproportionately high and adverse human health or environmental effects are anticipated. In accordance with the provisions of EO 12898, no further environmental justice analysis is required.

4.12 Hazardous Materials and Waste

Crocker would implement the appropriate mitigation strategies identified in Sections 5.12.1.4 of the PEIS to eliminate or reduce adverse impacts from Project-related hazardous materials and wastes. This will include the development and implementation of a Project-specific SPCC Plan, which describes secondary containment, inspection, fuel-handling and spill remediation procedures and requirements. The same amounts and types of hazardous materials outlined in Section 3.9 of the PEIS would also be anticipated for the proposed Project.

4.13 Health and Safety

4.13.1 Wind Facility Health and Safety

Crocker would implement BMPs and conservation measures identified in Section 5.13.4 of the PEIS, for protection of wind energy facility and transmission line workers and for the protection of public health and safety during the various phases of Project development. The Project is located in a rural setting. Construction and operation of the Project will have minimal impacts to the security and safety of the local populace. The following security measures will be taken to reduce the chance of physical and property damage, as well as personal injury, at the site:

- The towers will be setback from occupied homesteads as described in this EA and the applicable regulations identified herein.
- Security measures will be taken during the construction and operation of the Project including temporary (safety) and permanent fencing, warning signs, and locks on equipment and wind power facilities.
- Complete regular maintenance and inspections to minimize blade failure potential.
- Turbines will sit on steel enclosed tubular towers within which all electrical equipment will be located, except for the pad-mounted transformer where applicable. Access to the interior of the tower is only though a solid steel door that will be locked when not in use.
- Permanent meteorological towers will be free-standing. The guy wires on temporary meteorological towers will have color sleeves at ground level to increase visibility.
- Where necessary or requested by landowners, Crocker will construct gates or fences.
- Safety training will be conducted, and standardized practices will be implemented for construction crews and on-site personnel.

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4.13.1.1 Electromagnetic Fields and Stray Voltage

The proposed interconnection transmission line will be located adjacent to the O&M Facility. Wind turbine generators and associated interconnection cables will be setback from residences, where EMF will be at background levels.

EMF from underground electrical collection lines dissipates very close to the lines because they are installed below ground within insulated shielding. The electrical fields are negligible, and there is a small magnetic field directly above the lines that, based on engineering analysis, dissipates within 20 feet on either side of the installed cable. EMF associated with the transformers at the base of each turbine completely dissipates within 500 feet, so will avoid any EMF exposure to homes.

Stray voltage is a natural phenomenon that is the result of low levels of electrical current flowing between two points that are not directly connected. Electrical systems must be adequately grounded to the earth to ensure continuous safety and reliability, and to minimize this current flow. Potential effects from stray voltage can result when a person or animal comes in contact with neutral-to-earth voltage. Stray voltage does not cause electrocution and is not related to ground current, EMF, or earth currents. In those instances where distribution lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was directly under and parallel to the transmission line. These circumstances are considered in installing transmission lines and can be readily mitigated.

This project is within guidelines in the PEIS. No impacts due to EMFs or stray voltage are anticipated so no mitigation is proposed.

4.13.2 Transmission Facility Health and Safety

Transmission lines are designed to operate for decades and typically require only moderate maintenance. The estimated service life of the proposed Transmission Line is approximately forty years. Transmission infrastructure includes very few mechanical elements, which results in reliability. It is built to withstand weather extremes, with the exception of severe weather such as tornadoes and heavy ice storms. Transmission lines are automatically taken out of service by the operation of protective relaying equipment when a fault is sensed on the system, and are usually momentary. Scheduled maintenance outages are also infrequent. Therefore, the average annual availability of transmission infrastructure is in excess of 99 percent.

The Transmission Facility will be designed and constructed in compliance with local, state, and good utility standards. Crocker will use proper signage and guard structures when stringing wire. Installation of the guard structures and signage will be coordinated with the owner of the transportation corridor being protected. Guard structures can be temporary wood poles with a cross arm or line trucks with their booms used to hold the wire and protect the lanes of traffic.

The proposed transmission line will be equipped with protective devices to safeguard the public from the transmission line if a transmission line or pole falls or other accident occurs. Breakers and relays are located where the line connects to the substation, and will de-energize the line in

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the event of an emergency. In addition to protective devices, proper signage will be posted warning the public of the safety risks associated with the energized equipment.

4.13.2.1 Electromagnetic Fields and Stray Voltage

The frequency of transmission line EMF in the U.S. is 60 hertz and falls in the extremely low frequency ("ELF") range of the electromagnetic spectrum (any frequency below 300 hertz). For the lower frequencies associated with power lines, the electric and magnetic fields are typically evaluated separately. The intensity of the electric field is related to the voltage of the line, while the intensity of the magnetic field is related to the current flow along the conductors.

Crocker conducted an EMF study for the transmission line and estimated the maximum magnetic field at 62.98 mG, which occurs at approximately 10 feet from the proposed transmission line centerline. The maximum electric field for the Crocker transmission line is calculated to be 6.73 kV/m at 15 feet from the proposed transmission line centerline. At 75 feet from the proposed transmission line centerline (the edge of the proposed right-of-way), the calculated electric field is 1.11 kV/m. The results of this study are presented in Appendix I.

Transmission lines can induce stray voltage on a distribution circuit that is parallel to and immediately under the transmission line. Appropriate measures, such as proper grounding, will be taken to prevent stray voltage problems.

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5.0 CUMULATIVE IMPACTS

The cumulative impacts of past, present, and future actions on resources within the UGP Region are analyzed in Section 6.0 of the PEIS. Cumulative impacts represent the incremental effects of a proposed action when added to other past, present, or reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant actions, taking place over a given period.

Based on CEQ (1997) guidance and in accordance with the PEIS, inclusion of other potential actions is based on identifying commonalities between the potential impacts that would result from the Project and the impacts likely to be associated with those other potential projects. In order to avoid unnecessary discussions of insignificant impacts and projects and to adequately address and accomplish the purposes of this analysis, the cumulative impacts analysis for the Project was conducted using the following: The geographic scope or region of influence ("ROI") encompasses the area of affected resources and the distances at which impacts associated with the proposed Project may occur. For most resources, the ROI consists within or adjacent to the construction workspace; however, other resources such as air quality or visual resources consider the distances that impacts may travel and the regional characteristics of the affected resources (Table 5-1).

Table 5-1: Regions of Influence for Cumulative Impacts Analysis by Resource

Resource	Regions of Influence
Land Use	Project site & transmission line rights-of-way (row) (including USFWS easements); adjacent lands
Geological/Soil Resources	Project site & transmission line row (including USFWS easements); adjacent lands
Water Resources	Nearby surface waterbodies; shallow aquifers (recharge areas)
Air Quality	Local airshed
Vegetation	Project and transmission line row (including easements); adjacent lands
Wildlife	Project site and transmission line row (including easements); adjacent lands (habitats, ecosystems)
Aquatic biota	Nearby surface waterbodies (habitats, ecosystems)
Threatened and Endangered Sp.	Project site and transmission line row (including USFWS easements); adjacent lands (habitats, ecosystems)
Visual Resources	Local viewsheds (25 miles for UGP Region, see Section 4.7.1)
Paleontology	Project site & transmission line row (including easements); adjacent lands
Cultural	Project site & transmission line row (including easements); adjacent lands
Socioeconomic	Adjacent properties, local communities, counties, states
Environmental Justice	Adjacent properties, local communities, counties, states

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- The time frame extends from the past history of impacts to each receptor through the anticipated 30-year life of the Project.
- Past, present, and reasonably foreseeable future actions or activities (or types of actions). These include projects, activities, or trends that could affect human and environmental receptors within the defined ROIs and within the defined timeframe. Past and ongoing impacts to the existing environment are characterized by resource in Section 3.0 and are carried forward to this analysis. A project or activity must impact a resource category potentially affected by the Project. The future actions described in this analysis are those that are "reasonably foreseeably"; that is, they are ongoing (and will continue into the future), are funded for future implementation, or are included in near-term plans. Current and foreseeable future actions occurring with the ROI are available in Figure 22.

Based on the analysis provided in Section 4.0, the following resources either would not be impacted, impacts would be temporary and negligible, or the Project would result in beneficial impacts; and therefore, these resources are not brought forward for the cumulative effects analysis:

- **Land Use – Aviation**: The FAA provided a "Determination of No Hazard" to the Project. The installation of wind turbine towers in active croplands and installation of aboveground collector lines, if needed, will create a potential collision risk with crop-dusting aircraft. Crocker is not aware of any new wind farm plans in the vicinity of the Project Area so no additional cumulative effects are anticipated.
- **Land Use – Telecommunication**: The Project has been sited to avoid microwave beam paths, and Crocker is coordinating with DOE and Western on turbine placement to avoid impacts with Western operations and beam paths. Crocker is not aware of any new wind farm plans in the vicinity. No other activities are anticipated to impact telecommunications; therefore, no cumulative effects are anticipated.
- **Geological Resources** (Section 4.2): Excavation would be limited to 4 to 6 feet and based on the geology of the Project Area, the Project is not anticipated to encounter bedrock or require blasting.
- **Hydrogeological Resources / Water Rights** (Sections 4.3.1 and 4.3.4): Similar to the geological resources impacts discussion, impacts would be restricted to the upper 4 to 6 feet. Potential impacts to shallow aquifers and associated wells in the Project Area would be temporary and negligible, and comply with state permit requirements.
- **Waterbodies** (Section 4.3.2): Construction activities would temporarily impact less than 0.1 acre of ephemeral waterbodies, and 0.4 acres of lake edge habitat. It is unlikely that construction activities would occur in-water in either habitat type, thus further diminishing impacts associated with increased sedimentation. The disturbed area would be restored immediately after construction is completed. Impacts would be temporary and negligible.
- **Floodplains / Flood Storage** (Section 4.3.5): There are no designated floodplains that would be impacted by the Project.

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- **Air Quality** (Section 4.4): Although there would be limited emissions from construction vehicles and equipment during construction, the timeframe would be limited to the 12-month construction period and the Project overall would contribute to a reduction in air emissions.
- **Federally listed Species** (Section 4.6.4): No impacts are anticipated for the NLEB, Dakota skipper, Poweshiek skipperling, Topeka shiner, and rufa red knot; therefore, these species will not be carried forward in the cumulative effects analysis.
- **State-listed Species** (Section 4.6.5): The Northern River Otter is unlikely to occur in the Project Area. Grassland birds of concern are included in birds.
- **Paleontological Resources** (Section 4.8): As excavation would be limited to the first 4 to 6 feet, the likelihood of encountering deeply-buried paleontological resources is negligible.
- **Cultural Resources** (Section 4.9): Crocker has avoided all archaeological resources potentially eligible for listing, sites deemed culturally sensitive, or sites that have not been evaluated for eligibility following the guidelines outlined by SDSHS to date, and will avoid any additional sites if identified during future surveys.
- **Socioeconomics** (Section 4.10): As discussed in Section 4.10, the economic impacts of the Project on the local economy are anticipated to be beneficial.
- **Environmental Justice** (Section 4.11): There are no Environmental Justice communities within the Project Area.

The cumulative effects analysis for the remaining resources directly or indirectly affected by the Project are presented in the following subsections and displayed on Figure 22.

5.1 Land Use

5.1.1 Local Land Use

As discussed in Sections 3.6.1 and 3.1.1, Clark County and the Project Area have historically evolved from a landscape dominated by tallgrass prairie dotted with pothole wetlands of various shapes and sizes, to a landscape primarily composed of cultivated crops (30.5 percent), hay fields (2.8 percent), and pastures grazed by livestock (53.8 percent). According to the USDA 2012 data, both the number and average size of farms in Clark County increased by 3 percent and 16 percent respectively from 2007 to 2012 (USDA, 2012).

Permanent infrastructure associated with the Project would remove 74.4 acres from grassland/pasture and 78.2 acres from cultivated cropland production. Based on SSURGO data, this would include the permanent removal of 95.1 acres of prime farmland and 32.4 acres of farmland of statewide importance.

Additional development including residences, aggregate mining, and other infrastructure has the potential to occur in the Project Area and Clark County in the future; however, considering the continued decline in population, substantial new development is not anticipated. Crocker is not aware of any new wind farm plans in the vicinity of the Project Area. Therefore, cumulative

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impacts to cultivated cropland and pasture from new development are not anticipated to be substantial.

Consequently, we find that past and present activities in combination with the Project would have minimal impacts to cropland, pasture land and livestock grazing.

5.1.2 Recreation

Large and small game hunting and trapping occur throughout Clark County and the Project Area on both public and private lands. The Project would directly impact one WIA parcel during construction and operation through the installation of a wind turbine. No other public lands would be directly impacted by the Project.

Project indirect impacts to game species through displacement are anticipated to be negligible for white-tailed deer. Mortality and displacement of waterfowl species will occur, but is unlikely to affect recreation in the fall. Cumulative effects with the other two wind facilities may be limited, based on the relatively small size of the two neighboring facilities.

Other existing infrastructure, such as the state highway and local roads may contribute to wildlife mortality through collisions, particularly white-tailed deer, or may cause displacement of wildlife due to the noise generated from these activities.

As described in Section 4.1.2, the Project would not impact public fishing lakes, nor would it obstruct public access to these lakes. Therefore, there would be no cumulative effects on fishing.

Overall, there is a potential for cumulative impacts to land use and recreation should other activities also occur in the same areas. These impacts would be primarily associated with habitat loss, degradation, or fragmentation, mortality, or displacement. The Project, when combined with the activities described, is not anticipated to have a significant cumulative impact on hunting because it would result in localized displacement of game species. Furthermore, operation of the Project is not anticipated to have population-level effects on game species. Consequently, we find that past and present projects in combination with the Project would have long-term, permanent, and an incremental negative cumulative effect on recreation.

5.1.3 Conservation Easements

According to Bauman et al. (2016) there are approximately 43,967 acres of lands protected by USFWS or NRCS easements, The Nature Conservancy, or others within Clark County. In the project area there are 5,474 acres of USFWS grassland easement. The USFWS and other local groups are continuing their conservation efforts in this area.

The Project would temporarily impact 13.4 acres of USFWS wetland basins; however, there would be no permanent impacts to wetland basins. Additionally, the Project will temporary impact 260.5 acres on grassland easements, and permanently impact 15.1 acres. Temporary impacts on grassland and wetland easements would be permitted through a Special Use Permit. Through the USFWS process to allow wind development on grassland easement land, an easement exchange is required, Crocker would provide funds to the USFWS to purchase additional grassland easements at a 2:1 permanent impact ratio, based on the post-construction

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"As-Built" civil engineering survey. Therefore, Crocker will offset the permanent impacts on grassland easements.

5.1.4 Transportation

The Project will establish 43.6 miles of new access roads that will be maintained by Crocker for the life of the Project. Additionally, Crocker will make improvements to the existing public road system to allow for the safe transportation of vehicles and equipment. Increases in traffic on local roadways are expected during construction activities.

Other existing activities in the Project Area could contribute to increased traffic during Project construction, such as harvest and hunting seasons, gravel extraction activities, or state and local road maintenance. Crocker anticipates that these potential peak traffic periods can be mitigated through the development of a Transportation Plan, compliance with federal, state, and county regulations and permit conditions. Crocker will coordinate with farmers during peak harvest to ensure farmers are able to utilize the public roads during construction. Local Project management and support staff will be available on-site to address concerns or challenges that occur during construction. Consequently, we find that present activities in combination with the Project would have short-term, infrequent, and an incremental negative cumulative effect on transportation.

5.1.5 Other Existing Utility and Right-of-Way Corridors

The Project would tie-in with the existing Basin Electric Groton-to-Watertown 345 kV transmission line via the interconnection switchyard. The Project facilities will cross rights-of-way and utilities and Crocker will continue to coordinate on design details of these crossing and to ensure mitigation measures are implemented. No other activities are anticipated to impact these existing utilities. No substantial new developments are anticipated, and existing landowner agreements are in place for the existing utilities. Additionally, the utilities would be required to obtain the appropriate permits and landowner permissions for maintenance activities. Therefore, no cumulative effects are anticipated.

Crocker is working with the Northern Border Pipeline on the location of proposed facilities. The most recent conversation was on 1/10/18 regarding Northern Boarders fly-overs procedures and potential crossings. Due to the setback from the pipeline, they do not anticipate any problems with fly-overs. The Project design includes wind farm facility setbacks from the pipeline that are consistent with other projects developed by Geronimo Energy that are now successfully operating with Northern Border Pipeline facilities going through the project. Coordination will be on-going regarding potential pipeline crossings. Which Croker is responsible to have all approvals in place before crossing the pipeline.

5.2 Soil Resources

Any land disturbing activity could impact soil resources; therefore, agriculture and livestock grazing, aggregate mining, infrastructure and resident maintenance or developments, state highway and local road maintenance, other utility maintenance, Basin Electric transmission line, and wind farm maintenance could all impact soil resources. Soil disturbing activities associated with construction or industrial activities are regulated by the SDDENR NPDES Program, and

may require a stormwater permit if the construction activity disturbs one or more acres, or for certain businesses and industries (SDDENR, Undated [b]). The Project's impacts to soils would be incrementally minor and largely temporary, except where permanent facilities are installed (157.1 acres).

Studies have found that grazing of pasture land can contribute to soil compaction, decreased soil infiltration, alteration of the vegetation composition, reduced vegetation structure and biomass, and increase in non-native species (Salo et al., 2004; Warren et al., 2008; USFWS, 2009a). Further, as discussed in Section 3.3.3, high condition grasslands are able to retain a higher percentage of precipitation, and reduce peak flows relative to low condition grassland and bare ground. Gullies, headcuts, and stream bank erosion are also more prominent in low condition grasslands. Annual soil erosion ranges from 10 to 60 times higher for watersheds predominated with continuous cropping versus perennial grass watersheds (South Dakota Grasslands Coalition, 2007). The negative impacts to grasslands from grazing increase with the intensity of grazing, and can be mitigated through the adoption of designed rotational or prescriptive grazing systems that apply a set number of animal units in a known area-unit of grassland for a set period of time, mimicking historic bison grazing (Salo et al., 2004; USFWS, 2009a; Wang, 2016). According to USDA 2012 census data, 55 farmers (17 percent) practice rotation or management-intensive grazing out of approximately 321 farmers that manage permanent pasture, woodland pasture, and rangeland in Clark County.

5.3 Wetlands

The Project would permanently impact 0.2 acres of PEM wetlands and the remaining impacts would be temporary.

Additional development including residences, aggregate mining, and other infrastructure has the potential to occur in the Project Area and Clark County in the future; however, considering the continued decline in population, substantial new development is not anticipated. Therefore, cumulative impacts to wetlands from new development are not anticipated to be substantial. Other existing infrastructure maintenance associated with the state highway and local roads, utilities, the 345kV Basin Electric transmission line, and wind farms are anticipated to be temporary and infrequent, would obtain necessary permits and landowner permissions, and unlikely to substantially affect wetlands.

The Project's impacts to wetlands would be incrementally minor and largely temporary.

5.4 Acoustic Environment

Noise emissions during Project construction would be temporary and would comply with applicable state and county regulatory obligations and ordinances. The maximum calculated noise level of the wind turbines during operation results in a 50 dBA L_{EQ} at the nearest noise-sensitive receptor. All non-participating residences are projected at 41 dBA or less. Average Project-related sound pressure levels at residences for all turbine models range in hourly LEQ from 39 to 40 dBA. Maximum calculated noise levels at all non-participating residential receptors for all turbine models are well below the Clark County noise guideline of 50 dBA.

Other activities in the Project Area such as use of tractors and other farming equipment, two sand and gravel pit operations, and maintenance activities along highways and roads, pipeline, transmission line, or wind facilities could also generate noise emissions; however, the impact would be location specific, sporadic, and temporary.

Overall, there is a potential for cumulative impacts to the acoustic environment in the Project Area, primarily associated with the operation of the wind turbines. The Project, when combined with the activities and projects described, is not anticipated to have a significant cumulative impact on acoustic environment because noise emissions would comply with Clark County noise guidelines. Consequently, we find that present activities in combination with the Project would have short-term, infrequent, and an incremental negative cumulative effect on the acoustic environment.

5.5 Vegetation

The acreages of USGS (2011) GAP ecological systems that would be directly affected by construction and operation of the Project are identified in Section 4.6.1. Tallgrass prairie is considered one of the most endangered ecosystems in the U.S. comprising less than 1 percent of its historic range. (USGS, 2011; Higgins et al., 2001). Tetra Tech surveys indicate that of the 832.1 acres of potentially disturbed grassland surveyed, 42 percent (351.6 acres) is low quality, meaning it is heavily disturbed or grazed with low species diversity and dominated by non-native species. An additional 52 percent (435.2 acres) is of moderate quality, in a state of moderate disturbance with moderate species diversity and mixture of native and non-native dominant plant species. Less than 1 percent (0.1 acre) of the potentially undisturbed grassland that would be impacted by the Project is high quality grassland; this would be impacted temporarily during the installation of the collector system. Approximately 5 percent (45.3 acres) of potentially undisturbed grassland that would be impacted by the proposed Project have not been field verified.

The Project's impacts to vegetation would be incrementally minor and largely temporary, except where permanent facilities are installed (157 acres).

5.6 Wildlife

Agriculture and grazing activities can beneficially or adversely affect wildlife species by providing foraging habitat during certain seasons; but may also reduce, fragment, or degrade habitat species, and can disrupt nesting activity of some bird species. Application of herbicides and insecticides can also adversely affect a number of species and their prey. Intensive grazing activities can cause trampling of nests, alter vegetation community composition, and introduce invasive and noxious weeds. However, grazing is a critically important conservation tool that is necessary for the long-term management, protection and sustainability of grassland habitats and populations of grassland-dependent wildlife, particularly on private land, which makes up greater than 90 percent of the lands base in South Dakota (Doherty et. al. 2013). Nest success and nest survival for breeding waterfowl in the Prairie Pothole Region have been shown to be positively correlated to the amount of intact grassland habitat that exists at a larger, landscape-scale (Reynolds et. al. 2001; Stephens et al. 2005) suggesting that habitat quantity is more important than habitat quality for breeding waterfowl. Conversion of grassland habitats to other uses,

particularly cropland, is also known to pose the greatest threat to populations of breeding waterfowl and grassland birds in the Prairie Pothole Region (Stephens et. al. 2005; Stephens et. al. 2008, Doherty et. al. 2013; PPJV Implementation Plan 2016) and thus, grazing is an vitally important management tool that will help ensure the long-term sustainability of intact grassland landscapes and grassland-dependent wildlife populations in the Project Area.

Other existing infrastructure, such as the state highway and local roads may contribute to wildlife mortality through collisions, or may cause displacement of wildlife due to the noise generated from these activities, such as aggregate mining sites.

Cumulative effects to wildlife may occur to wildlife species and groups that are at risk of being impacted by this Project. Based on the review provided previously and the review in the BBCS (Appendix A), migratory birds are at moderate risk of collision due to the Project. Cumulative effects to migratory birds due to collision may result from the construction and operation of this Project, given the two operating wind facilities near to the Project, the Day County Wind Energy Center and Oak Tree Wind Farm. Given the location of the Project, potential impacts may be greatest on grassland birds and waterfowl either via collision or displacement, although research suggests that operating turbines may be a limited threat to waterfowl (Gue et al., 2013). These two wind projects may also have a cumulative effect on bats. Cumulative effects with the other two wind facilities may be limited, based on the relatively small size of the two neighboring facilities. The Oak Tree Wind Farm has 11 wind turbines, and the Day County Wind Energy Center has 66 operating turbines.

Cumulative effects to birds may also result from collisions with the existing 345kV Basin Electric and proposed Project transmission lines and from electrocution. Mortality of birds from collision and electrocution due to transmission lines is well documented. The risk of collision is related primarily to specific behaviors; in particular, courtship displays, flushing, and aerial displays may increase the risk of collision because the birds are distracted. Risk is also increased if a powerline is between roosting, feeding, or nesting areas. Bird species with poor vision, that are young or less agile, or that are unfamiliar with the area may also be at increased risk of collision with transmission lines. Crocker has designed the transmission facilities based on the APLIC (2006, 2012) guidance to minimize the risk of collision and electrocution of birds by power lines, and has chosen the shortest route to tie-in to the 345 kV Basin Electric transmission line (see Section 1.4.4). Adequate spacing of the line diminishes the risk of electrocution. The collector system will be placed underground, minimizing the risk of electrocution. In areas with transmission lines, flight diverters and other devices will be employed to reduce collision and electrocution. Specifically, any new transmission line for the Project will be marked with bird diverters, if acceptable to the power off-taker or owner.

Overall, there is a potential for cumulative impacts to wildlife species should other activities also occur in the same areas. These impacts would be primarily associated with the wind turbine and transmission line operation and associated impacts to bird species. Operation of the Project is not anticipated to have population-level effects on bird species. Consequently, we find that past and present projects in combination with the Project would have long-term, permanent, and an incremental negative cumulative effect on wildlife, which may be partially offset by easement exchange.

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5.7 Federally Listed Species (Whooping Crane)

The risk from this Project on whooping cranes is low. The Project Area is located on the eastern edge of the 95 percent whooping crane migration corridor South Dakota. Land within and surrounding the Project Area is scattered with intermittent wetlands and row crops that may provide stopover habitat and foraging opportunities for whooping cranes. By siting the Project on the edge of the 95 percent migration corridor and away from the more concentrated use areas in the center of the corridor, Crocker significantly reduced the likelihood of whooping crane stopovers and associated potential impacts. It is unlikely that other activities in the vicinity of the Project Area would contribute to impacts to the whooping crane; therefore, no cumulative effects are anticipated.

5.8 Visual Resources

The cumulative effect of the proposed Project and existing infrastructure in the vicinity of the Project, including the existing state highway and local roads, the 345kV Basin Electric transmission line, other utilities, and wind farms may be perceived as increasing the “industrial” appearance of the Project Area and the areas from which they will be seen. It is anticipated that wind turbines 400 feet in overall height could be visible from approximately 25 miles or farther, and could potentially cause large visual contrasts at distances less than 7 to 8 miles, and more moderate impacts up to approximately 15 miles, with smaller impacts beyond 15 miles.

The presence of the wind farms and other existing infrastructure within the viewsheds of GPAs, WPAs, WIAs, Reid Lake State Waterfowl Refuge, and School and Public Lands, and Bailey, Round, and Reid lakes may diminish the natural quality of those areas and the experience of the persons utilizing those areas, and may be a negative impact.

Overall, cumulative effects to visual resources would result from the Project in combination with existing aboveground infrastructure occurring within the some of the same viewsheds. Consequently, we find that past and present projects in combination with the Project would have long-term, permanent, and an incremental negative cumulative effect on visual resources.

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6.0 AGENCY COORDINATION

Crocker has coordinated with various federal, state, and local agencies to identify agency concerns regarding the proposed Project in various manners of communication. Project notification letters were sent to these agencies on April 18, 2016 and October 24, 2016. Additionally, Crocker has been coordinating with Clark County and the townships within the Project Area. A summary of agency comments and coordination is provided below. Agency response letters are provided in Appendix E.

6.1 Federal Agencies

6.1.1 United States Fish and Wildlife Service

The USFWS provided written comments on the Project on May 18, 2016, November 29, 2016, and November 2017. Crocker has coordinated with USFWS Ecological Services and Waubay WMD through meetings, conference calls, and site visits. Some comments are summarized below. Crocker's response to each of the topics below is provided:

- Crocker has been coordinating with the Waubay WMD to obtain grassland and wetland easement data, coordinate field reviews, and review various iterations of the Project design. Crocker and the USFWS conducted field reviews of wetland basins November 21-22, 2017. Additionally, Crocker and the USFWS had a conference call on November 27, 2017 to discuss minimizing the impacts of turbines and associated infrastructure on grassland easements. The layout reflected in this EA incorporates design suggestions by the USFWS to the extent practicable, while balancing setbacks, constructability, noise, shadow flicker, cultural resources, sensitive habitat, and other factors.
- Threatened/Endangered species: the whooping crane, rufa red knot, NLEB, and Poweshiek skipperling may occur in the Project Area.
    - Whooping crane: During 18 months of avian use surveys, Crocker has not observed any whooping cranes. Per USFWS guidance, Crocker will implement a whooping crane monitoring plan. Additionally, Crocker will coordinate with the USFWS regarding conservation measures identified for transmission lines in the Region 6 guidance and APLIC (2012) standards.
    - Rufa red knot: The USFWS did not provide specific guidance on this species and it has not been observed to date at the Project during 18 months of avian surveys.
    - NLEB: Crocker conducted acoustic presence/absence surveys for the NLEB during 2016. No NLEBs were detected (Section 3.6.4).
    - Poweshiek skipperling: Crocker evaluated potential habitat for this species and Dakota skipper using a tiered approach. First, potential habitat was identified through a desktop analysis with various GIS datasets. Second, in-field habitat assessments were conducted at potentially suitable habitat locations identified in the desktop analysis; and third, presence/absence surveys were completed in areas supporting potentially suitable habitat (i.e., appropriate forage and larval plant

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species) during the flight period 2017. No Poweshiek skipperlings or Dakota skipper were recorded (Section 3.6.4).

- Bald Eagles
    - Crocker conducted bald eagle nest and use surveys during 2016-2018. There are no nests in the Project Area and current use survey data indicates low use within the Project Area (Section 3.6.2.5).
- BCC and Other Grassland Birds: The Migratory Birds Division of the USFWS has published BCC (USFWS, 2008), which identifies species in need of coordination and proactive conservation. Primary threats to these species in South Dakota are habitat loss and fragmentation. The USFWS recommends avoidance, minimization, and, if necessary, compensation to reduce impacts to species protected by the MBTA.
    - Sections 3.6.2.2 and 3.6.2.3 and the BBCS (Appendix A) includes a discussion on BCC as well as grassland birds. Crocker was provided specific siting issues with turbines in fall 2016 and 2017.
- The layout reflected in this EA incorporates design suggestions by the USFWS to the extent practicable, while balancing setbacks, constructability, noise, shadow flicker, cultural resources, sensitive habitat, and other factors.

6.1.2 United States Army Corps of Engineers

The USACE provided comments on the Project on June 22, 2016. The agency's comments are specific to Section 404 of the CWA. If the project involves either the discharge of dredged or fill material into waters of the U.S. a Department of Army permit will be required.

Crocker has completed wetland delineations to identify waters of the U.S. for 78 percent of the Project and will complete the remaining delineations during Spring 2018. Project facilities have been sited to avoid and minimize permanent and temporary impacts to wetlands and waterbodies.

6.1.3 National Telecommunications and Information Administration

The NTIA provided comments on May 16, 2016. The Agency received responses from the USDA and DOJ stating, "no harmful interference anticipated." The DOE and DOC identified concerns regarding blockage of their radio frequency transmissions. The DOE noted the Project has potential to interfere with DOE Western operations. Western has three paths that run through the Project Area from the Clark Repeater. Western indicated on December 1, 2017 that the Project will not cause problems for Western and the Clark Repeater. Additional analysis may be required for Basin Electric and East River Cooperative.

The DOC, which includes NOAA, provided comments specific to potential weather radar impacts. The Agency notes that a portion of the Project falls within the Notification Zone. That is, due to the proximity of the Project to the Aberdeen Weather Surveillance Radar – 1988 Doppler, NOAA's Radar Operations Center would like to reevaluate the Project when turbines are sited, and track the Project to completion. Turbine placement may impact the radar's precipitation estimates over the northern portion of the Project Area. However, the Agency does not anticipate impacts to critical tornado detection and will not request mitigation.

Crocker submitted an updated project boundary to NTIA for review on November 16, 2017 and a response is pending. Crocker will continue to coordinate with NOAA on turbine placement and avoiding or minimizing potential impacts to weather radar.

6.2 State Agencies

6.2.1 South Dakota Game, Fish and Parks

In its letter dated March 14, 2016, the Wildlife Division provided several comments on wildlife and their habitats. Crocker provides a response to each of the topics outlined in the SDGFP March 14, 2016 letter below, and elsewhere in this EA:

- Recommended conducting appropriately-timed pre-construction wildlife surveys to document current site conditions and assess any potential impacts to wildlife habitat using established survey protocols and those written reports be submitted to SDGFP. Take or direct mortality of whooping cranes is a concern.
    - Crocker has conducted several avian and bat studies, including avian use studies, raptor and eagle nest surveys, lek surveys, bat acoustic surveys, NLEB presence/absence acoustic surveys, grassland avian use surveys, and Dakota skipper and Poweshiek skipperling habitat assessment and presence/absence surveys. Crocker is committed to completing two years of pre-construction avian use surveys. Protocols for these surveys are consistent with the WEG (USFWS, 2012) and/or have been coordinated with SDGFP and USFWS. Reports have been submitted to the agencies as they become available.
- Grasslands: Remnant prairie tracts have high conservation value, especially those that contain a high diversity of both plant and animal species with non-native, invasive plant species being rare or absent. The Agency recommended surveys for untilled tracts of native prairie and to site turbines in cultivated areas and that Crocker minimize habitat fragmentation by avoiding placement of turbines and roads in contiguous blocks of grassland. SDGFP recommended that Crocker limit ground disturbance to decrease the opportunity for introduction and establishment of non-native, invasive plant species, and should use native seed sources to stabilize any soil disturbance to reduce non-native, invasive plant species encroachment. Finally, avoid placement of turbines and roads in untilled native prairie; avoid or mitigate any loss of native prairie and limit any ground disturbance as much possible by reducing the length and width of both temporary and permanent access roads.
    - The Project footprint has been evaluated for natural communities and less than 1 percent (0.1 acre) of the potentially undisturbed grassland that would be impacted by the Project is high quality grassland (see Section 4.6.1).
    - Crocker will coordinate with SDGFP, USFWS, USDA NRCS, and landowners on seed mixes to be used during restoration.
- Grassland birds: SDGFP indicated that the placement of a wind farm in the proposed Project Area may reduce habitat suitability for grassland birds (increase habitat fragmentation and invasive species) and modify behavior (e.g., avoidance). SDGFP

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recommended conducting properly timed, species-appropriate surveys for breeding grassland birds (songbirds and grouse). Placement of turbines in areas of elevation (e.g. ridges) should be avoided, taking into consideration the soaring behavior of raptors.

- Crocker has conducted avian use surveys, breeding bird surveys, eagle nest surveys, and lek surveys.

- Wetlands: Placement of turbines should not occur in or near wetland basins and special care should be made to avoid areas with high concentrations of wetlands.
  - The Project would permanently impact less than 0.1 acre of wetlands on grassland easements and temporarily impact 11.8 acres of wetlands on USFWS easements.
  - Crocker and the USFWS conducted field reviews of wetland basins on November 21-22, 2017.
- Establish a buffer between public land boundaries and turbine locations.
  - Turbines are sited at least 550 feet from publicly owned lands.
- Transmission lines: Bury new power lines, and if this is not possible, placement of above-ground transmission lines should avoid spanning large wetlands and should not be placed between wetlands or wetland complexes. Recommend placing new transmission lines along existing corridors such as within existing disturbed areas such as road rights-of-way that do not currently intersect wetlands or run between wetlands or wetland complexes. Offered documents from the Avian Power Line Interaction Committee (APLIC) that provide useful information on how to reduce power line strikes and electrocutions, available from the Edison Institute (http://www.aplic.org)
  - Any new transmission line for the Project will be marked with bird diverters, if acceptable to the power off-taker or owner.
  - Crocker designed transmission facilities based on the APLIC guidance to minimize the risk of electrocution and collisions of birds by power lines and will follow APLIC guidelines during operations (APLIC, 2006; 2012).
- Mitigation: In areas where there is ecological damage in the siting of a wind power facility mitigate for habitat loss. Appropriate actions include but are not limited to ecological restoration, long-term management agreements, conservation easements, or fee title acquisitions to protect lands with similar or higher ecological quality.
  - Upon completion of the NEPA process, Crocker is required to conduct an easement exchange with the USFWS to replace permanent impacts to grassland easements at a 1:1 ratio with funding for the USFWS to purchase grassland easement acres elsewhere. A bond will be provided so at decommissioning of the project the permanent impact acres will be restored to grass and easement protection. Additionally, Crocker has volunteered to mitigate at a 2:1 ratio.
- Post construction: Conduct at least two years of post-construction bird and bat mortality studies.
  - As outlined in the BBCS (Appendix A), Crocker is committed to one year of post-construction avian and bat mortality monitoring. This monitoring includes weekly mortality surveys during the riskiest time of year (i.e., bird and bat migration

periods), searcher efficiency trials, carcass removal trials, and adaptive management. Following post-construction monitoring, there will be ongoing operational monitoring by staff for remaining life of project.

- Recommended scheduling a meeting with SDGFP and U.S. Fish and Wildlife Service representatives to further discuss wildlife concerns as well as a site visit to assist with micro-siting if the project is pursued.
    - Crocker has coordinated with SDGFP since April 2016 including survey protocols, survey results, and monthly meetings from August 2017 to present.
    - Crocker and the USFWS conducted field reviews of wetland basins on November 21-22, 2017.

6.2.2 South Dakota Department of Environment and Natural Resources

Crocker has received several responses from SDDENR's various programs. Overall, SDDENR indicated in its May 9, 2016 letter that the construction of the Project, using conventional construction techniques, should not cause violation of any statutes or regulations administered by SDDENR. The agency notes that appropriate erosion and sediment control measures must be installed to control the discharge of pollutants from the construction site. If the Project disturbs more than one acre, the Project will require authorization under the General Permit for Storm Water Discharge Associated with Construction Activities. Additionally, a Surface Water Discharge Permit may be required if any construction dewatering should occur as a result of the Project. Finally, impacts to tributaries and wetland should be avoided or minimized, if possible.

On April 22 and November 11, 2016, the Surface Water Program indicated that based on the information provided in the Project notification letters, the Project will have little or no impact on waste management in the area, including hazardous waste, solid waste, and asbestos. Similarly, on April 27 and October 28, 2016, the surface water program determined that based on the information in the Project notification letters, the Project will not have adverse environmental effects to drinking water in this area. Both letters recommend coordination with the local rural water system to ensure no impacts to existing lines. Crocker has been coordinating with the Clark Rural Water System and will continue to work with them throughout project development.

The Air Quality Program provided comments on the Project on April 25, 2016 and indicated the project will not cause a significant impact on the air quality of South Dakota and the Project is approved. The agency also notes that if the Project requires a temporary batch plant, a general permit will be required to operate.

The Ground Water Quality Program provided responses on May 2 and November 10, 2016. Both letters indicate SDDENR does not anticipate adverse impacts to ground water quality by this project. The Program also identified one petroleum or other chemical release in the vicinity of the Project Area in the April 2016 project notification letter; an additional release was identified in proximity to the Project based on the expanded Project Area in the October 2016 project notification letter. These releases are associated with farmsteads in the Project Area and will not be impacted. Finally, the Program notes that in the event contamination is encountered during construction activities or is caused by construction activity, Crocker or its designated representative, must report the contamination to SDDENR. The contaminated soil must be

temporarily stockpiled and sampled to determine disposal requirements. The Ground Water Quality Program response requested notification once a transmission line route was established. Crocker provided notification the transmission line will be located within the Project Area and the SDDENR indicated they had no additional comments or need for review.

Crocker will obtain authorization under the General Permit for Storm Water Discharge Associated with Construction Techniques. Crocker anticipates submitting its permit application during second quarter of 2018. If the Project will require a batch plant, Crocker will apply for a general permit from the Air Quality Program.

6.2.3 South Dakota State Historical Society

SDSHS provided comments on May 9 and November 7, 2016. The agency recommended several steps be taken to identify cultural resources including obtaining a record search from the SARC, conducting a Level III Intensive Survey prior to ground disturbance, completing an analysis of the visual effects on cultural resources, and contacting the Tribal Historic Preservation Officers.

Crocker has completed the SARC record search. The Level III Intensive Survey is expected to be completed during Spring 2018. Crocker continues to coordinate with SDSHS on the Project.

6.3 Local Agencies

6.3.1 Clark County

Crocker has been coordinating with Clark County and received a CUP in April 2017. Crocker had informal communication with the Clark County Highway Superintendent while attending County Commission meetings. Crocker will be reaching out following permitting to begin formal coordination on a road use agreement. Additionally, Crocker responded to a March 2017 e-mail from County staff on behalf of the Highway Superintendent regarding projected road use and construction methods, and offered to have a meeting with the appropriate County staff and the Highway Superintendent to continue discussion on road use. As required by the CUP, road use agreements will be in place and provided to Clark County 60 days prior to construction.

6.3.2 Ash, Cottonwood, Spring Valley, Warren, and Woodland Townships

Following the distribution of project notification letters, Crocker placed follow-up calls to townships to address any questions/concerns and offered to attend a township meeting. None of the townships have provided comments on the Project. Crocker will coordinate with townships in the Project Area to execute road agreements in 2018 prior to construction.

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6.4 Native American Tribes and Associated Bodies

Letters were supplied in January 2018 to SHPO and all Tribal governments with historic interests in the area requesting their interest in consultation.

6.5 Non-Governmental Organizations and Others

6.5.1 Interstate Telecommunications Cooperative, Inc.

ITC provided comments on the Project on October 26, 2016. The utility commented on concerns with inductive interference. Consultation on the current layout is underway and Crocker executed an agreement with the ITC on 2/2/18 to mitigate potential impacts.

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