COMMERCE DEPARTMENT

Dodge County Wind Project

Draft Environmental Impact Statement

The Human and Environmental Impacts of Constructing and Operating a 170 MW Wind Farm and Associated 345 kV Transmission Project

July 2019

eDocket Nos. IP-6981/CN-17-306;
IP-6981/WS-17-307; and IP-6981/TL-17-308

Abstract

Responsible Government Unit

Minnesota Department of Commerce
Energy Environmental Review and Analysis
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Dodge County Wind, LLC (DCW or applicant) is proposing to build a 170-megawatt wind farm in Dodge and Steele Counties in southeast Minnesota. The applicant is also proposing to build a 21-mile to 26-mile long 345-kilovolt high-voltage transmission line through Dodge and Olmsted Counties to connect the wind farm to the electric grid. DCW anticipates that construction will begin in 2020, and the project will be in- service in late 2020.

In order to build the project, DCW must obtain three approvals from the Public Utilities Commission (Commission): a certificate of need (CN) for the project as a whole, a site permit for the wind farm, and a route permit for the transmission line. The purpose of this environmental impact statement (EIS) is to provide information the Commission needs to make these permit decisions.

This draft EIS addresses the issues and mitigation measures identified in the Department's scoping decision of April 18, 2019. It evaluates the potential human and environmental impacts of the proposed Dodge County Wind Project and possible mitigation measures including transmission line route, route segment, and alignment alternatives.

This draft EIS was issued on July 29, 2019. It has been issued in draft form so that it may be improved by public comment. Comments on the draft EIS will be accepted through August 30, 2019. Comments should be sent by email, facsimile, or U.S. mail to:

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On-line: http://mn.gov/commerce/energyfacilities

Following the comment period, the draft EIS will be revised to incorporate comments and a final EIS will be issued.

Public hearings will be held in the project area and are anticipated to occur the week of September 16, 2019. Notice of the hearings will be issued separately. An administrative law judge (ALJ) from the Minnesota Office of Administrative Hearings will preside over the hearings. The ALJ will make recommendations to the Commission on the applicants' CN and route permit applications. Commission decisions on the applications are expected in early 2020.

Additional materials related to this project and its permitting proceedings are available on the Department's website: http://mn.gov/commerce/energyfacilities and on the State of Minnesota's eDockets system: https://www.edockets.state.mn.us/EFiling/search.jsp (enter the year "17" and the number "306," "307,"or "308").

Persons interested in receiving future notices about this project can place their names on the project mailing list by contacting docketing.puc@state.mn.us or 651-201-2246 and providing the docket number (17-306, 17-307, or 17-308), their name, email address, and mailing address. Please indicate how you would like to receive notices – by email or U.S. mail.

This document can be made available in alternative formats (i.e., large print or audio) by calling 651-539-1530 (voice).

List of Preparers

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Energy Environmental Review and Analysis
Minnesota Department of Commerce

Acronyms and Abbreviations

AADT	average annual daily traffic
AC	Alternating Current
ACS	American Community Survey
ACSR	aluminum-conductor steel-reinforced
AIMP	agricultural impact mitigation plan
ALJ	administrative law judge
AM	amplitude modulated
amps	amperes
ASTM	American Society for Testing and Materials
BMPs	best management practices
BWSR	Minnesota Board of Water and Soil Resources
CN	certificate of need
Commission	Minnesota Public Utilities Commission
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSAH	County State Aid Highway
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel scale
Department	Minnesota Department of Commerce
DEED	Minnesota Department of Employment and Economic Development
DNR	Minnesota Department of Natural Resources
ECS	Ecological Classification System
EERA	Energy Environmental Review and Analysis
EIS	Environmental Impact Statement
ELF	extremely low frequency
EMF	electric and magnetic fields
EPA	United States Environmental Protection Agency
ESA	Phase I Environmental Site Assessment
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FM	frequency modulated
FSA	Farm Services Agency
GIS	geographic information system
GPS	global positioning system
HAP	hazardous air pollutants
Hz	Hertz
ICDs	implantable cardioverter defibrillators

JEDI	Jobs and Economic Development Impacts
kV	kilovolt
kV/m	kilovolts per meter
MBS	Minnesota Biological Survey
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MET tower	meteorological tower
mG	milliGauss
MHz	megahertz
MMPA	Minnesota Municipal Power Agency
MISO	Midcontinent Independent System Operator
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MW	megawatt
NAAA	National Aviation Aircraft Association
NAC	noise area classification
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHIS	Natural Heritage Information System
NHPA	National Historic Preservation Act
NOX	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPDES/SDS	national pollutant discharge elimination system/sanitary disposal system
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NTIA	National Telecommunications and Information Administration
O&M	operations and maintenance
OAH	Office of Administrative Hearings
PM	Particulate matter
ppm	parts per million
PWI	public waters inventory
RIM	Reinvest in Minnesota
ROI	regions of influence
ROW	right-of-way
RTK GPS	real-time kinematic GPS
SHPO	Minnesota State Historic Preservation Office
SMMPA	Southern Municipal Power Agency
SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional cultural property
UHF	ultra-high frequency
USACE	United States Army Corps of Engineers

USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic chemicals
WCA	Wetland Conservation Act
WMA	wildlife management area
WNS	White Nose Syndrome
WPA	waterfowl production area

Executive Summary

Dodge County Wind, LLC (DCW or applicant) is proposing to build a 170-megawatt wind farm in Dodge and Steele Counties in southeast Minnesota (**Figure ES-1**). The applicant is also proposing to build a 21-mile to 26-mile long 345-kilovolt high-voltage transmission line through Dodge and Olmsted Counties to connect the wind farm to the electric grid (**Figure ES-2**). DCW anticipates that construction will begin in 2020, and the project will be in- service in late 2020.

In order to build the project, DCW must obtain three approvals from the Public Utilities Commission (Commission): a certificate of need (CN) for the project as a whole, a site permit for the wind farm, and a route permit for the transmission line. The purpose of this environmental impact statement (EIS) is to provide information the Commission needs to make these permit decisions.

This EIS evaluates alternatives to the project itself. It also evaluates the potential human and environmental impacts of the proposed project and possible mitigation measures including transmission line route, route segment, and alignment alternatives.

This EIS is not a decision-making document, but rather serves as a guide for decision makers

Project

The Dodge County Wind Project consists of two parts – a wind farm and a transmission line that connects the wind farm to the electrical grid:

- **Wind Farm**: The proposed 170 MW wind farm consists of up to 68 turbines to be located within an area of approximately 52,085 acres (the site) in Dodge and Steele counties. DCW anticipates that the wind farm would consist of 60 GE 2.5 MW turbines and eight (8) GE 2.3 MW turbines, for an installed capacity of 168.4 MW. DCW has identified four alternate turbine locations to provide for some flexibility if there are obstacles facing any of the proposed turbine sites. The wind farm also includes underground electric collection lines, an operation and maintenance building, permanent meteorological towers, and gravel access roads.
- **Transmission Project**: DCW proposes to construct between 21 and 26 miles of 345 kilovolt (kV) transmission line in Dodge and Olmsted counties to connect the wind farm to the electric grid. The 345 kV line would run from the new collector substation (DCW Substation), south of Claremont, to the Byron Substation, near the city of Byron. DCW proposed two possible routes for the transmission line (routes A and B). This EIS also evaluates additional routing alternatives for the transmission line. DCW proposes to use single-circuit monopole structures with heights of 80 to 140 feet, and spans of approximately 400 to 1,200 feet between structures. DCW proposes a typical right-of-way (ROW) of 150 feet, with a narrower ROW (approximately 75 feet) for portions that are within road ROW.

Figure ES-1. DCW Wind Farm

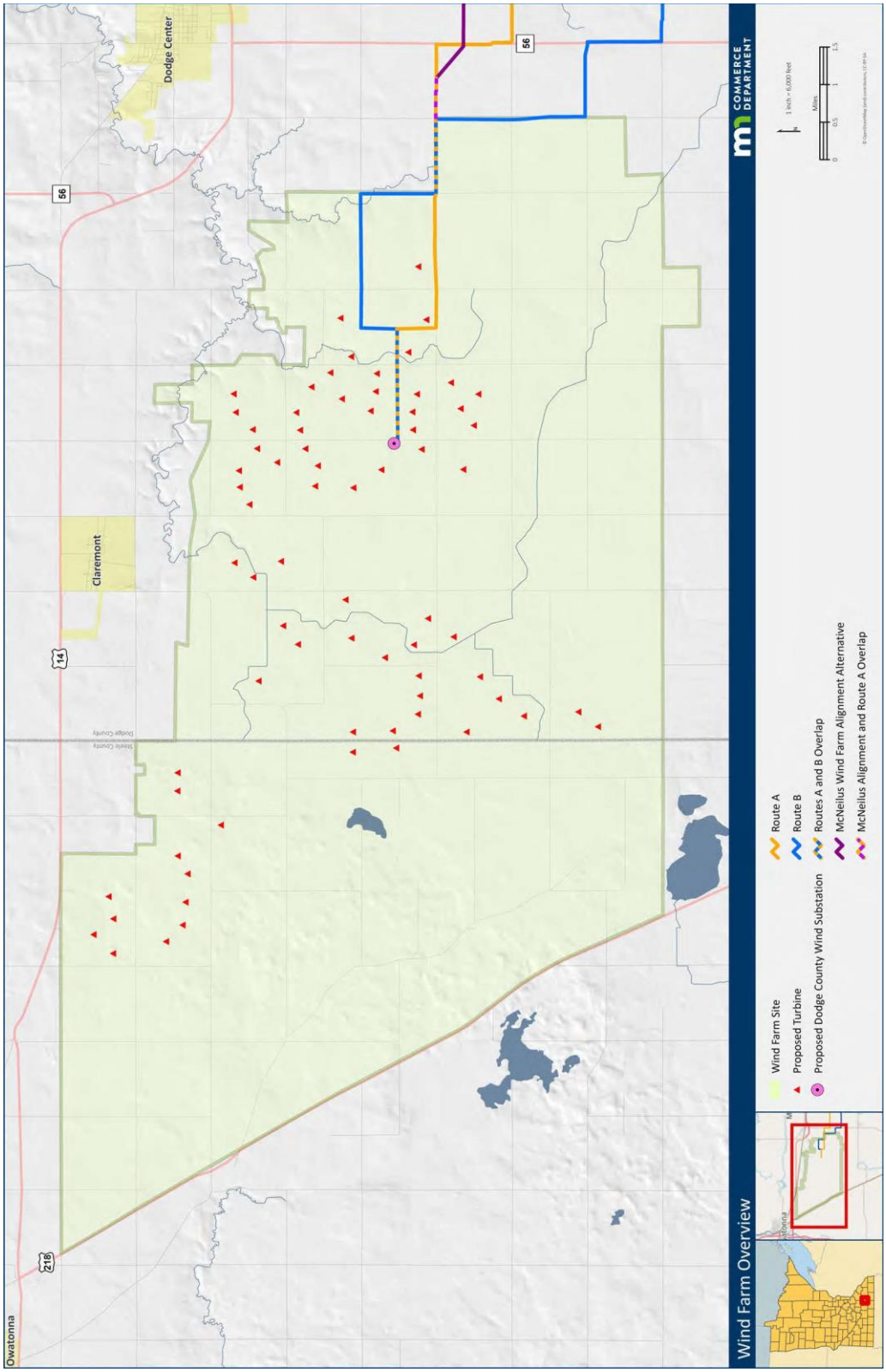
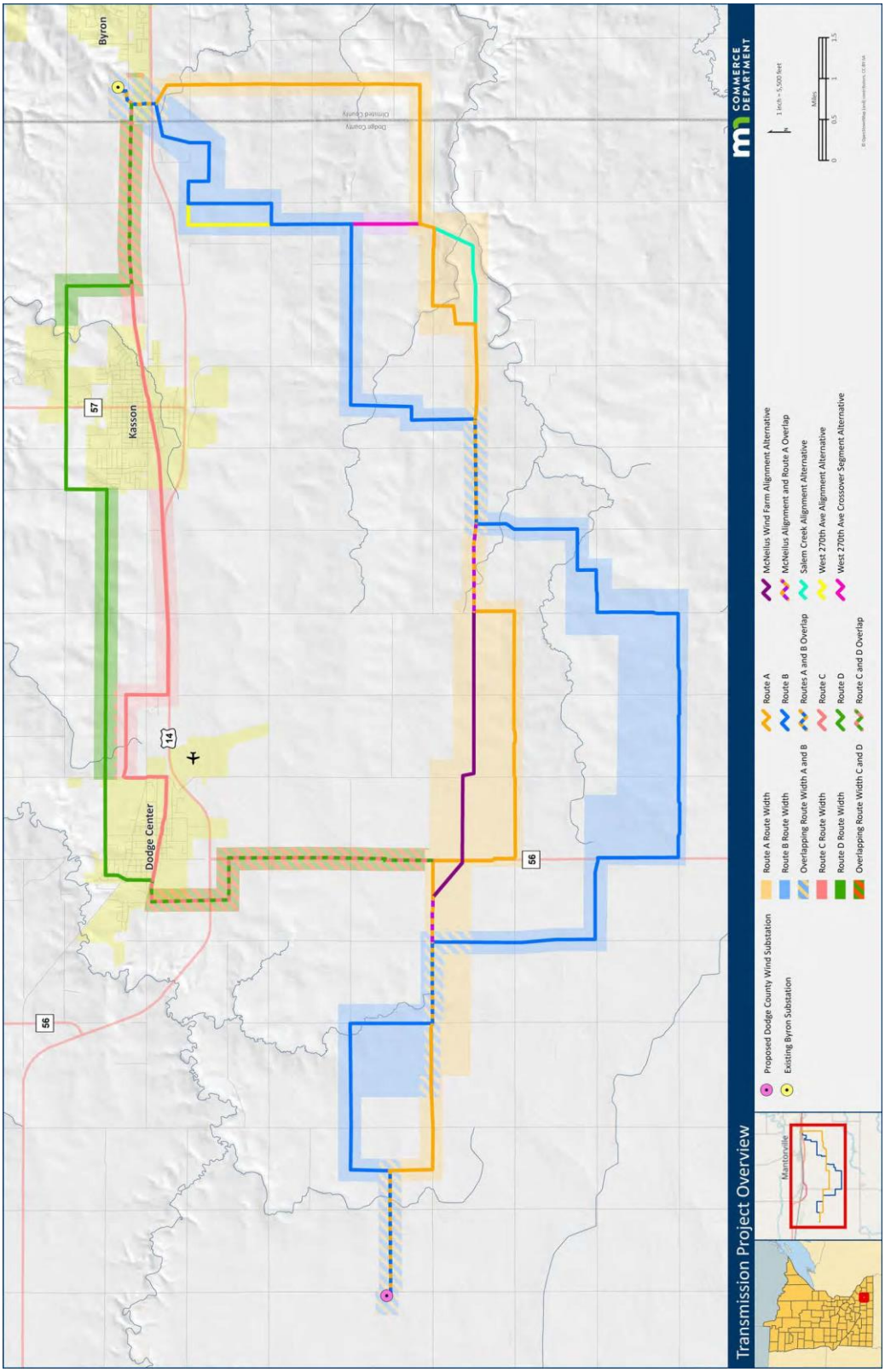


Figure ES-2 DCW Transmission Project – Routing Alternatives



DCW has negotiated a 30-year power purchase agreement to sell the entire output of the project to the Minnesota Municipal Power Agency (MMPA). MMPA is purchasing the power to meet its requirements under the State of Minnesota's renewable energy objectives.

State of Minnesota's Role

In order to build the DCW Project, DCW must obtain three approvals from the Public Utilities Commission (Commission)—a certificate of need (CN) for the project as a whole, a site permit for the wind farm, and a route permit for the transmission line. In addition to these approvals from the Commission, the Project also requires approvals (e.g., permits, licenses) from other state agencies and federal agencies with permitting authority for specific resources (e.g., the waters of Minnesota). Commission site and route permits supersede and preempt all zoning, building, and land-use regulations promulgated by local units of government.

DCW applied to the Commission for a CN, site permit, and route permit for the project in June 2018. DCW amended the applications for the CN and site permit in January 2019. With these applications, the Commission has before it three distinct considerations:

- whether the proposed Project is needed, or whether some other project would be more appropriate for the state of Minnesota, for example, a project of a different type or size, or a project that is not needed until further into the future,
- if the Project is needed, is the wind farm as proposed compatible with environmental preservation, sustainable development, and the efficient use of resources, and
- if the proposed Project is needed, where is the transmission line best located and what conditions should be placed on the route permit.

To help the Commission with its decision-making, the state of Minnesota has set out a process for the Commission to follow in making its decisions. This process requires the development of an EIS and public hearings before an administrative law judge (ALJ).

The goal of the EIS is to describe the potential human and environmental impacts of the project ("the facts"). The goal of the hearings is to advocate, question, and debate what the Commission should decide about the project ("what the facts mean"). The entire record developed in this process—the EIS and the report from the ALJ, including all public input and testimony—is considered by the Commission when it makes its decisions on the applicant's CN, site, and route permit applications.

Certificate of Need Decision

Construction of a large energy facility in Minnesota requires a CN from the Commission. Both the 170 MW wind farm and the 345 kV transmission line meet the definition of a large energy facility and require a CN.

The Commission must determine whether the proposed project is needed or if another project would be more appropriate for the state of Minnesota. Minnesota Rules, part 7849.0120 provides the criteria that the Commission must use in determining whether to grant a CN:

- The probable result of denial would be an adverse effect on the future adequacy, reliability, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states.
- A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record.
- The proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health.
- The record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments.

If the Commission determines that the applicant has met these criteria, a CN is granted. The Commission's CN decision determines the type of project, the size of the project, and the project's termini, or its start and end points. The Commission could place conditions on the granting of a CN.

The CN decision does not determine the locations of wind turbines or the route for transmission line; these determinations are made in the site and route permits for the project.

Need for the Wind Farm

Section 3 of the EIS provides an analysis of impacts associated with the DCW Wind Farm and alternatives to the wind farm portion of the Project. Because the DCW Project is intended to meet renewable energy objectives, wind farm alternatives examined in this EIS are limited to technologies that support renewable energy objectives. These alternatives are:

- a generic 170 MW wind generation project sited elsewhere in Minnesota,
- a 170 MW solar farm, and
- a "no-build" alternative.

The DCW Wind Farm would create human and environmental impacts similar to other large wind projects located in Minnesota:

- With use of mitigation measures outlined in its site permit application and site permit conditions, it is not anticipated that the wind farm would create significant impacts to air quality, water quality, wetlands, solid or hazardous wastes, overall vegetative cover in the project area, non-avian wildlife, rare and unique natural features, or property values.
- The proposed wind farm is consistent with local planning and zoning.
- The wind farm has the potential for impacts to avian and bat populations. DCW has

incorporated pre-construction avian studies in the design and layout of the wind farm. Preconstruction studies have also been used to inform the design of DCW's proposed post-construction avian fatality monitoring. The Commission's Draft Site Permit requires curtailment of turbine operation to minimize avian and bat fatalities, including restrictions on turbine operations during bat migration season and software that allows for adjustment of cut-in speeds during the operational life of the project. The most current Draft Avian and Bat Protection Plan for the project is included as Appendix G.

- The DCW Wind Farm would create noise. The predicted worst-case sound level from the project wind turbines is below the 50 dBA limit at all modeled residences within the site. DCW has incorporated in to the project design a 1,400-foot setback from residences for compliance with MPCA noise standards.
- The DCW Wind Farm would create both short-term and long-term economic benefits. Short-term economic benefits would occur as a result of the approximately 200 temporary construction jobs during the five to seven-month construction period and construction-related spending. DCW estimates expenditures on construction labor to be approximately $62.5 million. Once the project becomes operational, approximately five full-time workers will be required to operate and maintain the facility. Landowners with turbines or other wind farm facilities on their land would receive an annual lease payment for the life of the project. Local governments would receive wind production tax revenues over the operating life of the project. DCW estimates annual wind energy production tax payments of between $570,000 and $700,000 to Dodge County and between $130,000 and $160,000 to Steele County.

Need for Transmission Line

Chapter 4 of the EIS reviews potential impacts and mitigation measures for the proposed 345 kV transmission project as well as alternatives (no-build, other voltages, and alternative endpoints) to the 345 kV transmission project. If a transmission line is not built, the generation from the wind farm would have no outlet; the wind farm would not be financially viable and the project would not be built. Transmission voltages greater than 345 kV, while technically feasible, are in excess of what is required to connect the wind farm to the grid and would have greater costs and impacts than the proposed 345 kV transmission project. Transmission alternatives that connect the wind farm to the grid at a lower voltage are feasible and available, although they would have higher line losses, would subject the wind farm to a higher risk of curtailment, and may be more expensive than the proposed 345 kV transmission project.

Site Permit Decision

A site permit from the Commission is required to construct a large wind energy conversion system (LWECS), which is any combination of wind turbines and associated facilities with the capacity to generate five MW or more of electricity. The DCW Wind Farm will generate up to 170 MW; thus, it requires a site permit

In making a siting decision for the wind farm, the Commission considers factors prescribed in statute and rule. Minnesota Statutes, section 216E.03, identifies considerations that the Commission must take into account when siting wind farms, including potential impacts on human and natural resources. The Commission also must determine that a project is compatible with environmental preservation, sustainable development, and the efficient use of resources.

Section 3 of this EIS examines the potential impacts on human and natural resources from construction and operation of the wind farm. With use of mitigation measures outlined in its site permit application and site permit conditions the DCW Wind Farm is compatible with environmental preservation, sustainable development, and the efficient use of resources.

Route Permit Decision

The Commission is charged with locating transmission lines in a manner that is "compatible with environmental preservation and the efficient use of resources" and that minimizes "adverse human and environmental impact(s)" while ensuring electric power reliability (Minnesota Statutes, section 216E.02).

The EIS evaluates four routes – two proposed by DCW in its application (routes A and B), and two additional routes responding to the Commission's desire to evaluate route alternatives that follow existing 69 kV and 161 kV transmission lines (routes C and D). Additionally, this EIS evaluates three alignment alternatives, and one crossover segment that could be used with routes A and B. Routing alternatives are illustrated in Figure ES-2.

Comparison of Route Alternatives

Minnesota Rules, part 7850.4100 lists 14 factors for the Commission to consider in its route permitting decisions, including impacts on human settlements, impacts on land-based economies, and impacts on the natural environment.

Chapter 6 of this EIS discusses the route alternatives and their merits relative to these routing factors. Potential impacts are anticipated to vary among route alternatives for the following routing factors and elements:

- Displacement: Routes C and D would displace homes, non-residential buildings, and some businesses. It is anticipated that routes A and B can avoid displacement of homes, although there is one home within Route B's anticipated ROW.
- Aesthetics: Because of their proximity to homes and businesses, routes C and D would create significant aesthetic impacts. Both routes A and B are anticipated to have minor to moderate aesthetic impacts.
- Transportation: Both routes C and D conflict with the operation of the Dodge Center Airport. Route C also conflicts with the operation of the Canadian Pacific Railroad. DCW proposes to construct portions of both routes within county road ROW. The placement of routes A and B

along roadways could affect plans for future road expansions or realignments.

- Land-Based Economics: No impacts to forestry or mining are anticipated from the project Overall impacts to agricultural lands are anticipated to be minimal to moderate for all routes, although somewhat greater for routes A and B compared to routes C and D.
- Archaeological and Historic Resources: All routes have the potential to encounter unidentified archaeological sites. Routes A, B, and D are not adjacent to any historic properties. Two historic properties are located adjacent to the anticipated alignment of Route C in downtown Kasson. The Eureka Hotel is within the ROW of the alignment that most closely follows the existing 161 kV line
- Natural Resources: Impacts to wetlands and wildlife wetlands are anticipated to be minimal for all routes. Impact to vegetation are expected to be minimal to moderate for all routes. Impacts to surface waters are expected to be minimal for all routes with common mitigation measures, although routes C and D have fewer water crossings than routes A and B.
- Rare and Unique Natural Resources: Although rare and unique species exist along routes A, B, and C,impacts are expected to be minimal. Proper pole placement should alow routes to span these resources, thereby avoiding direct impacts.
- Use of Existing ROWs: Routes C and D follow existing ROW, although at the expense of dislocating home and businesses. Both routes A and B follow existing infrastructure for a significant portion of their length – 50 percent for Route A and 45 percent for Route B.
- Electrical System Reliability: Neither routes A or B pose system reliability challenges. Route C poses moderate to significant reliability concerns during construction. Route D poses moderate reliability concerns during construction.
- Cost: The only cost differentiator between routes A and B is the length. Because Route A is shorter, the lower cost is reflecitve of its length. Routes C and D would cost roughly double the cost of routes A and B.

The discussion here uses text and a stoplight graphic to briefly summarize the relative merits of the route alternatives (Table ES-1).

Table ES-1. Guide to Relative Merits of Route Alternatives

Anticipated Impact or Consistency with Routing Factor	Color/Shape
Impacts anticipated to be minimal with the conditions in section 5.0 of the Commission's generic route permit – OR- route alternative is very consistent with the routing factor.	
Impacts anticipated to be minimal to moderate with the conditions in section 5.0 of the Commission's generic route permit template; special conditions may be required for mitigation – OR – route alternative is very consistent with the routing factor, but less so than other route alternatives.	
Impacts anticipated to be moderate to significant and likely unable to be mitigated – OR – route alternative is not consistent with the routing factor or consistent only in part.	

These factors and factor elements are summarized in **Table ES-2**. For routing factors where impacts are anticipated to vary with the route alternatives, the graphic represents these anticipated impacts and compares them across alternatives.

Table ES-2. Relative Merits - All Routes

Routing Factor Element	Route A	Route B	Route C	Route D	Summary
Aesthetic Impacts					• Route A is near fewer homess and makes relatively better use of infrastructure than Route B. • Routes C and D are near substantially more homes than either routes A or B. • Route C would substantially alter the aesthetics of the downtown areas of Dodge Center and Kasson, • Route D would substantially alter the aesthetics of the Kasson-Mantorville education complex
Displacement of Homes and Businesses					• There are no homes and 5 buildings within the anticipated ROW of Route A. • There is one home and 5 buildings within the anticipated ROW of Route B. • There are 6 homes and 55 non-residential buildings within the anticipated ROW of Route C. • There are 34 homes and 16 non-residential buildings within the anticipated ROW of Route D
Transportation Impacts					• Portions of routes A and B are within county road ROW. The placement of transmission lines could affect plans for future road expansions or realignments. • Route C conflicts with operation of the railroad and Dodge Center Airport. • Route D conflicts with the operation of the Dodge Center Airport.
Agricultural Impacts					• The overall impact on agricultural lands is anticipated to be minimal to moderate for all routes. • Agricultural impacts are generally greater for routes A and B as a

Routing Factor Element	Route A	Route B	Route C	Route D	Summary
					those routes are located in predominantly agricultural areas, compared to the more urban routing of routes C and D.
Archaeological Impacts	●	●	○	●	• All routes have the potential to encounter unidentified archaeological sites. • Routes A, B, and D are not adjacent to any historic properties. • Two historic properties are located adjacent to the anticipated alignment of Route C in downtown Kasson. The Eureka Hotel is within the ROW of the alignment that most closely follows the existing 161 kV line.
Impact on Surface Waters	◓	◓	●	●	• Impacts to surface waters are anticipated to be minimal for all routes. • There are differences between routes A and B in the Salem Creek area
Impacts to Wetlands	●	●	●	●	• Impacts to wetlands are anticipated to be minimal for all routes. • There are differences between routes A and B in the Salem Creek area
Impacts to Vegetation	◓	◓	◓	◓	• Vegetation impact for all routes would be minimal to moderate. • Because routes C and D parallel existing infrastructure for the majority of their length any impacts are anticipated to be incremental
Impacts to Wildlife	●	●	●	●	• Impacts to wildlife is anticipated to be minimal for all routes
Rare and Unique Natural Resources	◓	◓	◓	●	• Although rare and unique species exist along routes A, B, and C, impacts are expected to be minimal. Proper pole placement should alow either route to span these resources, thereby avoiding direct impacts
Use or Paralleling of Existing Rights-of-	●	◓	●	●	• Route A makes relatively better use of existing infrastructure (roads and transmission lines) than does Route B.

Routing Factor Element	Route A	Route B	Route C	Route D	Summary
Way					• Routes C and D follow existing ROW, although at the expense of dislocation of homes and businesses.
System Reliability	●	●	○	◒	• Neither routes A or B pose a system reliability challenge. • Route C poses moderate to significant reliability concerns during construction. • Route D poses moderate reliabilty concerns during construction.
Costs Dependent on Design and Route	●	◒	○	○	• The only variable in costs between routes A and B is the route length. Because Route A is shorter, the lower cost is reflecitve of its length. • Routes C or D would cost roughly double ($90 to $100 million) the cost of routes A or B.

Because routes C and D are anticipated to create demonstrably greater impacts, including displacement of home and businesses, compared to other routing options, routes C and D are not carried forward for full analysis in this EIS. Routes C and D are evaluated in **Section 5.3**

In addition to the routing factors summarized in Table ES-2, it is important to note that transmission lines are large infrastructure projects that have adverse human and environmental impacts. Even with mitigation strategies, such as prudent routing, there are adverse impact of the transmission project that cannot be avoided. These impacts include long-term aesthetic changes to the project area, temporary construction impacts including noise and dust, loss of some productive agricultural land due to the DCW substation and transmission structures as well as constraints on the layout and operation of field operations, and natural resource impacts.

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1 Introduction

This environmental impact statement (EIS) has been prepared for the Dodge County Wind Project (DCW Project or Project) proposed by Dodge County Wind, LLC (DCW or applicant). This EIS evaluates the potential human and environmental impacts of the proposed project and possible mitigation measures including route, route segment, and alignment alternatives. Additionally, it evaluates alternatives to the Project itself.

This EIS is not a decision-making document, but rather serves as a guide for decision makers. The EIS is intended to facilitate informed decisions by state agencies

1.1 Project

The Dodge County Wind Project (DCW Project or Project) consists of two parts – a wind farm and a transmission line that connects the wind farm to the electrical grid. The Project will generate up to 170 megawatts (MW) of electric energy at a newly constructed Dodge County Wind Farm (DCW Wind Farm) and deliver this energy to the electrical grid at Southern Minnesota Municipal Power Agency's (SMMPA) existing Byron Substation via a newly constructed 345 kilovolt (kV) transmission line.

The proposed 170 MW wind farm (**Figure 1**) consists of up to 68 turbines to be located in Dodge and Steele counties. The wind farm also includes underground electric collection lines, a new collector substation, an operation and maintenance building, permanent meteorological towers, and gravel access roads.

DCW proposes to construct between 21 and 26 miles of 345 kilovolt (kV) transmission line in Dodge and Olmsted counties to connect the wind farm to the electric grid (**Figure 2**). The 345 kV line would run from the DCW Substation, southwest of the city of Dodge Center, to the Byron Substation, near the city of Byron. DCW proposed two possible routes for the transmission line; several segments are common to both proposed routes. DCW proposes to use single-circuit monopole structures with heights of 80 to 140 feet, and spans of approximately 400 to 1,200 feet between structures. For the majority of the proposed routes, DCW proposes a typical right-of-way (ROW) of 150 feet, with a narrower ROW (approximately 75 feet) for portions that are within road ROW. DCW is requesting a route width of 1,500 feet for the majority of the proposed routes, with a wider route width of 3,000 to 4,000 feet along certain segments of the proposed routes. DCW anticipates that construction will begin in 2020, and be in-service in late 2020. DCW has negotiated a 30-year power purchase agreement to sell the entire output of the project to the Minnesota Municipal Power Agency (MMPA). MMPA is purchasing the power to meet its requirements under the State of Minnesota's renewable energy objectives.[1]

[1] Minnesota Statutes 216B.1691.

Figure 1. Dodge County Wind Farm

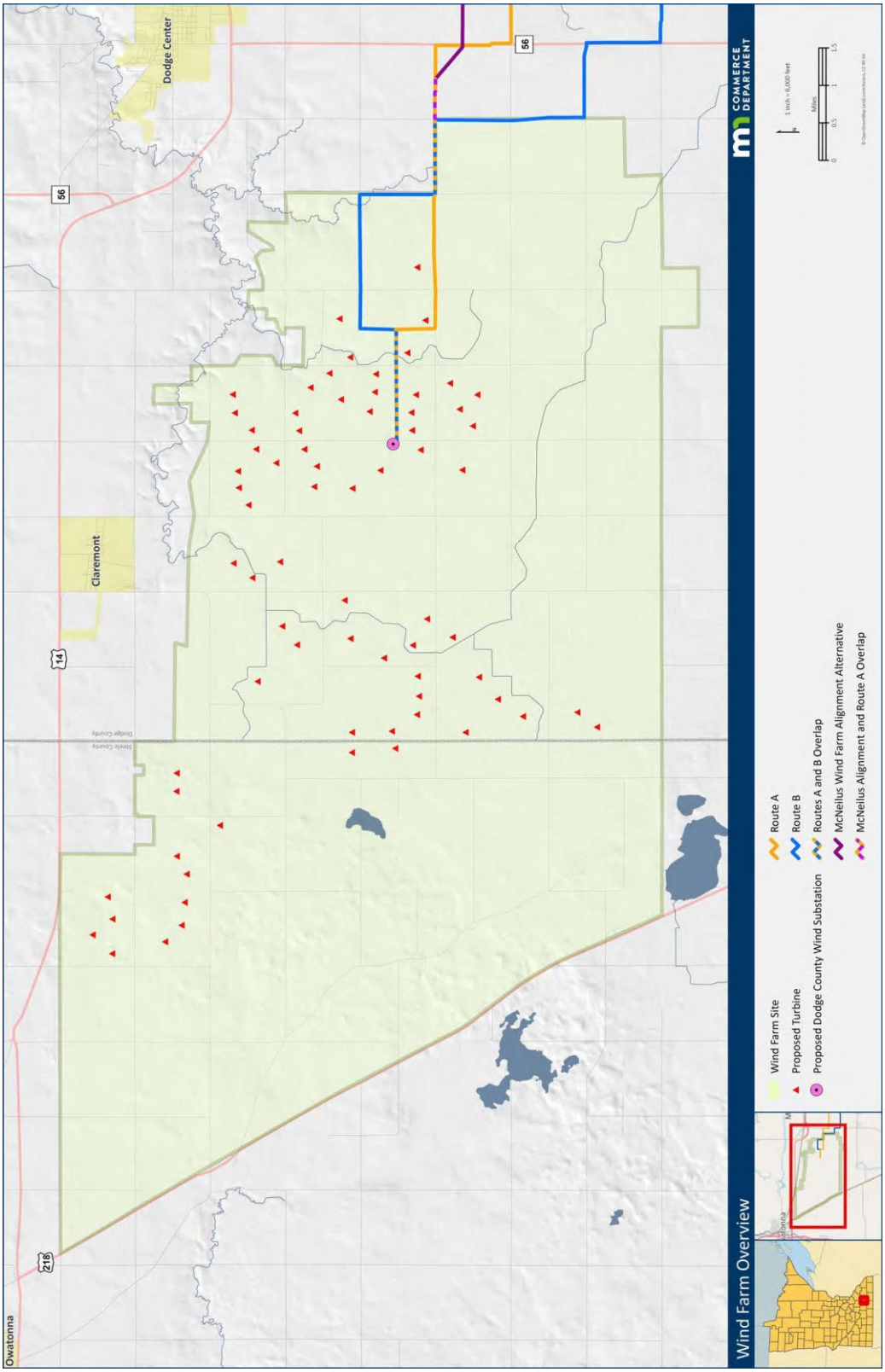
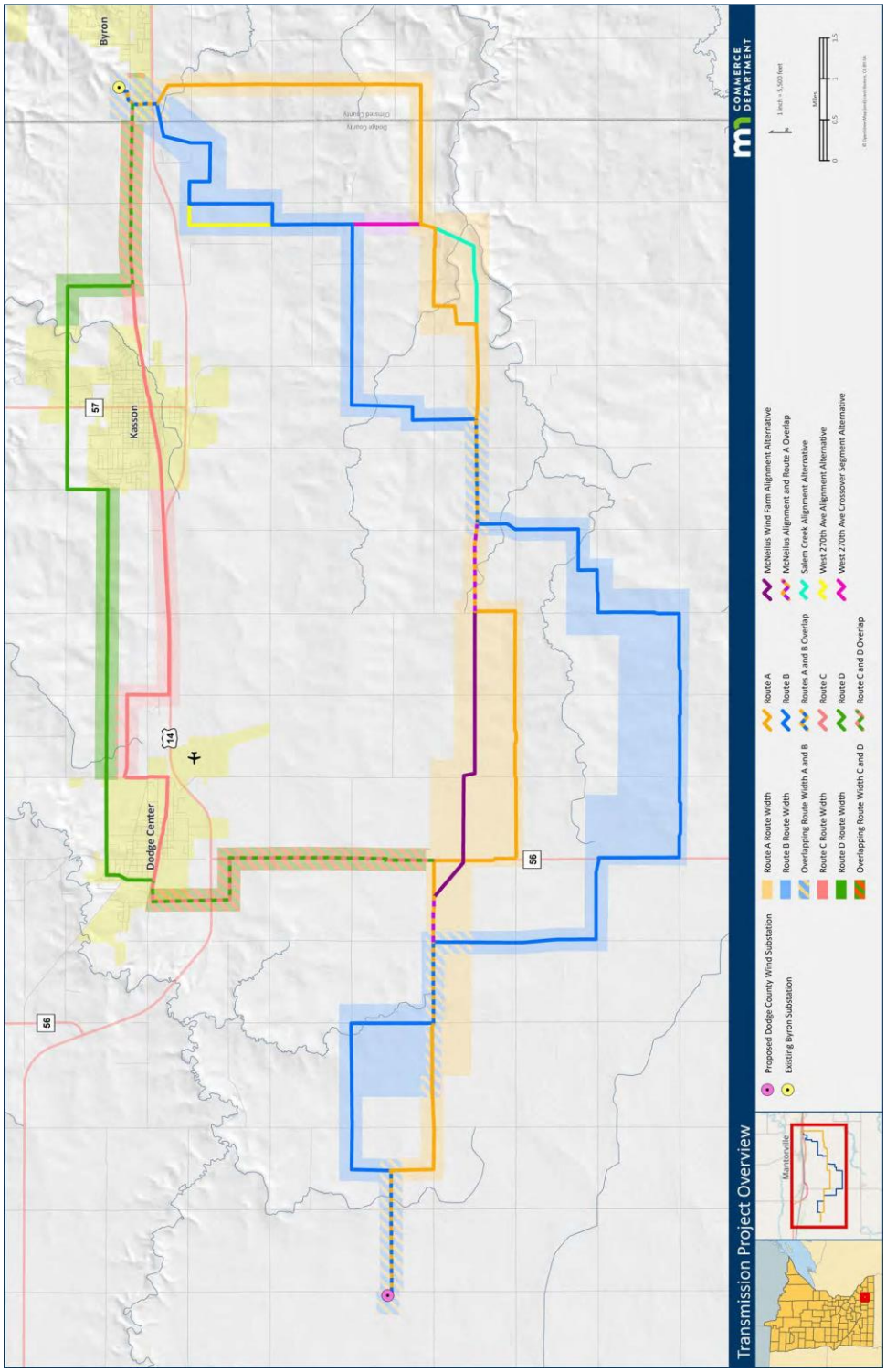


Figure 2. Dodge County Wind Transmssion Project



1.2 State of Minnesota's Role

In order to build the DCW Project, DCW must obtain three approvals from the Public Utilities Commission (Commission)—a certificate of need (CN) for the project as a whole, a site permit for the wind farm, and a route permit for the transmission line. In addition to these approvals from the Commission, the Project also requires approvals (e.g., permits, licenses) from other state agencies and federal agencies with permitting authority for specific resources (e.g., the waters of Minnesota). Commission site and route permits supersede and preempt all zoning, building, and land-use regulations promulgated by local units of government. [2]

DCW applied to the Commission for a CN,[3] site permit,[4] and route permit[5] for the project in late June 2018. DCW amended the CN[6] and site permit[7] applications in January 2019 to incorporate changes in the number, location, and type of turbines used in the wind farm. With these applications, the Commission has before it three distinct considerations:

- whether the proposed Project is needed, or whether some other project would be more appropriate for the state of Minnesota, for example, a project of a different type or size, or a project that is not needed until further into the future,
- if the Project is needed, is the wind farm as proposed compatible with environmental preservation, sustainable development, and the efficient use of resources, and
- if the proposed Project is needed, where is the transmission line best located and what conditions should be placed on the route permit.

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[2] Minnesota Statutes 216E.10

[3] Dodge County Wind, LLC, *Application for a Certificate of Need*, June 29, 2018. eDocket ID: 20186-144410-01, -02, -03, -04, -05, -06, -07 [hereinafter *CN Application*].

[4] Dodge County Wind, LLC, *Application for a Large Wind Energy Conversion System Site Permit, Dodge County Wind, LLC Project*. June 29, 2018. eDocket ID: 20186-144401-01,-02, -03,- 04, -05, -06, -07, 08, -09, -10, 20186-144403-01, -02, -03, -04, -05, -06, -07, -08, -09, -10, 20186-144405-01, -02, -03, -04, -05, -06, -07, -08, -09, 20186-144406-01, -02, -03, -04, -05, -06, -07, -08. [hereinafter *Site Permit Application*]

[5] Dodge County Wind, LLC, *Application to the Minnesota Public Utilities Commission for a Route Permit for a 345 kV High Voltage Transmission Line in Dodge County*, June 29, 2018, eDocket ID: 20186-144407-01,-02, -03,- 04, -05, -06, -07, 08, -09, -10, 20186-144408-0, 02, - 04, -05, -06, -07, 08, -09, -10, 20186-144409-01, 02, -03,- 04, -05, -06,-07, 20187-144643-01 [hereinafter *Route Permit Application*].

[6] Dodge County Wind, LLC, *Certificate of Need Application Amendment*, January 10, 2019, eDocket ID: 20191-149031-01, -03, -05, -07, -9, -11, -13, -15, -17, -19{hereinafter *Amended CN Application*}

[7] Dodge County Wind, LLC, *Site Permit Application Amendment*, January 9, 2019, eDocket ID: 20191-149029-01, -02, -03, -04, -05, -06, -07, -08, -09, -10) {hereinafter *Amended Site Permit Application*]

To help the Commission with its decision-making and to ensure a fair and robust airing of the issues, the state of Minnesota has set out a process for the Commission to follow in making its decisions. This process requires[8]:

- the development of an EIS.
- public hearings before an administrative law judge.

The goal of the EIS is to describe the potential human and environmental impacts of the project ("the facts"); the goal of the hearings is to advocate, question, and debate what the Commission should decide about the project ("what the facts mean"). The entire record developed in this process—the EIS and the report from the administrative law judge, including all public input and testimony—is considered by the Commission when it makes its decisions on the applicant's CN, site, and route permit applications.

1.3 Organization of Environmental Impact Statement

This EIS is based on DCW's certificate of need, site permit, and route permit applications, public comments received during the scoping comment period for this EIS, and input from the Commission. This EIS addresses the matters identified in the scoping decision for this project (**Appendix A**) and is organized as outlined as follows:

Chapter 1	Introduction	Provides an overview of the Project, the state of Minnesota's role, and the organization of the document.
Chapter 2	Regulatory Framework	Describes the regulatory framework associated with the project, including the state of Minnesota's certificate of need and site and route permitting processes, the environmental review process, and the permits and approvals that would be required for the project.
Chapter 3	Proposed Wind Farm and System Alternatives	Describes the engineering, design, and construction of the proposed wind farm. Chapter 3 also discusses the feasibility, availability, and potential impacts of the wind farm and alternatives, including a generic wind farm located elsewhere in Minnesota, a 170 MW solar facility, and a no-build alternative.

[8] Minnesota Statutes 216B and 216E

Chapter 4	Proposed Transmission Project and System Alternatives	Describes the engineering, design, and construction of the proposed transmission project. Chapter 4 also discusses the feasibility, availability, and potential impacts of system alternatives—i.e., alternatives other than a 345 kV transmission line that may meet the stated need for the transmission project.
Chapter 5	Transmission Project - Routing Alternatives	Describes the transmission project including possible routes, route segments, and alignment alternatives. Chapter 5 also describes the route alternatives considered, but not carried forward for full analysis.
Chapter 6	Transmission Project – Affected Environment, Potential Impacts, and Mitigation Measures	Discusses the resources in the project area and the potential human and environmental impacts of the project and identifies measures that could be implemented to avoid or mitigate potential adverse impacts. Chapter 6 also discusses the merits of the routes relative to the routing factors of Minnesota Rules, part 7850.4100
Chapter 7	Cumulative Potential Effects	Describes reasonably foreseeable projects in the project area and assesses the cumulative impacts of the proposed project in the context of these reasonably foreseeable projects.
Chapter 8	References	Provides references for resources used in development of the EIS.

1.4 Describing Potential Impacts and Mitigation

This EIS analyzes potential impacts of both the wind farm and the transmission project on various resources. The discussion of the duration, size, intensity, and location of the impacts provides context. This context is used to determine an overall resource impact level. Impact levels are described using qualitative descriptors. These descriptors are not intended as value judgments, but rather as a means to both ensure a common understanding among readers and compare resource impacts between alternatives.

- **Minimal** - Minimal impacts do not considerably alter an existing resource condition or function. Depending upon the resource and the location, minimal impacts may be noticeable to an average observer. These impacts generally affect common resources over the short-

term.

- **Moderate** - Moderate impacts alter an existing resource condition or function, and are generally noticeable or predictable for the average observer. Effects may be spread out over a large area making them difficult to observe, but can be estimated by modeling or other means. Moderate impacts may be long-term or permanent to common resources, but are generally short- to long-term for rare and unique resources.
- **Significant** - Significant impacts alter an existing resource condition or function to the extent that the resource is severely impaired or cannot function. Significant impacts are likely noticeable or predictable for the average observer. Effects may be spread out over a large area making them difficult to observe, but can be estimated by modeling. Significant impacts can be of any duration, and may affect common and rare and unique resources.

This EIS also discusses ways to avoid, minimize, or mitigate specific impacts. These actions are collectively referred to as mitigation.

- **Avoid** - Avoiding an impact means the impact is eliminated altogether by moving or not undertaking parts or all of a project.
- **Minimize** - Minimizing an impact means to limit its intensity by reducing project size or moving a portion of the project from a given location.
- **Mitigate** - Impacts that cannot be avoided or minimized could be mitigated. Impacts can be mitigated by repairing, rehabilitating, or restoring the affected environment, or compensating for it by replacing or providing a substitute resource elsewhere.

1.5 Sources of Information

The primary sources of information for this EIS are the applications for the CN, site permit, and route permit (and application amendments) submitted by DCW. Additional sources of information are identified in the References section at the end of this document. New and additional data has been included from the applicant and from state agencies. Information was also gathered by visits to the project area.

A number of spatial data sources, which describe the resources in the project area, were used in preparing this EIS (**References**). Spatial data from these sources can be imported into geographic information system (GIS) software, where the data can be analyzed and potential impacts of the project quantified, e.g., acres of wetland within the anticipated right-of-way.

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2 Regulatory Framework

The DCW Project requires three approvals from the Commission – a CN, a site permit for the wind farm, and a route permit for the transmission project. The Project will also require approvals from other state and federal agencies with permitting authority for actions related to the project.

2.1 Certificate of Need

Construction of a large energy facility in Minnesota requires a CN from the Commission.[9] Both the 170 MW wind farm and the 345 kV transmission line meet the definition of a large energy facility and require a CN. DCW submitted a CN application to the Commission on June 29, 2018, and revised the application on January 18, 2019 to incorporate changes in the number, location, and type of turbines used in the wind farm. The Commission accepted the application as complete and referred it to the Office of Administrative Hearings (OAH) for public hearings, to be conducted jointly with the hearings for the site and route permit applications, and authorized the Department of Commerce (Department) to conduct environmental review jointly with the site and route permit applications (**Figure 3**).

2.1.1 Certificate of Need Criteria

The Commission must determine whether the proposed project is needed or if another project would be more appropriate for the state of Minnesota. Minnesota Rules, part 7849.0120 provides the criteria that the Commission must use in determining whether to grant a CN:

- The probable result of denial would be an adverse effect on the future adequacy, reliability, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states.
- A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record.
- The proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health.
- The record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments.

If the Commission determines that the applicant has met these criteria, a CN is granted. The Commission's CN decision determines the type of project, the size of the project, and the project's termini, or its start and end points. The Commission could place conditions on the granting of a CN.

[9] Minnesota Statutes 216B.243.

The CN decision does not determine the locations of wind turbines or the route for transmission line; these determinations are made in the site and route permits for the project.

2.2 Site Permit

A site permit from the Commission is required to construct a large wind energy conversion system (LWECS), which is any combination of wind turbines and associated facilities with the capacity to generate five MW or more of electricity. This requirement became law in 1995. The Minnesota Wind Siting Act is found at Minnesota Statutes Chapter 216F. The rules to implement the permitting requirements are in Minnesota Rule 7854.

The DCW Wind Farm will generate up to 170 MW; thus, it requires a site permit. DCW submitted a site permit application to the Commission on June 29, 2018, and revised the application on January 9, 2019 to incorporate changes in the number, location, and type of turbines used in the wind farm. The Commission issued a Draft Site Permit on April 15, 2019 (**Appendix B**)

2.2.1 Site Permit Decision Criteria

In making a siting decision for the wind farm, the Commission considers factors prescribed in statute and rule. Minnesota Statutes, section 216E.03, identifies considerations that the Commission must take into account when siting wind farms, including potential impacts on human and natural resources. The Commission also must determine that a project is compatible with environmental preservation, sustainable development, and the efficient use of resources.[10]

2.3 Route Permit

Construction of a high-voltage transmission line in Minnesota requires a route permit from the Commission.[11] The DCW Transmission Project, a 345 kV transmission line, meets the definition of a high-voltage transmission line and requires a route permit from the Commission. DCW submitted a route permit application to the Commission on June 29, 2018. After accepting the application as complete, the Commission referred it to the Office of Administrative Hearings (OAH) for public hearings, to be conducted jointly with the hearings for the CN and site permit applications, and authorized the Department to conduct environmental review jointly with the CN application (**Figure 3**).

2.3.1 Route Permit Criteria

The Commission is charged with selecting transmission line routes that minimize adverse human and environmental impacts while ensuring electric power system reliability and integrity. Route permits

[10] Minnesota Statute 216F.03.

[11] Minnesota Statute Section 216E.03.

issued by the Commission include a permitted route and anticipated alignment, as well as conditions specifying construction and operation standards. A sample route permit is included in **Appendix C.**

Minnesota Statutes, section 216E.03, identifies considerations that the Commission must take into account when designating transmission lines routes. Minnesota Rules, part 7850.4100 lists 14 factors for the Commission to consider when making a decision on a route permit:

- Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services.
- Effects on public health and safety.
- Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining.
- Effects on archaeological and historic resources.
- Effects on the natural environment, including effects on air and water quality resources and flora and fauna.
- Effects on rare and unique natural resources.
- Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity.
- Use or paralleling of existing right-of-way (ROW), survey lines, natural division lines, and agricultural field boundaries.
- Use of existing large electric power-generating plant sites.
- Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way.
- Electrical systems reliability.
- Costs of constructing, operating, and maintaining the facility which are dependent on design and route.
- Adverse human and natural environmental effects which cannot be avoided.
- Irreversible and irretrievable commitments of resources.

The Commission must make specific findings that it has considered locating a route for a new transmission line along an existing transmission line ROW or parallel to existing highway ROW and, to the extent these are not used for the route, the Commission must state the reasons why.[12] The Commission may not issue a route permit for a project that requires a CN until a CN has been approved by the Commission, though these approvals may occur consecutively at the same Commission meeting.

[12] Minnesota Statute 216E.03.

The Commission is charged with making a final decision on a route permit within 1 year after finding the route permit application complete. The Commission may extend this time limit for up to 3 months for just cause or upon agreement of the applicant.

2.4 Environmental Review

The Minnesota Environmental Policy Act requires that an EIS be prepared for major governmental actions with the potential to create significant environmental impacts.[13]

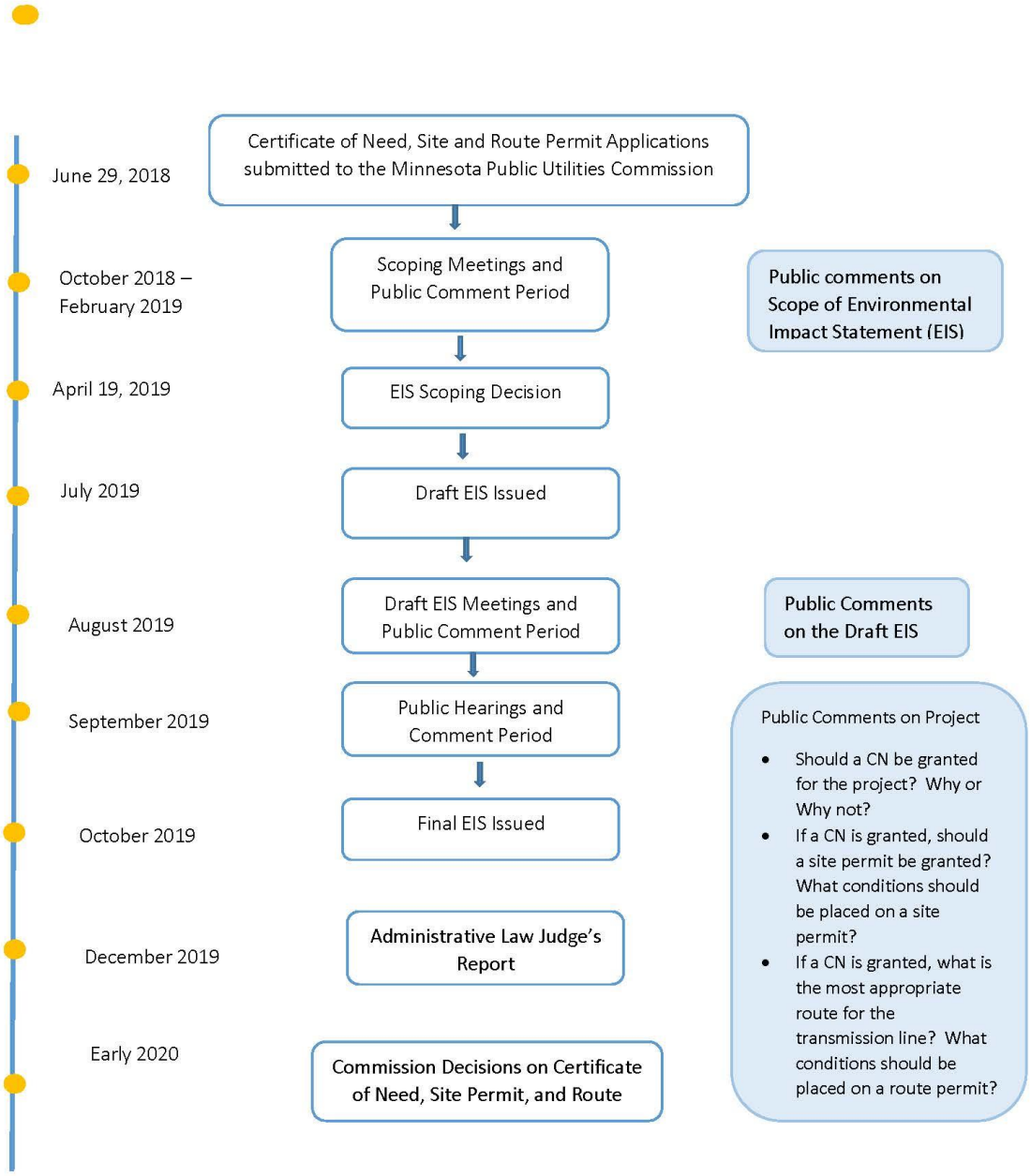
An EIS is intended to facilitate informed decision-making by entities with regulatory authority over a project. It also assists citizens in providing guidance to decision-makers regarding the project. An EIS describes and analyzes the potential human and environmental impacts of a project and possible mitigation measures, including alternatives to the project. It does not advocate or state a preference for a specific alternative. Instead, it analyzes and compares alternatives so that citizens, agencies, and governments can work from a common set of facts.

Before the Commission makes final decisions regarding DCW's CN and site and route permit applications, it must determine whether the EIS is adequate.

When there are multiple applications before the Commission for a single project, the environmental reviews required for each application may be combined. For this project, the Commission has authorized the Department to combine the environmental reviews required for the CN and site and route permits. This EIS addresses the CN and site and route permit applications.

[13] Minnesota Statute 116D.04.

Figure 3. Process Diagram



2.4.1 Environmental Impact Statement

Scoping is the first step in the development of the EIS for the project. The scoping process has two primary purposes:

- gather public input as to the impacts, mitigation measures, and alternatives to study in the EIS.
- focus the EIS on those impacts, mitigation measures, and alternatives that will aid in the Commission's decisions on the certificate of need and route permit applications.[14]

Department staff gathered input on the scope of the EIS through a public meeting and an associated comment period. Commission and Department staff held a joint public information and EIS scoping meeting on October 25, 2018, in the city of Owatonna. Approximately 110 people attended the meeting and 23 people provided comments at the meeting.[15]

A 36-day comment period, closing on November 15, 2018, provided the public an opportunity to submit written comments on potential impacts and mitigation measures for consideration in the scope of the EIS. In response to the amended site permit and CN applications, the Commission issued another comment period, ending on February 6, 2019. Comments were received from citizens and trade associations,[16] as well as the Minnesota Department of Natural Resources (DNR),[17] the Minnesota Department of Transportation (MnDOT)[18] and Dodge County Environmental Services.[19] DCW provided a response to comments on February 13, 2019.[20]

Commenters expressed concern about a variety of potential impacts associated with both the wind farm and transmission line portions of the project, including impacts to agriculture, public safety, noise, aviation, aesthetics, wildlife, sensitive natural communities, property values, local economies, and the overall character of the community.

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[14] "The scoping process must be used to reduce the scope and bulk of an environmental impact statement by identifying the potentially significant issues and alternatives requiring analysis and establishing the detail into which the issues will be analyzed." (Minnesota Rule 7850.2500, subp. 4)

[15] Oral Comments from October 25, 2018, Public Information and EIS Scoping Meeting, eDockets Number 201812-148342-01

[16] Written Public Comments on Draft Site Permit and Scope of EIS, eDockets ID 201812-148342-04, 201812-148342-07,and 201812-148342-10, 20192-150073-02, 20192-150039-02, 20192-150055-01, 20192-150059-01, 20192-149964-01, 20191-149278-01

[17] DNR Scoping Comments, November 15, 2018, eDockets ID 201811-147826-01, DNR Comments, February 6, 2019, eDocket ID: 20192-150042-01, -02, -03

[18] MnDOT Scoping Comments, November 15, 2018, eDockets ID 201811-147810-01

[19] Dodge County Environmental Services Scoping Comments, November 11, 2019, eDockets ID 201812-148342-04.

[20] Dodge County Wind, LLC, *Reply Comments*, February 13, 2019, eDockets Number 20192-150274-01

During the comment period, two specific route alignment alternatives were proposed for consideration in the EIS. In addition, several commenters at the public meeting and in written comments expressed a desire to see the line routed along U.S. Highway 14 to the extent possible, although none of the comments identified a specific route.

On December 20, 2018, Department staff provided the Commission with a summary of the EIS scoping process.[21] The summary discussed the routing alternatives that were proposed during the scoping process and identified two additional alignment alternatives (the West 270th Avenue Alignment Alternative, and the Salem Creek Alignment Alternative) and one short route segment alternative (West 270th Avenue Crossover Segment) that Department staff recommended for evaluation in the EIS. Department staff reviewed but ultimately did not recommend a routing alternative along Highway 14.

In its Order of April 15, 2019, the Commission found that the route alternatives proposed by Department staff were reasonable and appropriate for further analysis in the EIS. The Commission also directed the Department to analyze routes along the existing 161 kV and 69 kV transmission lines to the north of the Applicant's proposed routes and that the analysis consider double-circuiting of the proposed 345 kV transmission line with the existing 161 kV and 69 kV transmission lines.[22] The additional routes proposed by the Commission cross the cities of Dodge Center and Kasson. While acknowledging the potential difficulties of routing a large new transmission line along existing transmission infrastructure, the Commission directed review of the northern alternatives to build a thorough record on a range of route alternatives in order to resolve outstanding questions and enable the Commission to reach a better routing decision.

The Department issued a scoping decision for the EIS on April 18, 2019 (Appendix A). The scoping decision identifies the route, route segment, and alignment alternatives evaluated in this EIS and those alternatives that were not carried forward for evaluation. Department staff provided notice of the scoping decision to those persons on the project mailing list and to all landowners along alternatives newly proposed during the scoping process. Based on the scoping decision, Department staff prepared the EIS.

This draft EIS was issued on July 29, 2019. The EIS is issued in draft form so that it can be improved through public comment. The Department will receive comments on this draft EIS through public meetings and a public comment period. All timely, substantive comments received during the comment period will be included in a final EIS along with responses to the comments and appropriate

[21] Department EERA Comments on EIS Scoping and Route Alternatives, December 20, 2018, eDockets ID 201812-148623-02

[22] Commission, Order Identifying Route Alternatives and Issuing a Draft Site Permit, April 15, 2019, eDocket ID: 20194-151974-03

revisions to the draft EIS. The draft and final EIS will be entered in the records for these proceedings so they can be used by the Commission in making decisions about the project.

2.5 Public Hearing

After close of the comment period on the draft EIS, public hearings, presided over by an administrative law judge (ALJ) from the Office of Administrative Hearings (OAH), will be held in the project area. The hearings will address the need for the project (CN) and, if needed, appropriate site permit conditions for the wind farm and the most appropriate location for the transmission project (route permit). At these hearings, citizens, agencies, and governmental bodies will have an opportunity to submit comments, present evidence, and ask questions. Citizens can advocate for or against the granting of a CN; they can also advocate for what they believe is the most appropriate route for the project and for any conditions to include in a site or route permit. After the public hearings, an evidentiary hearing will be held in Saint Paul, Minnesota. The ALJ will submit a report to the Commission with findings of facts, conclusions of law, and recommendations regarding a CN and a site and route permit for the project. Decisions by the Commission on the CN, and site and route permit applications are anticipated in early 2020.

2.6 Commission Decision

After considering the entire record, including the final EIS, input received during the public hearings, and the ALJ's findings and recommendations, the Commission will determine whether to grant a CN for the project as proposed, grant a CN contingent upon modifications to the project, or deny the CN. The Commission may also place conditions on the granting of a CN.

If a CN is granted, the Commission will also determine the conditions appropriate for the wind farm's site permit and the conditions and route for the transmission line. Site and route permits include conditions specifying construction and operating standards; they also include mitigation plans and project-specific mitigation measures. Route permits include a permitted route and an anticipated alignment,

Decisions by the Commission on the CN and site and route permit applications are anticipated in early 2020.

2.7 Other Permits and Approvals

A site permit for the wind farm from the Commission is the only state permit required for the siting of the wind farm. Likewise, a route permit from the Commission is the only state permit required for the routing of the transmission project (i.e., the Commission's route permit determines where the line will be located). Commission-issued site and route permits supersede local planning and zoning and bind

state agencies;[23] thus, state agencies are required to participate in the Commission's permitting process to aid the Commission's decision-making and to indicate site and routes that are not permittable.

However, various federal, tribal, state, and local approvals may be required for activities related to the construction and operation of the project. All permits subsequent to the Commission's issuance of a route permit and necessary for the project (commonly referred to as "downstream permits") must be obtained by a permittee. The information in this EIS may be used by downstream permitting agencies in their evaluation of impacts to resources. Table 1 lists permits and approvals that could be required for the project, depending on the final design.

[23] Minnesota Statutes, sections 216F.07 and 216E.10

Table 1. Potential Permits and Approvals Required for DCW Project

Unit of Government	Type of Application	Purpose
U.S. Army Corps of Engineers – St. Paul District (USACE)	Section 404 Clean Water Act – Dredge and Fill	Protects water quality through authorized discharges of dredged and fill material into waters of the United States.
	Section 10 – Rivers and Harbor Act	Protects water quality through authorized crossings of navigable waters.
U.S. Fish and Wildlife Service (USFWS)	Section 7 Endangered Species Act Consultation	Establishes conservation measures for endangered species.
	Special Use Permit	Authorization to cross USFWS-owned land or easements.
Federal Aviation Administration (FAA)	Part 7460 Review	Review to prevent airspace hazards due to structures taller than 200 feet.
Native American Tribes	National Historic Preservation Act (NHPA), coordination in support of USACE Section 106 to determine impacts on traditional cultural properties	Coordination to prevent impacts to traditional cultural properties.
Minnesota Department of Natural Resources (DNR)	License to Cross Public Waters	License to prevent impacts associated with crossing public waters.
	License to Cross Public Lands	License to prevent impacts associated with crossing public lands.
	State Threatened and Endangered Species Consultation	Consultation to avoid, minimize, and mitigate impacts to state-listed species.
Minnesota Pollution Control Agency (MPCA)	National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit	Minimizes impacts to waters due to construction of the project.
	Section 401 Clean Water Act – Water Quality Certification	Ensures project will comply with state water quality standards.
Minnesota State Historic Preservation Office (SHPO)	National Historic Preservation Act Section 106 Consultation	Ensures adequate consideration of impacts on significant cultural resources.
Minnesota Department of Agriculture (MDA)	Agriculture Impact Mitigation Plan (AIMP)	Establishes measures for protection of agricultural resources.
Minnesota Department of Transportation (DOT)	Utility Permit	Authorizes accommodation of utilities along highway rights-of-way
	Driveway Access	Authorizes access to driveways along highways.
	Oversize/Overweight Permit	Authorizes the use of roads for oversize or overweight vehicles.
Minnesota Board of Water and Soil Resources (BWSR)	Wetland Conservation Act	Coordination with BWSR and local governments to ensure conservation of wetlands.
Local/County Governments	Wetland Conservation Act, Road Crossing, Driveway, Oversize or Overweight, and Land Permits	Permits from local governments to ensure conservation of wetlands, proper use of local roads and lands.

2.7.1 Federal Approvals

The United States Army Corps of Engineers (USACE) regulates potential impacts to waters of the United States. Dredged or fill material, including material that moves from construction sites into these waters, could impact the quality of the waters. The USACE requires permits for projects that may cause such impacts. The USACE is also charged with coordinating with Native American tribes regarding potential impacts to traditional cultural properties.

The U.S. Fish and Wildlife Service (USFWS) requires permits for the taking of threatened or endangered species. The USFWS encourages consultation with project proposers to ascertain a project's potential to impact these species and to identify general mitigation measures for the project.

The Federal Aviation Administration (FAA) regulates civil aviation, including the airspace used for aviation. The FAA requires permits for tall structures, such as wind turbines and transmission structures, which could adversely impact aviation.

2.7.2 State of Minnesota Approvals

The Minnesota Department of Natural Resources (DNR) regulates potential impacts to Minnesota's public lands and waters. The DNR requires a license to cross public lands and waters; licenses may require mitigation measures. Similar to the USFWS, the DNR encourages consultation with project proposers to ascertain a project's potential to impact state-listed threatened and endangered species and possible mitigation measures.

A general national pollutant discharge elimination system/sanitary disposal system (NPDES/ SDS) construction stormwater permit from the Minnesota Pollution Control Agency (MPCA) is required for stormwater discharges from construction sites. A permit is required if a project disturbs 1 acre or more of land. To ensure that state water quality standards are not compromised, the general NPDES/SDS permit requires:

- use of best management practices,
- a stormwater pollution prevention plan, and
- adequate stormwater treatment capacity once the project is constructed.

The Minnesota State Historic Preservation Office (SHPO) is charged with preserving and protecting the state's historic resources. SHPO consults with project proposers and state agencies to identify historic resources (e.g., through surveys) and to avoid and minimize impacts to these resources.

The Minnesota Department of Agriculture (MDA) ensures the integrity of Minnesota's food supply while protecting the health of its environment and the resources required for food production. MDA assists in the development of agricultural impact mitigation plans (AIMP) to avoid and mitigate impacts to agricultural lands.

A permit from the Minnesota Department of Transportation (MnDOT) is required for transmission lines that are adjacent to or cross over Minnesota trunk highway rights-of-way. MnDOT's utility accommodation policy generally allows utilities to occupy portions of highway rights-of-way where such occupation does not put the safety of the traveling public or highway workers at risk or unduly impair the public's investment in the transportation system.

The Minnesota Board of Water and Soil Resources (BWSR) oversees implementation of Minnesota's Wetland Conservation Act (WCA). The WCA is implemented by local units of government (LGUs). For linear projects that cross multiple LGUs, BWSR typically coordinates the review of potential wetland impacts among the affected LGUs. The WCA requires anyone proposing to impact a wetland to

- try to avoid the impact,
- try to minimize any unavoidable impacts, and
- replace any lost wetland functions.

2.7.3 Local Approvals

The Commission's site and route permits supersede local planning and zoning regulations and ordinances. However, permittees must obtain all local approvals necessary for the project that are not preempted by the Commission's site or route permits—e.g., approvals for the safe use of local roads.

2.7.4 Conservation Programs

As discussed in Section 3.3.4.2, there are lands throughout the wind farm site that are part of various conservation programs including Reinvest in Minnesota (RIM) and the Conservation Reserve Enhancement Program (CREP). Impacts to lands held in conservation are not anticipated as part of the transmission project, but not all land records had been verified at the time of the publication. DCW indicates that it will work with landowners, local governmental entities administering such programs, and sponsoring federal agencies on a site-specific basis to coordinate the approvals necessary for placing the project on these lands.

2.7.5 National Electric Safety and Reliability Code

The project, both the wind farm and the transmission project, must meet the requirements of the National Electrical Safety Code (NESC). Permittees must comply with the most recent edition of the NESC, as published by the Institute of Electrical and Electronics Engineers, Inc., and approved by the American National Standards Institute, when constructing new facilities or upgrading existing facilities.[24]

The NESC is designed to protect human health and the environment. It also ensures that the collection system, the transmission lines and all associated structures are built from high-quality materials that

[24] Minnesota Statute 326B.35.

will withstand the operational stresses placed upon them over the expected lifespan of the equipment, provided that routine maintenance is performed.

Permittees must also comply with North American Electric Reliability Corporation (NERC) standards. NERC standards define the reliability requirements for planning and operating the electrical transmission grid in North America.

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3 Proposed Wind Farm and System Alternatives

DCW proposes to construct, own, and operate a 170 MW Large Wind Energy Conversion System (LWECS or wind farm) consisting of up to 68 turbines to be located within an area of approximately 52,085 acres (the site) Dodge and Steele counties.[25]

This section of the EIS provides a high level analysis of impacts associated with the Wind Farm and alternatives to the wind farm portion of the Project.

If the DCW Project is approved by the Commission, DCW will provide wind-generated electricity through a Power Purchase Agreement (PPA) with Minnesota Municipal Power Agency (MMPA).[26] Production is intended to help MMPA in meeting, and exceeding, its renewable energy objectives under Minnesota Statute 216B.1691. Because the DCW Project is intended to meet renewable energy objectives, wind farm alternatives examined in this EIS are limited to technologies that support renewable energy objectives.

For the wind farm portion of the Project, these alternatives will include:

- a generic 170 MW wind generation project sited elsewhere in Minnesota,
- a 170 MW solar farm, and
- a "no-build" alternative.

3.1 Wind Farm Project Description

DCW anticipates that the wind farm would consist of 60 GE 2.5 MW turbines and eight (8) GE 2.3 MW turbines, for an installed capacity of 168.4 MW. In addition to the proposed turbine locations, DCW has identified four alternate turbine locations to provide for some flexibility if there are obstacles facing any of the proposed turbine sites. [27]

Each tower will be secured by a concrete foundation that varies in design depending on soil conditions. A control panel inside the base of each turbine tower houses communication and electronic circuitry. Each turbine is equipped with a wind speed and direction sensor that communicates with the turbine's control system to signal when sufficient winds are present for operation. Turbines feature variable-speed control and independent blade pitch to ensure aerodynamic efficiency.

Each turbine will be grounded and shielded to protect against lightning. The grounding system installed during foundation work will be designed for local soil conditions and in accordance with local

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[25] *Amended Site Permit Application*, at p. 8.
[26] *Certificate of Need Application*, at p. 2.
[27] *Amended Site Permit Application*, at p. 8.

utility or code requirements. Lightning receptors are placed in each rotor blade and in the turbine tower. The electrical components are also protected.

The turbines have active yaw and pitch regulation and asynchronous generators. The turbines use a bedplate drivetrain design, where all nacelle components are joined on common structures to improve durability.

The rotor consists of three blades mounted to a rotor hub. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system, and other electrical and mechanical systems. Hub heights of 90 meters (GE 2.5 MW turbines) or 80 meters (GE 2.3 MW turbines), and the rotor diameters of 116.5 meters (382 feet), and a rotor speed of 7.4 to 15.7 rotations per minute. A smooth tubular steel tower supports the nacelle and rotor. All modern turbine models contain emergency and backup power systems to allow shutdown of the turbine if power to the grid is lost.

The portion of the foundation that is above ground is roughly 16 feet wide at the base of the tower. The turbine towers, on which the nacelle is mounted, consist of three or four sections welded together at the factory by automatically controlled power welding machines. Welds are and ultrasonically inspected during manufacturing per American National Standards Institute (ANSI) specifications. All surfaces are coated for protection against corrosion in a non-glare white, off-white, or light gray color. Access to the turbine is through a lockable steel door at the base of the tower.[28]

The wind turbines' freestanding tubular towers will be connected to the foundation through a base plate and anchor bolts. Although geotechnical surveys, turbine tower load specifications, and cost considerations will dictate final design parameters of the foundations, DCW anticipates that the concrete foundation will extend approximately 12 feet below grade and 68 feet in diameter and require approximately 600 cubic yards of concrete. The actual soil displacement depends upon soil requirements and turbine size.[29]

All turbines will use Low Noise Trailing Edge serrations along approximately 20 to 30 percent of the trailing edge of the outboard blade to reduce operating noise.[30] The turbine specifications are provided in **Table 2**.

Along with the turbines, the DCW wind farm will include associated facilities (**Table 3**) such as, approximately 41 miles of underground electric collection lines, a new collector substation, an operation and maintenance building, permanent meteorological towers, and approximately 22 miles of gravel access roads.[31]

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[28] *Site Permit Application*

[29] ibid., at p. 133

[30] Ibid., at p., 11

[31] Ibid., at Section 6.6.3.

Table 2. Wind Turbine Specifications[32]

Feature	GE 2.5 MW Turbine	GE 2.3 MW Turbine
Nameplate Capacity	2.5 MW	2.3 MW
Hub Height	90 m (295.3 ft)	80 m (262.5 ft)
Rotor Swept Area	10,656 m² (114,700 ft²)	10,656 m² (114,743 ft²)
Total Height (ground to fully extended blade tip)	148.3 m (486.5 ft)	138.3 m (453.7ft)
Rotor Diameter	116.5 m (382.2 ft)	116.5 m (382.2 ft)
Design Life	Design criteria contemplates 20 years	Design criteria contemplates 20 years
Cut in Wind Speed	3 m/s (10 ft/s)	3 m/s (10 ft/s)
IEC Wind Class	S	S
Cut-Out Wind Speed	32 m/s (105 ft/s) low turbulence, 31 m/s (102 ft/s) medium and high turbulence in 600 sec time interval	32 m/s (105 ft/s) low turbulence, 31 m/s (102 ft/s) medium and high turbulence in 600 sec time interval
Rotor Speed	7.4-15.7 RPM	7.4-15.7 RPM
Tip Speed	81.7-85.4 m/s (268.0-280.18 ft/s)	81.7-85.4 m/s (268.0-280.18 ft/s)
Sound at Turbine	Lw = 110 dBA	Lw = 107.5 dBA
Power Regulation	Blade pitch controls power. Controls included for zero voltage ride through (ZVRT) and enhanced reactive power (0.9 power factor)	Blade pitch controls power. Controls included for ZVRT and enhanced reactive power (0.9 power factor)
Generation	2.5 MW per turbine	2.3 MW per turbine
Tower	Multicoated, conical tubular steel with safety ladder to the nacelle. Rest platforms each section	Multicoated, conical tubular steel with safety ladder to the nacelle and a fall-arresting safety system
Nacelle Bedplate	Cast iron bedplate with fabricated extension to support the generator	Cast iron bedplate with fabricated extension to support the generator
Main Bearings	Roller bearings	Roller bearings
Supervisory Control and Data Acquisition (SCADA)	Each turbine equipped with SCADA controller hardware, software and database storage capability	Each turbine equipped with SCADA controller hardware, software and database storage capability
Federal Aviation Administration (FAA) Lighting	Yes, per FAA permitting	Yes, per FAA permitting

[32] *Amended Site Permit Application*, at Table 3

The DCW Substation is where the 34.5 kV collection lines from the wind turbines are aggregated and stepped up to 345 kV for connection to the utility transmission grid through the proposed 345 kV transmission line. At least one, and up to two permanent meteorological tower(s) used to measure climatic data for predicting and optimizing the Project's operation will also be included within the site.[33]

Table 3. Additional Facilities

Facility Type	Description
Access roads to turbines and laydown areas	• Each turbine will be accessible by a low profile gravel road extending from the turbine base to a public road. The access roads will be all-weather gravel construction and will be approximately 16 feet wide once the wind farm is operational. • Temporary roads will be approximately 40 to 45 feet wide to facilitate turbine construction • Approximately 22 miles of gravel access roads.
Step-up transformers	• Power from each turbine is stepped up from 690 volts to the collector system voltage of 34.5 kV by means of a step-up transformer, mounted on the pad outside the turbine tower.
34.5 kV collector and feeder lines	• Collector and feeder lines are installed in in underground trenches, with a depth of 36 to 48 inches • The collector lines coming into the DCW Substation will combine the electrical output of the wind turbines into two 34.5kV circuits and will be stepped up to the 345kV transmission voltage within the DCW Substation, and then to the Byron Substation, where the project connects to the power grid. • In total, DCW anticipates the total length of collector lines will be approximately 40.7 miles. • Collector lines may be run above ground as existing underground utilities, other infrastructure, shallow bedrock, or sensitive environmental conditions require.
Operation and Maintenance (O&M) Facility	• The O&M Building is planned to be located directly north of the proposed Project substation along 140th Avenue. • Approximately 2 acres will be needed for construction of the O&M.
Meteorological Towers	• One or two permanent meteorological towers may be sited. • Permanent meteorological towers will be free-standing monopole structures and meet FAA and local requirements. • Located no closer than 250 feet from the edge of the road rights-of-way and from the site control boundaries (wind\land rights). • Construction area of 400x400 feet with permanently affected area of less than 0.1 acres.
Construction Staging and Turbine Laydown Areas	• 10-acre turbine laydown and construction staging area for turbine components during construction • Other temporary staging areas may be needed for parking and unloading of large equipment deliveries.

[33] *Site Permit Application*, at p. 14.

DCW Substation	• The DCW Substation is planned to be located on approximately one acre west of 140th Avenue and north of 670th Street in Ripley Township, Dodge County. .
Site Control and Data Acquisition (SCaDA) system	• Each turbine is equipped with SCADA controller hardware, software and database storage capability • Remotely monitors the conditions of the wind farm and alerts technicians to any irregularities with the wind turbines, circuit breakers, meters, meteorological equipment, etc.

3.1.1 Project Location

The Project is located in Steele and Dodge counties in southern Minnesota, southwest of Dodge Center, Minnesota. The site is within Aurora, Havana, and Owatonna townships in Steele County and within Ashland, Claremont, Hayfield, Ripley, and Westfield townships in Dodge County (**Figure 1**). **Table 4** lists the Township, Range, and Sections in which the project is located.

Table 4. DCW Wind Farm Location[34]

County Name	Township Name	Township	Range	Sections
Steele	Aurora	106N	19W	1-17, 21-28, 34-36
Steele	Havana	107N	19W	26-36
Steele	Owatonna	107N	20W	25, 36
Dodge	Ashland	106N	17W	6, 7, 18-20, 29-32
Dodge	Claremont	107N	18W	31-35
Dodge	Hayfield	105N	17W	6
Dodge	Ripley	106N	18W	1-36
Dodge	Westfield	105N	18W	1

Within the approximately 52,085 acre site, DCW has secured wind rights for approximately 16,121 acres of private land, or approximately 89 percent of the land required for the wind farm.[35] DCW intends to commence construction in early 2020, and commence commercial operation of the Project by the end of October 2020.[36]

The site is located in a predominately agricultural area of southern Minnesota. Land use within the project area is primarily agricultural and is the use that accounts for approximately 45,530 acres, or approximately 87% of the site (**Appendix D**) with an additional 5% of land indicated as hay/pasture/herbaceous land cover.[37]

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[34] *Site Permit Application*, at p. 14.

[35] *Amended Site Permit Application*, at p. 8.

[36] Response to Data Request Question 10 (**Appendix M**)

[37] *Site Permit Application*, at p.80.

The preliminary site layout is shown on in the maps in **Appendix D**. The wind farm design/layout incorporates the wind energy conversion facility siting criteria outlined in the Commission's Order Establishing General Wind Permit Standards (Docket No. E, G999/M-07-1102, January 11, 2008 - Commission General Permit Standards) and the Department's Site Permit Application Guidance.[38] The Applicant also incorporated avoidance and setback recommendations from Steele and Dodge counties (**Table 5**).[39]

Table 5. Wind Project Setback Comparison

Resource	Commission	Steele County	Dodge County
Non-participating/ Participating Property Lines	3 RD on non-prevailing wind axis and 5 RD on prevailing wind axis from non-participating property lines[1]	Greater of 5 times the RD or total height from neighboring property lines	Same as MPUC
Residential Dwellings	500 feet and sufficient distance to meet state noise standard.	Minimum of 750 feet from neighboring dwellings	Greater of 750 feet from participating dwellings and 1,000 feet from non-participating dwellings or compliance with noise standard
Meteorological Towers	250 feet from the edge of road ROW and boundaries of developer's site control, or consistent with county ordinances, whichever is more restrictive.	Total height of tower.	Greater of 250 feet or 1.1 times tower height (1.2 times tower height for non-participating residences). Guy wires must meet the setback.
Other Structures	None specified.	None specified	None specified.
Public Roads	250 feet (76 meters)	Total height minimum front yard setback for district (100 feet in Agricultural district), whichever is greater	250 feet or 1.1 times total height from the property line, ROW or easement, whichever is greater
Recreational Trails	250 feet (76 meters)	None specified	300 Feet
Public Lands	Generally not permitted on public lands. Wind Access buffer applies.	None specified	Same as MPUC
Wetland, Streams and Ditches	No turbines, towers or associated facilities allowed. Electric collector and feeder lines may cross or placed subject to DNR, FWS, and/or USACOE permits.	None specified	No turbines, towers or associated facilities located within any type of wetland
Internal Turbine Spacing	3 RD on east-west axis and 5 RD on north south axis[1]	Wind access buffer	Wind access buffer

[38] Ibid. at pp.8-11.

[39] Ibid. at p.22.

Resource	Commission	Steele County	Dodge County
Public Conservation Lands	None specified.	None specified	Wind access buffer
Native Prairies	Turbines and associated facilities shall not be placed in native prairies, unless approved in the native prairie protection plan	None specified.	Turbines and associated facilities will not be placed in native prairies unless approved in the native prairie protection plan
Sand & Gravel Operations	Turbines and associated facilities shall not be placed in active sand and gravel operations, unless negotiated with landowner.	None specified.	No turbines, towers or associated facilities in active sand or gravel mines.
Aviation	Turbines and associated facilities shall not be located so as to create an obstruction to navigable airspace of public and private airports.	None specified.	Same as MPUC
[1] For both GE2.3 and GE 2.5 turbines, 3 RD is turbine is 349.5 meters (1,147 feet); 5RD e is 582.5 meters (1,911 feet). [3] 1.1 times tower height is 88 meters (289 feet)for GE 2.3 turbines, and = 99 meters (325 feet) for GE 2.5 turbines.			

3.1.2 Project Cost and Schedule

The installed capital costs for the proposed wind farm are estimated to be approximately $250 million, including development, design and construction of the facilities. Ongoing operations and maintenance costs are estimated to be approximately $2.5 million in year one, and approximately $750,000 annually for the remaining 29 year life of the project.[40]

Depending on interconnection process completion, permitting, and other development activities the Project is expected to achieve commercial operation by the fourth quarter 2020.

3.1.3 Project Decommissioning

Information in this section is adapted from the Decommissioning Plan prepared by DCW for both the wind farm and transmission aspects of the project are discussed in **Appendix F**. Decommissioning of the transmission project is discussed in **Section 4.1.7**.

The anticipated lifespan of the wind farm is 30 years.

[40] *Site Permit* Application, at p. 135DCW Response to Data Request 8, **Appendix M**

At the end of the project's useful life DCW will disconnect the Project from the grid by tripping the 345 kV breaker at the DCW Substation, opening the 345 kV circuit, and working with SMMPA to safely disconnect the conductors at the Byron Substation.

The decommissioning of the wind farm will look like the installation, but in reverse order. A crane will be used to remove hub and blades from the nacelle and placed on the ground. . Once on the ground, a crew and small crane will remove the blades from the hub. Disassembled, blades will be placed into a carrying frame and loaded onto a truck for removal from the site. The hub will also be loaded onto a truck for removal.

After removal of the rotor, the crane will remove the nacelle and then take down the tower section by section. Turbine foundations will be removed to a depth of four feet and removed from the site unless the landowner wishes to keep the extracted concrete. If landowners prefer to keep extracted concrete, the concrete will be crushed and provided to the landowner.

Pad mounted transformers will be disconnected and removed from the site. The concrete pads will be crushed and hauled offsite, unless the landowner requests to retain the concrete

A crane will be used to dismantle MET towers from the top down and will be loaded onto trucks to be removed from the site.

Unless a landowner informs DCW otherwise, access road, will be removed and the land will be restored.

Underground collection lines buried above four feet below the surface will be removed. Underground collection buried greater than four feet below the surface will be abandoned in place unless requested by the landowner or other entity. In certain cases, landowners may wish to abandon underground collector lines in place when located above four feet below the surface to minimize impacts to the environment. Site permits issued by the Commission require that any agreement between landowners and DCW to leave underground cables in place at a lesser depth or no removal must recorded with the county and show the location of all remaining infrastructure. If the cables are to be removed, a trench will be opened the cables pulled out, cut into manageable lengths and removed from the site.

All unsalvageable materials will be disposed of at authorized sites in accordance with applicable regulations.

After dismantling the Project, DCW, or its contractor, would remove components having salvage value. Generally, turbines, transformers, electrical components, towers, and transmission poles are refurbished and resold or are recycled for scrap. . Decommissioning of the existing turbines will include removal and transport of generators and towers offsite to disposal facilities and/or sale of towers and generators. Unless expressly requested by the landowner, non-salvageable material will be broken down for transport, removed from the site, and disposed at an authorized site in accordance with applicable regulations

DCW estimates the decommissioning costs for the wind farm to be approximately $6.5 million out of a net total cost of $10.2 million (salvage value for both the wind farm and transmission line was estimated at $2.2 million). DCW plans to establish performance bonds with Dodge, Steele, and Olmsted counties for the total amount of infrastructure located within each county. DCW is currently negotiating with counties to determine the specific requirements of the bond.

3.2 Project Alternatives

The Commission must consider alternatives to the proposed Project.[41] In addition to evaluating alternatives and their impacts, a no build option must also be evaluated. This section provides a discussion of alternate power sources to the DCW Wind Farm.

The alternatives considered would generate energy equivalent to that of the proposed wind farm and provide renewable, low, or zero carbon emission energy. Typically, alternatives to the project would include generation facilities of all types, including plants that use coal, natural gas, fuel oil, or similar non-renewable fuels, as well as transmission facilities (to import energy) in lieu of generation. However, because the proposed wind farm would be producing renewable energy for use in Minnesota and the surrounding area, alternatives considered here were selected as they are technologies eligible to be counted toward renewable energy objectives.[42] Alternatives to the transmission project associated with the wind farm are discussed in **Chapter 4**.

Alternatives evaluated include:

- a 170 MW wind generation plant sited elsewhere in Minnesota,
- a 170 MW Solar Farm, and
- a “no build” alternative.

3.2.1 170 MW Wind Farm

An alternative to the proposed wind farm that would utilize an eligible renewable energy resource is a wind farm sited elsewhere in Minnesota. Such a project could be an approximately 170 MW Project or a combination of smaller dispersed projects. The analysis in this EIS will attempt to describe differences in the impacts associated with a generic 170 MW wind farm sited in Minnesota and the proposed DCW Wind Farm.

3.2.2 170 MW Solar Farm

Another alternative renewable energy source to the DCW Wind Farm is a solar farm of similar electricity generation as the proposed project. A photovoltaic power station, also known as a solar

[41] Minnesota Rule 7849.1200

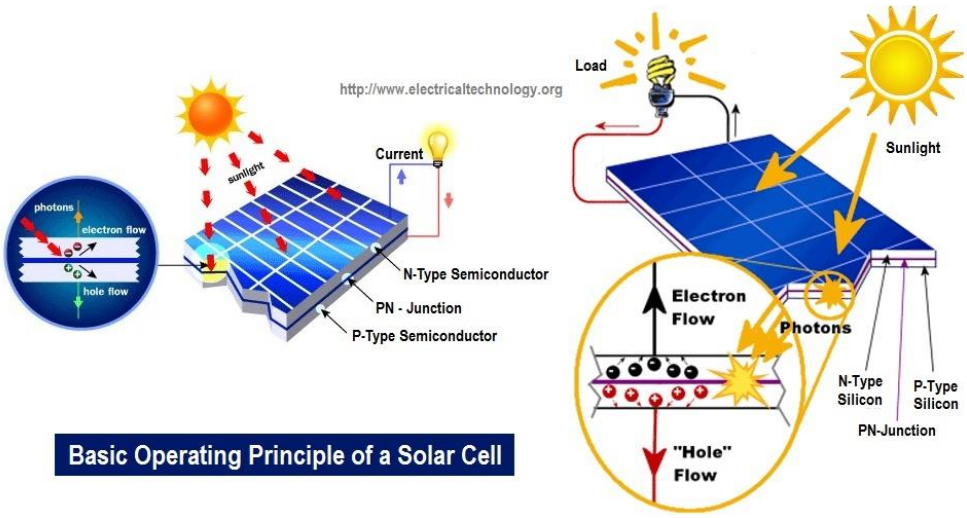
[42] Minn. Statute 216B.1691, Subd. 1. Eligible energy technologies include technologies that generate electricity from solar, wind, hydroelectric, hydrogen, or biomass.

farm, is a large-scale photovoltaic system (PV system) designed for the supply of power into the electrical grid. They are differentiated from most building-mounted and other decentralized solar power applications because they supply power at the utility scale, rather than to a local user or users. As with the generic wind farm alternative, the solar farm alternative could be at a single site, or could be several smaller utility-scale sites.

The analysis for this alternative relies on data from two, single site solar installations in Minnesota, the 100 MW North Star Solar project and the 63.25 MW Marshall Solar Project.[43] While the capacity of the operating projects is less than the proposed DCW Wind Farm, many of the impacts are similar. Significant differences, such as the amount of acreage required for a 170 MW solar farm versus the acreage required for the operating projects are highlighted in the discussion of impacts.

PV systems convert both direct and indirect solar energy (direct and scattered sunlight) to electrical energy by capitalizing on nature's inherent desire to keep electrical charges in balance (Figure 4). At the most basic level, electrical current is the flow of electrons through a conductor. When solar radiation strikes a PV cell some of it is absorbed, exciting electrons within the cell. Some of these electrons move freely between layers from negative to positive. In the process, electrons from the positive layer are disrupted and "flow" back to the negative layer through the external load creating a continuous flow of electrons, or, a continuous flow of electric current.

Figure 4. Solar Cell [44]



[43] North Star Solar PV, LLC Project, eDocket No. IP6943/GS-15-33, Marshall Solar Project, eDocket No. IP6941/GS-14-1052.

[44] Source: https://www.electricaltechnology.org/2015/06/how-to-make-a-solar-cell-photovoltaic-cell.html

3.2.3 No Build Alternative

The no build alternative assumes no wind project is constructed. The analysis for this alternative considers the potential benefits and drawbacks of not constructing the DCW Wind Farm.

The no build alternative analyzes the impacts of the status quo. For example, with a proposed roadway project, the no build alternative assesses the impacts associated with not improving the roadway. This includes potential traffic increases on nearby roads and highways, increased maintenance costs, and longer travel times.

For the proposed wind farm, the primary impacts of the no build alternative are: (1) reducing the state's ability to meet its renewable energy objectives, (2) the loss of economic benefits in the project area, and (3) the possible negative impact of providing replacement electricity from a non-renewable energy source.

The potential impacts of the no build alternative are discussed below.

Renewable Energy Objectives

Minnesota has committed to a renewable energy objective of generating 25 percent of its electricity from eligible renewable sources by the year 2025.[45] Minnesota utilities forecast the need for 5,841 MW of renewable generation by the year 2025 to meet this objective.[46] {If the DCW Wind Farm is not built, it could reduce the state's ability to meet renewable energy objectives. While possible to site a wind elsewhere in in Minnesota, there are areas in the state that have better wind resources than others as shown in **Figure 5.**

3.2.3.1 *Loss of Economic Benefits*

If the proposed wind farm is not built, there would be a loss of economic benefits in the project area. Landowners would lose lease payments over the operational life of the project. Local governments would lose wind energy production tax revenues. The wind farm will pay a Wind Energy Production Tax to the local units of government of $0.0012 per kilowatt-hour (kWh) of electricity produced. This would result in an estimated annual Wind Energy Production Tax revenues of between $570,000 and $700,000 in Dodge County, and between $130,000 and $160,000 in Steele County.[47]

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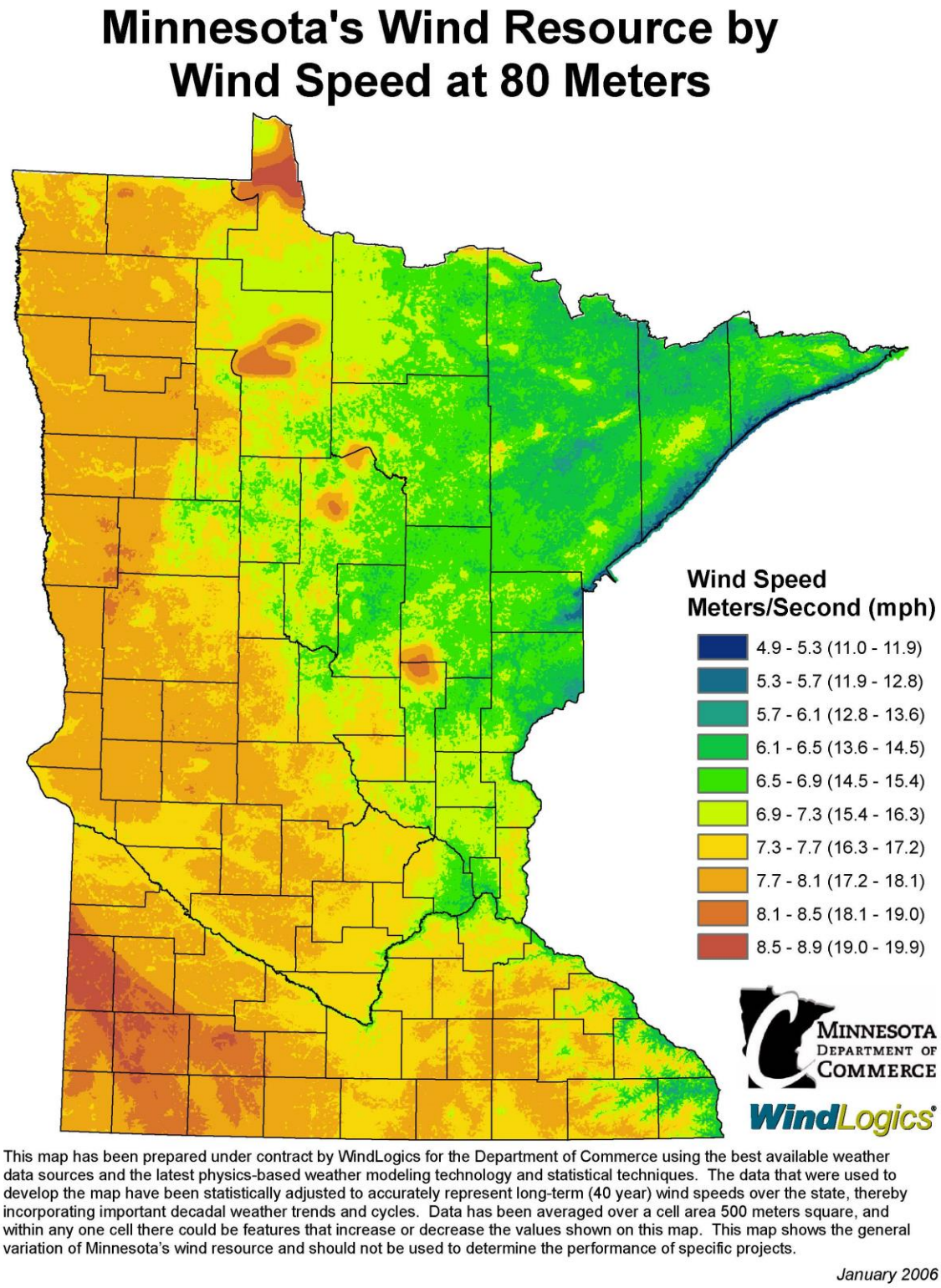
[45] Minn. Statute 216B.1691

[46] Minn. Statutes 216C.05

[47] *Site Permit Application*, at p. 86.

Figure 5. Minnesota Wind Resource Map[48]



This map has been prepared under contract by WindLogics for the Department of Commerce using the best available weather data sources and the latest physics-based weather modeling technology and statistical techniques. The data that were used to develop the map have been statistically adjusted to accurately represent long-term (40 year) wind speeds over the state, thereby incorporating important decadal weather trends and cycles. Data has been averaged over a cell area 500 meters square, and within any one cell there could be features that increase or decrease the values shown on this map. This map shows the general variation of Minnesota's wind resource and should not be used to determine the performance of specific projects.

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If the DCW Wind Farm is not constructed, there would be a loss of revenue to local businesses. The proposed wind farm is expected to generate approximately 200 temporary construction jobs and five (5) permanent operation and maintenance jobs.[49] These employment opportunities and associated income would be lost if the project is not built. If the DCW Wind Farm is not constructed, local labor would not be employed in the construction or operation of the project, although to some degree this loss would be offset by other employment opportunities. The location of these opportunities is unknown.

3.2.3.2 Replacement with a Non-Renewable Resource

Impacts of non-renewable energy sources vary. However, it is possible that if the DCW Wind Farm is not built, the electrical power it would have produced may be replaced with a non-renewable energy resource. The projected average annual output from the DCW Wind Farm is approximately 636,605 megawatt-hours. [50] Though the impacts associated with non-renewable sources vary, it is possible to estimate, as an example, the impact of replacing the DCW project MWh/year output with natural gas or, less likely, coal energy. However, since no non-renewable proposals are being considered in this case, that comparative analysis is not pursued in this review.

Benefits

Benefits of not building the project include avoidance of potential human and environmental impacts associated with the proposed wind farm. These potential impacts are discussed further below in this section for the wind farm and in Chapter 6 of this EIS for the associated transmission project.

3.3 DCW Wind Farm and Alternatives - Human and Environmental Impacts

The proposed wind farm and the project alternatives have the potential for human and environmental impacts, which are discussed below, along with possible mitigation strategies.

3.3.1 Air Quality

Electric generation facilities may emit air pollutants during construction and operation. This EIS examines air emissions as required by Minnesota Rule 7849.1500, subp. 2.

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[48] Minnesota Department of Commerce, Map Resources https://stage.wcm.mnit.mn.gov/commerce/industries/energy/technical-assistance/maps.jsp

[49] *Site Permit Application*, at p. 85

[50] *Amended Site Permit Application*, at p. 26.

3.3.1.1 Criteria Pollutants

Minnesota Rule 7849.1500 requires examination of emissions of the following pollutants: sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon dioxide (CO_2), mercury (Hg), and particulate matter (PM). These common pollutants (other than mercury) are known as criteria pollutants.[51]

DCW Wind Farm

The proposed wind farm would not emit criteria pollutants during operation. Impacts from construction would be short-term and temporary as a result of construction. Impacts would include dust due to earth moving and emissions from diesel-powered construction equipment.

Dust and emissions associated with the construction of the project would be similar to large scale outdoor construction activities such as road work and residential developments. The project site includes multiple construction "sites" for installing individual turbines and access roads. Dust from construction traffic can be controlled using standard construction practices such as watering of exposed surfaces, covering of disturbed areas, and reduced speed limits on site. Once construction is completed, air and dust emissions related to vehicular traffic would be reduced. Limited emissions would be associated with routine maintenance and repairs.

Generic 170 MW Wind Farm

A generic 170 MW wind farm would not emit criteria pollutants during operation, and would have ancillary emissions (construction, transmission line) similar to those of the proposed project.

170 MW Solar Farm

As with the proposed project, a solar farm would not emit criteria pollutants during operation. Temporary air quality impacts would occur during the construction phase of the solar farm project. Once operational, the project would not generate criteria pollutants or carbon dioxide.

During construction of the solar farm project short-term air emissions are expected as a result of vehicle exhaust from the construction equipment and from vehicles traveling to and from facility location. The magnitude of the construction emissions is influenced heavily by weather conditions and the specific construction activity occurring. Exhaust emissions from primarily diesel equipment would vary according to the phase of construction but would be minimal and temporary.

In addition to emissions from construction equipment, short-term air quality impacts from fugitive dust may result from travel on unpaved roads, some grading at the site and excavation required for trenching for electrical and communications cables, foundations for inverter boxes, O&M buildings and, depending upon site conditions, solar array piers at some locations. Fugitive dust is considered

[51]United States Environmental Protection Agency(EPA). *Criteria Air Pollutants*. https://www.epa.gov/criteria-air-pollutants

particulate matter under air quality regulations. The concentrations of fugitive dust that is fine particulate matter (P.M. less than 2.5 microns or PM2.5) is generally small, or approximately 3 percent to 10 percent of total particulate matter (US Environmental Protection Agency (EPA) AP-42, Sections 13.2 and 11.9). Since fine particulate matter has the potential to travel further into the lungs, it is of greater concern than larger particle size ranges.

Mitigation

Dust from construction activity can be controlled using standard construction practices such as watering of exposed surfaces, covering of disturbed areas, and reduced speed limits on site. Emissions from construction vehicles can be minimized by limiting construction equipment idling to the extent practical when not in use; and following equipment manufacturer-recommended operations and good combustion practices, including not tampering engines to increase horsepower and using ultra-low sulfur diesel.

3.3.1.2 Hazardous Air Pollutants and Volatile Organic Compounds

Electric generation facilities have the potential to emit air pollutants during construction and operation. Minnesota Rule 7849.1500 requires this ER to examine emissions of hazardous air pollutants (HAP) and volatile organic compounds (VOC). These classes of pollutants are known or suspected of causing cancer and other serious health effects.[52]

DCW Wind Farm

The wind farm would emit minimal HAPs or VOCs during operation. Petroleum-based fluids used in the operation of wind turbines, such as gear box oil, hydraulic fluid and gear grease, have a low vapor pressure and any release of VOCs would be minimal.

Generic 170 MW Wind Farm

A generic 170 MW wind farm would have HAP and VOC emissions similar to the proposed project, as the generic 170 MW wind farm would utilize the petroleum-based fluids during wind turbine operation.

170 MW Solar Farm

As with wind farm, minor emissions of toxic air pollutants would occur from vehicle and equipment use and from any minor solvent and coating use associated with maintenance of equipment (gear box oil, hydraulic fluid and gear grease) and upkeep of buildings.

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[52] EPA. *Hazardous Air Pollutants*, https://www.epa.gov/haps

Mitigation

Other than standard best management practices (BMPs) for the handling and storage of the small quantities of hazardous materials, no additional mitigation measures are recommended.

3.3.1.3 Ozone

Large electric power generating facilities, such as coal, natural gas, and biomass facilities, have the potential to produce reactive gases, which can lead to ground-level ozone formation. Ozone and nitrous oxide are reactive compounds that contribute to smog and can have adverse impacts on human respiratory systems.[53] Accordingly, these compounds are regulated and have permissible concentration limits. Minnesota has an ozone limit of 0.08 parts per million (ppm).[54] The federal ozone limit is 0.07 ppm.[55] Minnesota Rule 7849.1500, subpart 2 requires that anticipated ozone formation be addressed. Ozone can cause human health risks and can also damage crops, trees and other vegetation.[56]

DCW Wind Farm

The wind farm would not produce ozone or ozone precursors at the operating wind turbines. Ozone production can occur adjacent to transmission lines under specific conditions. Ozone production from the associated transmission project is discussed in Section 6.6.5. The human and environmental impact will be minimal and no mitigation related to ozone formation is proposed.

Generic 170 MW Wind Farm

A generic 170 MW wind farm would not produce ozone or ozone precursors at the operating wind turbines. The generic 170 MW wind farm would have minimal or no impacts related to ozone formation, similar to the proposed project Any transmission line associated with the project, whether new or existing, would generate small amounts of ozone and nitrous oxide (see Section 6.6.5).

170 MW Solar Farm

A 170 MW solar farm would not produce ozone or ozone precursors at the operating of the PV panels. As with wind farm, the ozone production associated with a 170 MW solar farm would depend on the use of associated transmission lines to deliver power to the grid. The generic 170 MW solar farm would have minimal or no impacts related to ozone formation, similar to the proposed project. Ground level ozone formation and associated impacts are anticipated to be minimal.

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[53] EPA. *Criteria Air Pollutants*. https://www.epa.gov/criteria-air-pollutants
[54] Minn. R. 7009.0800, https://www.revisor.mn.gov/rules/?id=7009.0080.
[55] EPA. *2015 National Ambient Air Quality Standards (NAAQA) for Ozone*.https://www.epa.gov/ozone-pollution/2015-national-ambient-air-quality-standards-naaqs-ozone
[56] EPA. *Ozone Pollution.* https://www.epa.gov/ozone-pollution

Mitigation

Since neither wind farm nor solar farms produce ozone or ozone precursors there will be minimal or no human or environmental impacts, and thus no mitigation related to ozone formation. Ozone and nitrous oxide emissions from the associated transmission line are anticipated to be well below regulatory limits (Section 6.6.5).

3.3.2 Water Resources

Different generation options have different water usage and effects on the water quality and water resources.

3.3.2.1 Water Appropriations

Large electric power generating facilities may require water for operations. This section discusses potential water appropriation impacts from such facilities.

DCW Wind Farm

An O&M facility will be constructed within the site to serve as a center for the wind farm's O&M efforts, provide Project access and storage, and house the SCADA system. The O&M facility will provide office space for the crews, as well as a shop/storage area for spare parts and vehicles. It will also house the central monitoring equipment for the generating facility where the turbines are monitored and controlled. The footprint of the facility is anticipated to be approximately 2 acres and will include an access road, parking lot and O&M building. The O&M building will be approximately 7,500 square feet and will house equipment.[57]

The O&M facility will require the installation of a well for potable water and the design and installation of an Individual Sewer Treatment System (septic system).[58] The amount of water used for these facilities is anticipated to be roughly equivalent to the amount consumed by a residence or farmstead in the area (500 gallons per day, or 100 gallons per person per day).[59]

The concrete turbine foundations will require up to approximately 1,600 cubic yards of excavation depending on soil requirements and turbine size.[60]

A water appropriations permit may also be required if temporary dewatering activities are needed during construction.[61] The determination of need for the water appropriations permit for construction

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[57] *Site Permit Application*, at p 18.
[58] Ibid.
[59] Response to Data Request 6, (Appendix M)
[60] *Site Permit Application*., at p 90.
[61] Ibid.

dewatering activities will be determined by the contractor during construction depending on site conditions.

The installed foundation concrete is anticipated to take up to approximately 600 cubic yards of material. Geotechnical data, turbine loads, and cost considerations will dictate the final design of the foundation at each turbine location.[62] A temporary concrete batch plant, if deemed necessary, for construction of turbine foundations may require a water appropriations permit from the DNR.

Generic 170 MW Wind Farm

Water appropriations for a generic 170 MW wind farm would be similar to the proposed project, depending on the need for an on-site concrete batch plant and proximity to existing water supplies.

170 MW Solar Farm

A solar facility such as the North Star Solar Project is comprised of PV modules mounted on linear axis tracking systems and centralized inverters. In addition to the modules grouped into arrays, the facility also includes electrical cables and conduit, electrical cabinets, step-up transformers, SCADA systems and metering equipment, an operations and maintenance (O&M) area, and roads providing access to the equipment. A perimeter fence surrounds the facility.[63]

The operation and maintenance facility for the North Star Solar project includes a flat gravel/grass area for parking and receiving and a building of approximately 3,000 to 5,000 square feet housing equipment used to operate and maintain the solar facility.[64]

The minimal need for concrete in the construction of solar farms does not warrant a batch plant. Subsurface work (cables, conduit, grading, and trenching) is conducted above water table levels, negating the need for dewatering; however, should dewatering become necessary a solar farm project would require the comparable regulatory review and permitting as for the wind farm. Given the rural nature in siting solar farms, it would be anticipated that domestic water and sewer services would generally be provided by on-site infrastructure (i.e., private well and septic), which would require similar regulatory review and permitting as for the wind farm.

Mitigation

There would be minimal or no human or environmental impacts concerning water appropriations for these projects, outside of BMPs and standard conditions contained in the DNR permit. No mitigation is required. If temporary dewatering is required during construction activities, discharge of dewatering

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[62] *Site Permit Application*.

[63] Minnesota Department of Commerce. *North Star Solar Project, Environmental Assessment*. September, 2015. https://mn.gov/eera/web/file-list/4480/ {Hereinafter *North Star Solar Project EA*}

[64] Ibid.

fluid will be conducted under the National Pollutant Discharge Elimination System (NPDES) permit program and addressed by the Project's Storm Water Pollution Prevention Plan (SWPPP), as required.

3.3.2.2 Wastewater

Large electric generation facilities have the potential to generate significant amounts of wastewater. This section discusses potential impacts from wastewater generation.

DCW Wind Farm

The wind farm's O&M facility would generate household amounts of wastewater. DCW plans to build an on-site septic system to serve the O&M facility.[65]The potential impacts of this wastewater and septic system are anticipated to be minimal and mitigation beyond that required by the Dodge County permit for the Individual Sewage Treatment System.

Generic 170 MW Wind Farm

A generic 170 MW wind farm would have wastewater impacts similar to the proposed project.

170 MW Solar Farm

Similar to an wind farm, a solar farm would likely require a private well and septic system at the O&M building to provide sanitary services and water for maintenance, like the North Star Solar Farm.[66]

Given the rural nature of most large solar farms, it is anticipated that domestic sewer services would be provided by a private well and septic system. Wells and septic system installations require state and local permits.

Mitigation

There would be minimal or no human or environmental impacts concerning waste water from these projects; outside of BMPs and standard conditions contained in the Individual Sewage Treatment System permits, no mitigation is required.

3.3.2.3 Groundwater

Ground water in Minnesota is largely a function of local geologic conditions that determine the type and properties of aquifers. The Minnesota DNR divides the state into six ground water provinces based on bedrock and glacial geology.[67] Most groundwater originates from rain and melting snow and ice that infiltrate into the ground; it is the source of water for springs and wells. It is relied on as a source for drinking water, irrigation, and industrial use. Groundwater can be sourced from shallow

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[65] *Site Permit Application*, at p 18.

[66] *North Star Solar Project EA*, P. 40.

[67] DNR. *Minnesota Groundwater Provinces* (https://www.dnr.state.mn.us/groundwater/provinces/index.html)

surficial aquifers or from deeper confined aquifers. Activities that reduce the quantity of available water or introduce contaminants into these aquifers can affect groundwater resources and the people and industries that rely on them.

This section assesses the potential for construction and operation of the project to affect the quantity of available water or to introduce pollutants that would degrade the quality of groundwater resources.

DCW Wind Farm

Dodge and Steele counties are part of groundwater province 2 (South-Central groundwater province).

Bedrock in this region is made up of alternating beds of limestone, sandstone, and shale, but is composed largely of limestone. The St. Peter Sandstone is the deepest layer of sedimentary rock and varies in thickness from less than 200 feet to over 550 feet. Glacial drift overlies this Paleozoic rock and makes up the present day surface of the project area. The average thickness of the glacial drift is generally around 100 feet.

Glacial drift is largely composed of sand, gravel, sandstone and clay. In places, adequate supplies of groundwater for ordinary use can be obtained from the glacial drift itself, but groundwater is more commonly drawn from the underlying limestone where it is underlain by impervious beds of shale.

According to the Minnesota Department of Health (MDH) County Well Index online database, wells are interspersed throughout the project area. Well depths within the project area vary widely ranging between 30 feet to 465 feet deep, with most being in excess of 100 feet in depth.

Impacts to groundwater resources from construction and operation of the wind farm are anticipated to be minimal. Water supply needs during project operation are anticipated to be limited to the O&M facility requirements, which will be satisfied via a private well. As previously noted, the temporary concrete batch plant may need a water well to provide water for concrete production during the construction phase of the project.

Generic 170 MW Wind Farm

Impacts to groundwater from a generic 170 MW wind farm might be comparable to the DCW Wind Farm, depending on site location and geological material underlying the project site. The potential for groundwater contamination resulting from construction may be higher in areas with karst geology.

170 MW Solar Farm

The infrastructure at the North Star project, including the direct-embedded piers supporting the PV tracking installations, foundations for inverters and the Operations and Maintenance (O&M) facility, and embedded transmission poles were installed at a depth above the average depth to groundwater

of 15-40 feet.[68] No impacts to geologic and groundwater resources were anticipated as a result of construction or operation of the North Star Project.

With the shallow subsurface depth requirements for infrastructure at solar farms it is unlikely these type of projects situated elsewhere in Minnesota would pose a general threat to groundwater quality; however, with certain site specific subsurface conditions (karst or high water table) the risk may increase.

Mitigation

Large scale excavation at wind farms is limited to the turbine pads and the O&M facility (including well and septic) and are temporary. Groundwater resources are not expected to be impacted from these activities. Individual wind turbine locations should not impact the use of existing water wells; to comply with residential and noise setbacks, turbines are generally located at least 1,000 feet from homes, well away from where most residential wells are located. During "down-stream" permitting, measures would be taken to identify any nearby wells prior to construction of turbine foundations. Permitting agencies such as the DNR, MPCA, and MDH determine appropriate actions to protect local groundwater resources.

Groundwater use for both wind farms and solar farms is anticipated to be minimal, and supply and drawdown impacts will be further addressed, if necessary, in appropriations permits.

3.3.2.4 Surface Water

Surface water in the vicinity of the wind farm consists of streams, creeks, public ditches, and wetlands. This section assesses the potential for the proposed wind farm to impact surface water resources. Potential impacts to surface waters from electric generation projects are largely related to construction activities. During operation, in the cases where hazardous materials (i.e., fuel, lubricants, hydraulic oil, etc.) may be stored onsite, these supplies need to be properly stored to prevent potential impacts to surface waters from releases.

DCW Wind Farm

The DCW site is located within the Upper Mississippi River Basin and found within are the Zumbro, Upper Cedar, and Cannon River watersheds.[69] There are numerous small watercourses and wetlands within these drainage basins, including named and unnamed creeks (Appendix D).

Some watercourses and water bodies within the project area are designated as public waters and are listed in the public waters inventory (PWI) by the State of Minnesota.[70] Public waters are designated as such to indicate which lakes, wetlands, and watercourses over which DNR has regulatory jurisdiction.

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[68] *North Star Solar Project EA*, P. 61.
[69] *Site Permit Application*, at p 90-94.
[70] Ibid.

Public waters are identified on PWI maps and are designated as public waters under DNR's Public Waters Permit Program (Minnesota Statute 103G.005, Subdivision 15).

Some of the watercourses within the site are subject to protection buffer requirements under the Minnesota Floodplain Management Law (Minnesota Statute 103F.48). Minnesota's Buffer Law requires perennial vegetative buffers of up to 50 feet along lakes, rivers, and streams and buffers of 16.5 feet (5 meters) along ditches. Seven of the PWI streams within the site have designated 50-foot (15 meter) protection buffer requirements according to the MN Buffer Law, including Dodge Center Creek and two associated tributaries. In addition, a number of designated watercourses scattered throughout the site have designated 16.5 foot protection buffer requirements.[71]

Table 6 lists the public waters in the site and the distance of the protective buffer.

The Clean Water Act (Section 303(d)) requires each state to list streams and lakes that are not meeting their designated uses (i.e., impaired) because of excess pollutants. Two recorded waterbodies within the site are listed as impaired by the MPCA. Dodge Center Creek and Turtle Creek fail to meet one or more of the water quality standards.[72]

There are no DNR designated wildlife lakes within the site, nor have any outstanding resource value waters or trout streams been identified within the site.[73]

Floodplains are areas susceptible to flooding that are adjacent to rivers, streams, and lakes. In flat areas, the floodplain can extend more than a mile from the flooding source. Floodplains can also be the normally dry areas adjacent to wetlands, small ponds, or other low areas that cannot drain as quickly as the rain falls.

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps have been created and are available for most of the project area; however, not all of base flood elevations have been determined (Appendix D). There are 100-year flood plains (Zone A) that have been identified for Dodge Center Creek and associated tributaries located within the northcentral portion of the site. Large expanses of the site containing agricultural watercourses has been determined as areas with minimal flood hazards (Zone C).[74]

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[71] *Site Permit Application*, at p 90-94.

[72] Ibid.

[73] Ibid.

[74] Ibid.

Table 6 Public Waters Inventory

PWI Feature Name	PWI Type	Protection Buffer (feet)	Length within Project Area (miles)
Unnamed	Public Ditch	16.5	2.64
Unnamed	Public Ditch	16.5	0.64
Unnamed Creek	PW Altered Natural/Public Ditch	16.5	12.40
Unnamed	Public Ditch	16.5	0.18
Unnamed	PW Altered Natural/Public Ditch	16.5	2.22
Unnamed	PW Altered Natural/Public Ditch	16.5	1.50
Dodge Center Creek	PW Altered Natural	50.0	0.19
Unnamed Creek	PW Natural	50.0	0.03
Unnamed	Public Ditch	16.5	1.76
Dodge Center Creek	PW Natural	50.0	1.18
Unnamed	Public Ditch	16.5	0.67
Unnamed	Public Ditch	16.5	0.46
Unnamed	Public Ditch	16.5	0.00
Unnamed Creek	PW Altered Natural	50.0	3.21
Unnamed	Public Ditch	16.5	0.19
Unnamed	Public Ditch	16.5	0.62
Unnamed	Public Ditch	16.5	0.05
Unnamed Creek	PW Altered Natural	50.0	0.52
Unnamed	Public Ditch	16.5	3.79
Unnamed	Public Ditch	16.5	0.40
Unnamed Creek	PW Natural	50.0	1.17
Unnamed	Public Ditch	16.5	1.51
Unnamed Creek	PW Natural	50.0	2.04
Total			37.39

During construction of the DCW wind farm, there is the potential for sediment to reach surface waters due to ground disturbances from vegetation clearing, excavation, grading, and construction traffic. Potential impacts to surface water resources from construction of access roads, turbine sites, and collection lines when the ground is disturbed by excavation, grading, trenching, and construction traffic could include erosion from increased surface water runoff, sedimentation, discharges from groundwater dewatering, and diversion of watercourses. However, these impacts will be temporary during construction of the wind farm and will be minimized to the extent possible through the use of

BMPs. Impacts to surface waters are expected to be negligible. If access roads cross waterbodies, they will be designed to maintain stream flow by using culverts.

Turbine siting and general site design will reduce impacts to surface waters. Optimal turbine locations are those which are topographically elevated from their surroundings. Ideally, turbines are located on elevated uplands where they are not expected to affect streams or surface water bodies directly. None of the proposed turbines, substation or access roads are located within a FEMA designated 100-year floodplain (Appendix D).

Generic 170 MW Wind Farm

The primary source of impacts to surface water from a generic 170 MW wind farm would be erosion and runoff during construction. Generally mitigation strategies would be similar to those of the proposed project. In areas where a surface water body is identified as impaired, the SWPPP would provide detailed mitigation to prevent or reduce impacts to impaired water bodies.

170 MW Solar Farm

Similar to wind farms, potential impacts to surface waters from a solar farm occur during the construction phase; there is the possibility of sediment reaching nearby surface waters and wetlands as the ground is disturbed by excavation, grading and construction traffic. The potential for impacts to surface waters is affected by the solar farm's design and proximity to surface water features.

Maintenance and operation activities for the PV facilities are not expected to have an adverse impacts on surface water quality.

Mitigation

Protection of surface waters from construction and operation of the proposed project is implemented through the NPDES permit and the associated SWPPP. The MPCA issues NPDES permits for construction activities when more than an acre of land is disturbed. A SWPPP will be developed prior to construction. BMPs such as silt fencing, management of exposed soils and revegetation plans to prevent erosion will be included in the SWPPP. In addition to erosion control measures, fueling and lubricating construction equipment away from waterways will ensure that fuel and lubricants do not enter waterways.

Site permits issued by the Commission for wind farms require permits and approvals from the DNR, USFWS and/or Army Corps of Engineers (USACE) for any access roads constructed across streams or drainage ways. If access roads are constructed across streams or drainage ways, roads must be designed to ensure that runoff from the upper portions of the watershed can readily flow to the lower portions of the watershed.

3.3.2.5 Wetlands

Wetlands provide a multitude of ecological, economic and social benefits and vary in type and extent. Some wetlands are dry for much of the year while others are almost always covered by several feet of water.[75] Some wetlands are dominated by grasses and forbs, others by shrubs and trees. Wetlands also vary in size and extent, with some extending for miles, with annual and seasonal variation. They provide important habitat for wildlife and plants and ecological services such as recharging groundwater, reducing floods, and filtering pollutants from surface water. They are also a source of food and fiber, and support cultural and recreational activities. It is estimated that Minnesota has lost about 50 percent of its original wetland acreage.[76]

The USFWS is the principal US Federal agency tasked with providing information on the status and trends of wetlands. The USFWS National Wetlands Inventory (NWI) is a publically available resource that provides detailed information on the abundance, characteristics, and distribution of US wetlands. NWI wetlands are based on aerial imagery and are not field verified.

In Minnesota, agencies representing three levels of government (federal, state and local) regulate certain activities that affect wetlands, lakes and watercourses. Any wetland listed in the PWI is protected by the Minnesota Public Waters Work Permit. A public waters work permit must be obtained from the DNR for work affecting the course, current or cross-section of public waters, including public waters wetlands. Most other wetlands not listed in the PWI are regulated under the Minnesota Wetland Conservation Act of 1991 (WCA). The WCA is administered by the Minnesota Board of Water and Soil Resources and is implemented by Local Government Units (LGUs).

DCW Wind Farm

Wetlands are not a common feature at the site. There are scattered wetlands and wetland complexes associated with watercourses across the site. Most are classified as freshwater emergent with some shrub/scrub and forested wetland types (**Appendix D**). It is likely that some of the identified wetlands would be considered jurisdictional Waters of the United States due to their proximity to the Straight River or the South Branch Middle Fork Zumbro River and potential for cultural resources.[77]

According to the USFWS NWI database, the site contains approximately 1,592 acres of mapped NWI wetlands and open water features, comprising 3.1% of the site area (**Table 7**).[78]

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[75] DNR. *Wetlands*. http://www.dnr.state.mn.us/wetlands/index.html
[76] Ibid.
[77] *Site Permit Application*, at p 94-97.
[78] Ibid.

Table 7. NWI Wetland Types within the Project Area

NWI Type	Acres	Percent of Project Area
Freshwater Emergent Wetland (PEM)	1,186	2.3%
Freshwater Forested/Shrub Wetland (PFO/PSS)	337	0.7%
Freshwater Pond (Open Waters)	57	0.1%
Riverine Waters	12	0.0%
Total	1,592	3.1%

The Soil & Water Conservation Districts of Dodge and Steele counties administer the WCA in the project area. Generally, a Replacement Plan is required by the WCA for an impact that wholly or partially drains or fills a wetland. Wetlands are also federally protected under Section 404 of the Clean Water Act. A wetland permit from the USACE is required when discharging dredged or fill material into jurisdictional wetland and/or non-wetland Waters of the United States. A permit and/or preconstruction notification may also be required by the local watershed district depending upon the location, size and type of impact.

Wetlands can be impacted directly or indirectly from construction activities (i.e., access roads, turbine sites, substation sites, and collection lines) associated with development of wind farms. Direct impacts result from disturbances that occur within the wetland. Indirect impacts result from disturbances that occur in areas outside of the wetland, such as uplands or up-stream waterways.

Turbines and meteorological towers for the wind farm will be sited and built in upland, higher elevation areas to maximize the wind resources and, in doing so, will avoid direct impacts to wetlands and surface waters. Access roads and operation facilities will be designed and sited to reduce direct impacts on wetlands to the greatest extent feasible. Temporary impacts associated with electric feeder and collector lines, and crane paths will also be minimized by siting to avoid wetland features. Installation of underground utilities will decrease impacts by boring under PWI wetlands as necessary.[79]

Access roads and project infrastructure will be designed and sited to avoid or minimize permanent impacts to wetlands to the greatest extent feasible. Temporary impacts to wetlands may occur based on construction easement extents. Field work to delineate wetlands is ongoing so that wetland areas can be avoided. In the event that permanent wetland impacts cannot be avoided during the siting of project infrastructure, DCW will coordinate with the appropriate agencies including USACE, WCA, and the Soil and Water Conservation Districts of Dodge and Steele counties.[80]

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[79] *Site Permit Application*, at p 94-97

[80] Ibid.

Turbine layouts under consideration are expected to have minimal impacts to wetlands based on completed field surveys of proposed turbine locations, access roads, and the O&M site, and desktop review of NWI data of collection lines and crane path areas associated with the wind farm.

Generic 170 MW Wind Project

The primary source of impacts to wetlands from a generic 170 MW wind farm would be similar to those for the DCW Wind Farm (i.e., erosion and runoff, dewatering discharges, direct impacts such as compaction from crossing wetlands during construction). Generally mitigation strategies would be similar to those of the proposed project, however the extent and degree of these strategies would be dependent on site specific features of the generic project.

170 MW Solar Farm

Construction and maintenance of a solar facility has the potential to result in long-term and temporary loss of wetlands or wetland function. The preferred method for minimizing impacts to wetlands is to avoid disturbance of the wetland through project siting and design. Similar to wind farms, potential impacts to wetlands from a solar farm can occur during the construction phase; there is the possibility of sediment reaching nearby wetlands as the ground is disturbed by excavation, grading and construction traffic, potential introduction of invasive species, and changes in wetland type and function.

Post-construction impacts from the development of a solar farm may continue to affect the wetland ecosystem. The solar panel itself will decrease the amount of light reaching the soil surface, which may change the plant community, decrease plant productivity and reduce carbon sequestration. As part of maintaining any solar site, vegetation is controlled through mechanical and chemical techniques, which may cause disturbance, damage vegetative populations, and create the potential for contamination due to pesticides.

While the surface area or foot print (PV panels vs turbine tower) of a solar farm is larger than that associated with a wind farm, the mitigation strategies (avoidance through siting and minimization through BMPs) would be similar to those of the DCW Wind Farm, however the extent and degree of these strategies would be dependent on site specific features of the generic project.

Mitigation

Because construction of both wind farm and solar farm projects generally involve the disturbance of more than one acre of soil, the project developer will need to submit a NPDES permit application to the MPCA for construction activities. The application identifies which BMPs are to be employed during construction of the project. A SWPPP would be developed prior to construction to identify BMPs such as silt fencing, management of exposed soils and revegetation plans to prevent erosion.

In addition to erosion control measures, fueling and lubricating construction equipment away from waterways will ensure that fuel and lubricants do not enter waterways.

Access roads constructed adjacent to streams and drainage-ways would be designed and constructed to have a low-profile that will not impede natural drainage patterns. If construction occurs across drainage ways or drain tiles, it would be conducted in a manner to avoid adverse impacts. If necessary, culverts may be installed within access roads that are constructed in drainage-ways to allow cross drainage and prevent impoundment of water.

A Utility Crossing License would be required for any crossings of PWI by roads, or electric feeder and collector lines; this license would specify methods and mitigation requisites.

A vegetation management plan can be developed to formalize measures to minimize the disturbance and removal of vegetation on project sites, prevent the introduction of noxious weeds and invasive species and re-vegetate disturbed areas consistent with the safe and reliable operation of the specific project.

A formal wetland delineation will be completed prior to final layout design and construction.[81] Final layout design will be completed in a manner that will avoid and minimize wetland impacts to the greatest extent practicable. For wetland impacts that cannot be avoided, DCW will secure all necessary permits required under Section 404 of the CWA, Section 401 of the CWA, and the Minnesota WCA.

3.3.3 Solid and Hazardous Wastes

Large electric generation facilities have the potential to generate solid and hazardous wastes. Solid and hazardous wastes, if not properly handled, can contaminate surface and ground waters. This contamination can cause a variety of human and environmental health impacts depending on the type and amount of contamination.

DCW Wind Farm

Potential hazardous materials within the site are typical of agricultural uses and may include contamination from petroleum products (diesel fuel, gasoline, natural gas, heating oil, lubricants, and maintenance chemicals), pesticides and herbicides.[82] Older farmsteads may also contain lead-based paint, asbestos-containing building materials (e.g. shingles and siding), and polychlorinated biphenyls ("PCBs") in electrical transformers. Unmarked farmstead waste dumps which may contain various types of wastes are also commonly found in rural settings.

The wind farm would generate solid waste during construction including construction debris such as scrap wood, plastics, cardboard and scrap metals. Petroleum products would also be present on site, such as oil and fuel. Operation of the wind farm is not expected to generate significant quantities of solid and hazardous waste materials. Small quantities of hydraulic oil, lube oil, grease, and cleaning

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[81] *Site Permit Application*, at p 96.

[82] Ibid. at p 79-80.

flush will be maintained and stored at the O&M building, and as these fluids are replaced the waste products will be handled and disposed of through an approved disposal firm as required by regulations.

Prior to construction, DCW will conduct an American Society for Testing and Materials (ASTM) conforming Phase I Environmental Site Assessment (ESA) within the site to identify potential existing environmental hazards.[83]

Generic 170 MW Wind Farm

A generic 170 MW wind farm sited in an agricultural setting would have solid and hazardous waste impacts similar to the proposed project.

170 MW Solar Farm

As with a wind farm, a solar farm will generate solid waste during construction (e.g., scrap wood, plastics, cardboard and wire). Small amounts of hazardous wastes would be generated during operation, (e.g., oils, grease, hydraulic fluids and solvents). The small quantities of hazardous materials would be stored within the O&M facilities.

Mitigation

Hazardous wastes will need to be handled and stored appropriately; hydraulic fluid, lubrication oil and grease would be disposed of through an approved waste disposal firm. Leaks or spills could be mitigated using appropriate clean up techniques. A listing of all potentially hazardous materials related to the operation of the wind farm will be maintained at the O&M facility.

It is not anticipated that the wind farm would require a hazardous waste generators license. Hazardous waste generation would likely fall below the quantity required for a very small quantity generator license (220 pounds per month).

The Phase I ESA will be used to identify and avoid potential hazardous waste sites within the site.[84]

3.3.4 Natural Resources

Large electric generation facilities have the potential to impact natural resources, including flora, fauna, habitat, soils and water. This section discusses potential impacts to natural resources from the operation of a generation facility.

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[83] *Site Permit Application*, at pp. 79-80.

[84] Ibid

3.3.4.1 Ecological Setting

The DNR and the U.S. Forest Service have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota[85]

Ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The system uses associations of biotic and environmental factors, including climate, geology, topography, soils, hydrology, and vegetation. The ECS enables resource managers to consider ecological patterns for areas as large as North America or as small as a single timber stand and identify areas with similar management opportunities or constraints relative to that scale. There are eight levels of ECS units in the United States. Map units for six of these levels occur in Minnesota: Provinces, Sections, Subsections, Land Type Associations, Land Types, and Land Type Phases. **Figure 6** represents the Ecological Subsections in Minnesota.

DCW Wind Farm

The site is located within the Oak Savanna Subsection (222Me) of the Eastern Broadleaf Forest Province. The Oak Savanna Subsection of the Minnesota and Northeast Iowa Morainal Section (MIM) is a long band of deciduous forest, woodland, and prairie that stretches nearly 350 miles from Polk County in northwestern Minnesota to the Iowa border (**Figure 6**). The western boundary of the province in Minnesota is sharply defined along much of its length as an abrupt transition from forest and woodland to open grassland, with the northeastern boundary exhibiting a gradual transition between eastern deciduous forests and the mixed conifer-hardwood forests of northern Minnesota.

The Oak Savanna Subsection is located in southeast Minnesota. Historically, the area consisted primarily of burr oak savanna with areas of tallgrass prairie and maple-basswood forests. Today, most of this subsection is farmed, with extensive development to the north. Loss of wetlands, declines in water quality, and sedimentation of surface waters are of concern throughout the subsection.[86]

Soils in the region are characterized by Mollisols and Alfisols, which correlate with the former prairie and forest vegetation of the area.[87] Within the site, there are thirteen soil associations. Generally, the soils within the site are characterized by silty clay loams that are deep, moderately well drained and underlain by firm glacial till.[88]

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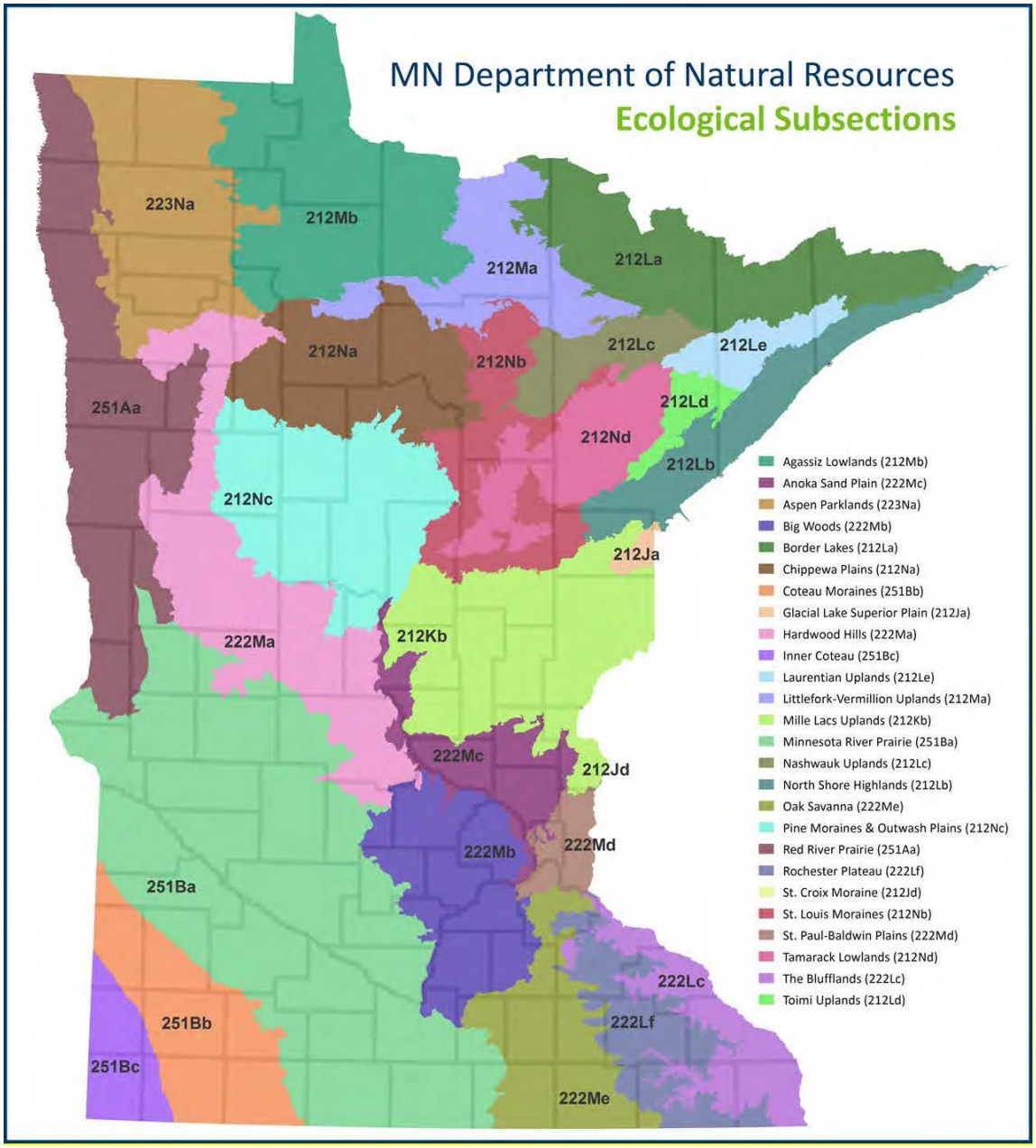
[85] DNR *Ecological Classification System*, http://www.dnr.state.mn.us/ecs/index.html
[86] DNR *Ecological Classification System, Oak Savanna subsection* (https://www.dnr.state.mn.us/ecs/222Me/index.html)
[87] Ibid.
[88] *Site Permit Application*, at p 87.

Figure 6. Minnesota Ecological Subsections[89]



Generic 170 MW Wind Farm

A generic 170 MW wind farm located elsewhere in Minnesota may have different ecological and environmental features (setting) compared to the proposed project. However, wind farms are often

[89] DNR (1999) *Ecological Section of Minnesota*, Available from: https://gisdata.mn.gov/

sited in areas of the state that provide the greatest wind resources (**Figure**), which also tend to be in agricultural areas of the state with similar ecological features.

170 MW Solar Farm

While the site selection criteria for wind farms and solar farms share some common prerequisites (i.e., point of interconnect, adequate roadways and stakeholder concerns), there are sufficient contrasts to expect different siting outcomes (environmental setting).

Site identification analysis for solar farms takes into account the suitability of the specific sites and may include such factors as:

- Quality of terrain – Sloped land, excessively rocky or sandy terrain, uneven land etc., can all significantly add to the cost of installing a solar farm. Degree of forest clearing or tree removal must be low.
- Local weathering factors – Desert conditions often coincide with excessive dust fall, flooding and flash flooding, high erosion, etc., and these can limit the viability of a site and in many cases can make a site non-viable.
- Proximity to Grid connection- One of the biggest hidden costs of a solar farm is the distance required to connect to the grid.
- Local Transmission Capacity – Careful study must be done if the power grids will be able to handle the excess capacity that a solar farm would introduce.
- Proximity to Main Roads - Proximity of a solar farm to a main road is considered an economic factor as the transportation costs affect the overall cost benefits.
- Conservation and Environmental Impact Issues – Large tracts of undeveloped land too often coincide with sensitive or protected areas or protected species. Often the presence of a single protected species of plant or animal can halt or completely alter the development plans for a solar farm.
- Local Regulations and Ownership – Objections from the stakeholders, conflicts with current land use and zoning, and removal of agriculturally productive land.
- Flood Risk Assessment – The desire to avoid conflicts with agriculture may result in low lying sites subject to flooding concerns.
- Prime Farmland-since 0.5 acres of prime farmland per megawatt of net generating capacity cannot be removed from agricultural production, unless there are no feasible and prudent alternatives. It is likely that a solar facility of scale needed to generate 260 MW, would be limited in terms of site selection in areas with significant amounts of prime farmland.

3.3.4.2 Wildlife

Wildlife can potentially be impacted by large energy projects. Wildlife such as birds, mammals, fish, reptiles, amphibians and insects, can be permanent or migratory. Many species utilize the available habitat in and adjacent to the project area for forage, breeding and shelter.

DCW Wind Farm

Historically, the site and surrounding region contained a variety of natural communities and habitat that supported diverse species of wildlife. As the historic vegetation has been converted to agricultural use, the wildlife species that occupy the landscape reflect the changes in habitat type and availability. The most common species within the site tend to be generalists and are able to utilize rural, urban or agricultural habitats.[90] According to the general distribution of wildlife in the region and their habitat preferences, a variety of common and widespread species have the potential to occur within the site at some time during the year. The majority of migratory wildlife species are birds, including waterfowl, raptors and songbirds and migratory bat species.

Local and migratory species use the grasslands, farm woodlots, wetlands and other areas for food and cover. Mammals common to this landscape include opossum, skunk, squirrels, rodents, rabbits, deer, fox, coyotes, and raccoons. Reptiles and amphibians are associated with wetlands, waterways and forested stretches throughout the project area. Reptiles and amphibians include snakes, turtles and frogs. Several species of birds and bats are also known to occur in this landscape, including grassland birds, migratory birds, raptors and waterfowl.[91]

Studies have shown that placement of turbines and auxiliary structures can result in decreased densities of songbirds and other species. Species of grassland birds, such as various grouse species, are particularly susceptible to displacement due to their high site fidelity.[92] The potential for habitat avoidance by wildlife in response to wind turbines and associated infrastructure is highly variable depending on the species, seasonal and annual variation in weather, migration patterns, and individual behavior patterns.

In highly fragmented landscapes or those with few intact natural communities, public lands (state or federal) and private lands under permanent conservation easement provide wildlife habitat that has long-term protections from development and encroachment. Within and adjacent to the site, there are several small state-managed Wildlife Management Areas (WMAs) and federally owned Waterfowl Protection Areas (WPAs) (Appendix D). These conservation lands are non-participating landowners, and are treated as such with respect to setbacks from turbines and associated facilities. At a minimum, wind turbines will be placed at least five rotor diameters or three rotor diameters, depending on wind direction and property location, from identified management areas within and adjacent to the DCW wind farm.[93]

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[90] *Site Permit Application*, at p 104-108.

[91] Ibid.

[92] National Wind Coordinating Committee. *Wind Turbine Interactions with Birds, Bats, and their Habitats*, (2010) https://www1.eere.energy.gov/wind/pdfs/birds_and_bats_fact_sheet.pdf

[93] *Site Permit Application*, at Table 2.

Birds

The potential for habitat fragmentation impacts as a result of the wind farm is low because the proposed project is sited in an agricultural landscape and much of the remaining habitat is disturbed. The wind farm is designed to avoid placing turbines and access roads in DNR-mapped native prairie, native plant communities, and sites of biodiversity significance (Appendix D).

The wind farm has the potential to cause displacement of some bird species from the site due to increased human activity or the presence of tall structures, though clearing of habitat will be minimal. Many of the most-observed bird species within the site are common, disturbance-tolerant species, similar to the results of surveys at other wind energy facilities in the region.

The operation of the wind farm may result in avian fatalities from collision with the turbines or other structures. Based on the results of post-construction monitoring at similar facilities located on agricultural landscapes in southern Minnesota, estimated bird carcass rates at the DCW Wind Farm would be expected to be within the range reported from studies at other wind facilities in the region (Table 8). No single species or group is expected to experience a disproportionate amount of estimated mortality or impacts of a magnitude to affect the local or migratory population, as reflected in studies completed by Erickson et al.

Studies of bird fatalities near wind farms indicate that fatalities will occur and that they will vary with bird type (e.g., raptor, waterfowl, passerine), habitat availability, and other resources available within the site. At this time it is unclear how these fatalities will impact avian populations on a broader scale. Studies looking at avian fatalities caused by wind turbines throughout the United States estimated a fatality range of between 134,000 to 327,000 birds per year.[94]

[94] USFWS. *Migratory Birds Program. Wind Turbines*, https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds/collisions/wind-turbines.php

Table 8. Annual Bird Carcass Rates in Southern Minnestota

Project Name	Estimated Bird Carcasses/ Megawatt/Year	Source
Buffalo Ridge (Phase I; 1996)	4.14	Johnson et al., 2000
Buffalo Ridge (Phase I; 1997)	2.51	Johnson et al., 2000
Buffalo Ridge (Phase I; 1998)	3.14	Johnson et al., 2000
Buffalo Ridge (Phase I; 1999)	1.43	Johnson et al., 2000
Buffalo Ridge (Phase II; 1998)	2.47	Johnson et al., 2000
Buffalo Ridge (Phase II; 1999)	3.57	Johnson et al., 2000
Buffalo Ridge (Phase III; 1999)	5.93	Johnson et al., 2000
Elm Creek	1.55	Derby et al., 2010b
Elm Creek II	3.64	Derby et al., 2012
Moraine II	5.59	Derby et al., 2010c
Lakefield 2012	2.75	Westwood, 2013
Lakefield 2014	1.07	Westwood, 2015
Prairie Rose (2013)	0.44[1]	Chodachek et. al, 2014
Big Blue, Grand Meadow, and Oak Glen (2013)	0.3-0.5[2]	Chodachek et. al, 2014

DCW conducted nearly two years of avian use point count surveys to document species presence and overall avian use of the site consistent with the methodology described in the USFWS Land-based Wind Energy Guidelines and the Eagle Conservation Plan Guidance: Module 1. Based on the results of the Year 1 Avian Use Study, 16,112 individual birds comprised of 144 species were recorded. Passerines were the most abundant species group of birds recorded during surveys, accounting for more than 84 percent of all birds observed. Seven species of raptor were observed and low overall raptor use of the study area at 0.4 birds per survey was documented. Red-tailed hawks (*Buteo jamaicensis*) and northern harriers (*Circus hudsonius*) were the most frequently observed raptors with 49 and 28 observations, respectively.[95]

Birds observed during the Year 1 Avian Use Study include waterfowl (Canada goose [*Branta canadensis*], mallard [*Anas platyrhynchos*], northern shoveler [*Anas clypeata*]), upland game birds (ring-necked pheasant [*Phasianus colchicus*] and mourning dove [*Zenaida macroura*]), raptors (bald

[95] *Site Permit Application*, at p 105.

eagle [*Haliaeetus leucocephalus*], red-tailed hawk, American kestrel [*Falco sparverius*]) and many songbirds (blackbirds, sparrows, swallows).[96]

Avian Wetland Utilization Surveys conducted as part of the Year 1 Avian Survey effort documented waterbird usage of two wetland areas within the site between March 16, 2016 and September 26, 2016. These surveys documented 21,243 individual birds representing 18 different waterbird species. The most commonly observed species were redhead (*Aythya americana*) and ring-necked duck (*Aythya collaris*), representing 25 percent and 13 percent of all observations, respectively.[97]

No federal threatened or endangered species were observed during the surveys. One state listed species, the Henslow's sparrow (state endangered) was documented within the site during the Year 1 Avian Use Study. The Henslow's sparrow was observed utilizing an isolated patch of restored grassland habitat in the east-central portion of the site. Three special status species were documented: Franklin's gull (*Leucophaeus pipixcan*; Minnesota special concern), Acadian flycatcher (*Empidonax virescens*; Minnesota special concern), and bald eagle (Bald and Golden Eagle Protection Act). Both the Franklin's gull and Acadian flycatcher were noted a small number of times during the spring migratory period only, and no evidence was observed that these species breed within the site.[98]

Bald eagle collisions with wind turbines are of additional concern as bald eagles populations continues to grow and expand throughout Minnesota. Bald eagles are afforded additional protections under the Bald and Golden Eagle Protection Act, which is administered by the USFWS. Wind energy facilities are eligible to apply for Incidental Take Permits and Nest Removal Permits issued by the USFWS, which will allow for the non-intentional take of bald eagles and the removal of bald eagle nests, respectively. Bald eagle incidental take permits and nest removal permits are considered to be voluntary permits, meaning a project proposer must make the determination to pursue a permit based on the respective risk of their project's potential to take a bald eagle.

Over the 216 hours of avian surveys, 63 bald eagle flight minutes were documented, with 18 of these minutes occurring within the rotor swept zone (defined in the study as 66-492 feet above ground level) and within 2,625 feet of the survey point. Eagle and raptor nest surveys were initiated in March of 2015, and were conducted up to five-miles from the site. These ground-based surveys documented three bald eagle nest sites within five miles of the site. The 2017 raptor nest report and addendum indicates the presence of seven bald eagle nests, five of which were active, within 10 miles of the site.[99] No bald eagle nests have been identified within the project area.

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[96] *Site Permit Application*, at p 105.
[97] Ibid.
[98] Ibid.
[99] Ibid.

Bats

Bat fatality studies indicate a broad range of fatalities across the United States as a result of wind development. Fatality rates are highest for migrating-tree roosting bat species, with the majority of fatalities occurring during the late summer and early fall migration (roughly July-October). Documented bat fatalities are highest in the eastern United States, while those in the Midwest represent a wide range of fatality rates. Post-construction fatality studies completed in Iowa, Minnesota and Wisconsin show bat fatality estimates ranging from 1 to 24 bats/MW/year.[100]

Bat species present in Minnesota include the hoary bat, eastern red bat, big brown bat, silver-haired bat, tri-colored bat, little brown bat, northern long-eared bat, and evening bat. The northern long-eared bat is federally listed threatened and state listed as special concern. The big brown bat, little brown bat, and tri-colored bat are also listed as special concern.

It is presumed that projects in areas with similar habitat and cover types would have similar fatality rates, depending on migration patterns, known roosting and foraging areas, and hibernacula. However, bat migration routes and behavioral patterns are poorly understood and there is a lack of comparative studies of bat fatalities from wind facilities, making it difficult to determine fatality rates at regional levels much less at broader scales. Estimated bat carcass rates at the DCW wind farm would be expected to be within the range reported from studies at other wind facilities in the region (**Table 8**). Activity of both groups decreased as wind speeds at the site increased, and as temperatures at the site decreased.[101]

The site is within the range of several bat species including little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), eastern red bat (*Lasiurus borealis*), and the hoary bat (*Lasiurus cinereus*). Although these bats are fairly common within Minnesota and the range of these bats overlaps the general vicinity of the site, the preferred habitat of these species is not abundant within and in the vicinity of the DCW wind farm site. The little brown and big brown bats utilize lakes and streams for foraging, and caves, and human structures for roosting. Silver-haired, eastern red and hoary bats are forest-dwelling species. Relatively little of these habitats are present within thesite.[102]

In correspondence to the Applicant, dated May 26, 2017, the DNR identified a portion of the site that may have higher bat use (west-central portion) and the DNR requested that turbines not be sited in this area.[103]

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[100] National Wind Coordinating Committee. *Wind Turbine Interactions with Birds, Bats, and their Habitats*, (2010) https://www1.eere.energy.gov/wind/pdfs/birds_and_bats_fact_sheet.pdf

[101] Ibid.

[102] *Site Permit Application*, at p 107-108.

[103] Ibid.

Table 9. Annual Bat Carcass Rates in Southern Minnesota

Project Name	Estimated Bat Carcasses/MW/Year	Source
Buffalo Ridge (Phase I; 1999)	0.74	Johnson et al., 2000
Buffalo Ridge (Phase II; 1998)	2.16	Johnson et al., 2000
Buffalo Ridge (Phase II; 1999)	2.59	Johnson et al., 2000
Buffalo Ridge (Phase III; 1999)	2.72	Johnson et al., 2000
Buffalo Ridge (Phase II; 2001/Lake Benton I)	4.35	Johnson et al., 2004
Buffalo Ridge (Phase II; 2002/Lake Benton I)	1.64	Johnson et al., 2004
Buffalo Ridge (Phase III; 2001/Lake Benton II)	3.71	Johnson et al., 2004
Buffalo Ridge (Phase III; 2002/Lake Benton II)	1.81	Johnson et al., 2004
Elm Creek	1.49	Derby et al., 2010b
Elm Creek II	2.81	Derby et al., 2012
Moraine II	2.42	Derby et al., 2010c
Lakefield 2012	19.87	Westwood, 2013
Lakefield 2014	20.19	Westwood, 2015
Prairie Rose (2013)	0.41[1]	Chodachek et. al, 2015
Big Blue (2013)	6.33	Chodachek et. al, 2014
Grand Meadow (2013)	3.11	Chodachek et. al, 2014
Oak Glen (2013)	3.09	Chodachek et. al, 2014

Mammals

Many common mammal species are likely to utilize the site, including white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), coyote (*Canis latrans*), red fox and gray fox (*Vulpes fulva* and *Vulpes urocyon*), Virginia opossum (*Didelphis virginiana*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), striped skunk (*Mephitis mephitis*), short-tailed weasel (*Mustela erminea*), and badger (*Taxidea taxis*). The larger mammal species are most likely to utilize the wooded areas and uncultivated grassland areas that are

present within the site, while the smaller mammal species are likely to use those areas as well as the cultivated areas.[104]

Reptiles and Amphibians

An assortment of reptiles and amphibians are anticipated to be present within the site, such as the American toad (*Anaxyrus americanus*), Cope's gray treefrog (*Hyla chrysoscelis*), western chorus frog (*Pseudacris triseriata*), painted turtle (*Chrysemys picta*), snapping turtle (*Chelydra serpentine*), wood turtle (*Glyptemys insculpta*), common and plains garter snake (*Thamnophis sirtalis* and *Thamnophis radix*), milk snake (*Lampropeltis triangulum*), redbelly snake (*Storeria occipitomaculata*), and smooth green snake (*Opheodrys vernalis*). Most of the species listed here live in habitats associated with wetlands, streams, and ditches or can be found in the margins of wetlands, streams, and ditches. A few of the species (*e.g.*, wood turtle and garter snakes) may be found in open areas, such as grasslands or fallow agricultural fields.

Generic 170 MW Wind Farm

Because impacts to wildlife would depend upon specific site characteristics, it is difficult to assess wildlife impacts for a generic 170 MW wind farm located elsewhere in Minnesota. As discussed above, impacts to birds and bats are the primary concern with wind projects. Information about local bird and bat populations within Minnesota is incomplete and different sites provide varying habitat and foraging areas for different species of birds and bats.

170 MW Solar Farm

As with wind farms, impacts to wildlife from solar farm development depends upon specific site characteristics, it is difficult to assess wildlife impacts for a solar farm without detailed knowledge of the proposed site's environmental setting.

A 170 MW solar farm likely would be sited on agricultural land and similar types of wildlife common to disturbed areas, such as the proposed DCW Wind Farm, would be expected. It is assumed that these species' use of agricultural lands is largely limited to occasional foraging in the fields and shelter within wooded areas that may surround the fields.

Wildlife that resides within the construction zone would likely be temporarily displaced to adjacent habitats during the construction process. The wildlife species found near these agricultural lands do not generally require specialized habitats and are able to find suitable habitat nearby, and would only be displaced a short distance for a limited time (during construction activity).

The majority of the potential impacts to wildlife are due to the relatively large footprint of a solar farm and the corresponding changes to the habitat (i.e., loss and fragmentation). Once restoration of the

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[104] *Site Permit Application*, at p 107.

facilities is established after construction, the existing agricultural landscape that is used by habitat generalists will be replaced by a modified habitat that may be attractive to some species and less attractive to species that use the open farm and pasturelands.

The solar farm is typically enclosed by a fence, limiting movement by animals. Solar facilities permitting by the Commission typically have fences designed to allow small animals to enter the property. Although a variety of birds, small mammals, reptiles and amphibians are likely to still be able to gain access to the property to use the habitats under and around the solar arrays, access will be limited for larger wildlife. Fencing around facilities may also disturb wildlife movement corridors. With or without openings, the habitat of the land changes significantly. Hiding spots, preying strategy, food availability will all be affected.

A generic 170 MW solar farm would have fewer impacts on avian and bat species than a wind farm due to its low profile and near-static nature of the component parts. A National Fish and Wildlife Forensics Laboratory report[105] has identified some avian risks associated with PV facilities. Some birds in the study suffered impact trauma, and related predation. Preliminary findings, based on limited data, suspect the danger is the possible appearance of the facility as a large body of water. Migrating birds may attempt to land, consequently incurring the trauma.

Mitigation

Wildlife mitigation strategies for wind farm sites generally incorporate a combination of micro-siting and best management practices. Specific to the DCW Wind Farm, and in conjunction with the Applicant's on-going efforts, including among other efforts, the placing all turbines and project infrastructure outside of the west-central portion of the project area delineated by DNR, DCW will implement the following measures:[106]

- Avoid and minimize siting turbines in mapped native prairie, native plant communities, and MBS sites of biodiversity significance ranked moderate, high or outstanding;
- Maintain, at a minimum, the three by five times the rotor-diameter setback from WMAs and WPAs to reduce the risk to waterfowl/waterbirds and grassland-associated birds;
- Avoid or minimize placement of turbines in high quality grassland or pasture areas that may act as native grasslands for breeding grassland bird species;
- Avoid or minimize placement of turbines in previously undisturbed shrub/scrub vegetation types that may provide additional habitat for breeding birds;
- Protect existing trees and shrubs by avoiding tree removal for turbines, access roads, and underground collector lines;

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[105] Kagan et al. 2014. *Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis*. USFWS Forensics Lab., https://www.ourenergypolicy.org/wp-content/uploads/2014/04/avian-mortality.pdf

[106] *Site Permit Application*. At pp. 117-119

- Avoid or minimize disturbance of individual wetlands or drainage systems during construction. Wetland delineations and micro-siting of turbines will be conducted prior to construction to identify limits of wetland boundaries and to avoid placement of turbines in sensitive wildlife habitat;
- Maintain sound water and soil conservation practices during construction and operation of the project to protect topsoil and adjacent resources and minimize soil erosion. To minimize soil erosion during and after construction, BMPs for erosion and sediment control should be used. These practices include, but are not limited to, silt fencing, temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization;
- Construct wind turbines using tubular monopole towers;
- Light turbines in accordance with FAA requirements;
- Coordinate with local Natural Resources Conservation Service (NRCS) staff to revegetate non-cropland and pasture areas disturbed during construction or operation of the wind facility with native seed mixes appropriate to the region;
- DCW will coordinate with DNR regarding potential minimization measures, such as the feathering of turbine blades up to the manufacturer set cut-in speed at night between April 1 and October 31. Of note, this operational strategy is only known to minimize risks to bat species. Curtailment to manufacturer's recommended cut-in speed is not anticipated to reduce avian mortalities;
- Conduct Tier 4 post-construction monitoring in order to better understand bird and bat impacts that are attributable to the Project operation and adjust operations as appropriate based on the level of mortality observed;
- Implement the wind farm's ABPP during construction and operation of the Project. The ABPP (Appendix G) has been developed in accordance with the guidelines and recommendations set forth in the USFWS Land-based Wind Energy Guidelines (2012) and the Wind Turbine Guidelines Advisory Committee's Recommended Guidelines to the USFWS (2010); and.
- Inspect and control noxious weeds in areas disturbed by the construction and operation of the project.

High wind conditions reduce bird and bat flight activity. Wind turbines require a minimum wind speed (cut-in speed) for operation. Impacts to birds and bats could be mitigated by "feathering" or locking the turbine blades up to the manufacture's designated cut-in speed, or by increasing the cut-in speed during periods of high activity.[107] Curtailment of turbines has been found to effectively reduce bat fatalities by a minimum of 50 percent by raising operational cut-in speeds.[108]Recently issued site

[107] Arnett et al. *Effectiveness of Changing Wind Turbine Cut-In Speeds to Reduce Bat Fatalities at Wind Facilities*. (2009), http://www.batsandwind.org/pdf/Curtailment_2008_Final_Report.pdf
[108] Ibid.

permits Commission issued site permits for wind farms include curtailment provisions (**Appendix B, at Section 7.5.4**).

The most likely impacts to wildlife due to the development of solar farms arise from the changes to the existing habitat (i.e., vegetation loss, species composition, and fragmentation) and displacement (i.e., altered species behavior) from the areas on and around development.

The siting of solar facilities in locations that avoid or minimize impacts to known wildlife movement corridors can minimize impacts to wildlife; requiring Biological and Natural Resource Inventories for the identification of any known wildlife movement corridors should be considered.

Planting wildflower meadows and restoring natural grasslands in the "unused" margins between solar panel rows to attract insects, bees, and butterflies to the sites may provide food and nesting spots for birds.

Avoiding the use of photodegradable erosion-control materials where possible and using biodegradable materials (typically made from natural fibers) instead, preferably those that will biodegrade under a variety of conditions, can minimize the impact to wildlife. Checking open trenches and removing trapped turtles before filling trenches can minimize impacts to turtles.

3.3.4.3 Vegetation

Construction and operation of large energy projects may cause short-term and long-term impacts to vegetation. Short-term impacts are associated with construction; once the construction activity (i.e., temporary lay-down areas, grading and excavation of soils, trenching for electric feeder/collector lines, etc.) is completed the disturbed area can be returned to pre-construction conditions. Long-term impacts include those which are permanent in nature and are usually associated with the construction site of individual wind turbines and associated facilities, such as collector and feeder lines, access roads, and O&M building.

Construction activities could potentially lead to introduction of noxious weeds and invasive species through ground disturbance, extended periods of exposed soils, the introduction of topsoil contaminated with weed seeds, vehicles importing weed seed from a contaminated site to an uncontaminated site, and conversion of land cover types, particularly from forested to open settings. Invasive species and noxious weeds out-compete native plants, alter species composition and natural communities, and diminish ecosystem functions.

Maintenance and emergency repair activities could also result in direct impacts to vegetation from removal of vegetation, localized physical disturbance, and soil compaction caused by the use of equipment. Such impacts on vegetation would be short-term and more localized than construction-related impacts.

DCW Wind Farm

Based on the United States Geological Society's National Land Cover Database, land cover in the project area is primarily cultivated crops, which account for 87 percent of the land cover in the area. For the most part, pasture and grassland areas are fragmented across the project area and forested areas appear limited to stream corridors, near lentic water features, and around homesteads.[109] Land cover type within the site is shown in Table 10 and Appendix D.

Table 10. Land Cover Type in the Project Area

Land Cover	Sum of Area (Acres)	Percent of Project Area
Cultivated Crops	45,530.2	87.42%
Grassland	2,083.3	4.00%
Hay/Pasture	618.8	1.19%
Disturbed/Developed	2,689.7	5.16%
Open Water	63.9	0.12%
Wetlands	481.6	0.92%
Deciduous Forest	610.0	1.17%
Shrub/Scrub	3.3	0.01%
Barren Land	4.2	0.01%
TOTAL	52,085.0	100%

The Minnesota Biological Survey (MBS) systematically collects, interprets, monitors and delivers data on plant and animal distribution as well as the ecology of native plant communities and functional landscapes. At the conclusion of work in a geographic region, ecologists assign a biodiversity significance rank to each survey site. These ranks are used to communicate the statewide native biological diversity significance of each site to natural resource professionals, state and local government officials, and the public. The biodiversity ranks help to guide conservation and management. A site's biodiversity significance rank is based on the presence of rare species populations, the size and condition of native plant communities within the site, and the landscape context of the site (for example, whether the site is isolated in a landscape dominated by cropland or developed land, or whether it is connected or close to other areas with intact native plant communities).[110]

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[109] *Site Permit Application*, at p. 97

[110] DNR, *Minnesota Biological Survey*, https://www.dnr.state.mn.us/mbs/index.html.

The MBS identifies 16 Sites of Biodiversity Significance that are located completely within or partially within the site (see maps in **Appendix D**). The MBS uses four classifications denoting the level of biological diversity to rank sites:[111]

- **Below**. Sites lack occurrences of rare species and natural features or do not meet MBS standards for outstanding, high, or moderate rank. These sites may include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movement, buffers surrounding higher- quality natural areas, areas with high potential for restoration of native habitat, or open space.
- **Moderate**. Sites contain occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes.
- **High**. Sites contain very good quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes.
- **Outstanding**. Sites contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most ecologically intact or functional landscapes.

Eight of the MBS Sites of Biodiversity Significance within the site have been given a "below" biodiversity significance ranking, five sites are ranked as "moderate", and three sites are ranked as "high."[112]

Based on the ecological significance of moderately and highly ranked MBS sites, the DNR recommends avoidance of these areas within the site. In addition, the DNR recommends avoidance of any "below" ranked MBS sites that contain native prairie.

The DNR also applies a conservation status rank to native plant communities (i.e., common to critically impaired) that reflects their relative rarity and endangerment in Minnesota. A native plant community is a group of native plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. These groups of native plant species form recognizable units, such as oak savannas, pine forests, or marshes, that tend to repeat over space and time. Native plant communities are classified and described by considering vegetation, hydrology, landforms, soils, and natural disturbance regimes.[113]

There are many kinds of vegetated areas that are not native plant communities. These include places where native species have largely been replaced by exotic or invasive species such as smooth brome grass, buckthorn, and purple loosestrife, and planted areas such as orchards, pine plantations, golf

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[111] DNR, *Minnesota Biological Survey*, MBS Site Biodiversity Significance Ranks, https://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html.
[112] *Site Permit Application*, at p 97-104.
[113] DNR, *Native Plant Community Classification*, https://www.dnr.state.mn.us/npc/classification.html.

courses, and lawns. Other areas not considered to be native plant communities include areas where modern human activities such as farming, overgrazing, non-sustainable logging, and development have destroyed or greatly altered the vegetation.[114]

Twenty native plant communities are located within the site (see maps in **Appendix D**); twelve of which are native prairies.[115] **Table 11** provides the acreage and biodiversity ranking associated with the plant community types present within the site.

Construction and operation of the wind farm would result in direct and indirect impacts to vegetation communities. Direct effects to vegetation would occur from disturbance or removal of vegetation at the wind turbine generator pad sites, along access roads, and in association with the 34.5-kV underground electrical collection system.

Table 11. DNR Native Plant Communities in the Project Area[116]

Native Plant Community Type	Acreage within Project Area by Biodiversity Rank	
	High	Moderate
MHs49a – Elm, Basswood, Black Ash- (Hackberry) Forest	51.4	N/A
MHs38 – Southern Mesic Oak Basswood Forest	N/A	32.9
FFs59c – Elm-Ash-Basswood Terrace Forest	53.5	1.3
MHs39a – Sugar Maple – Basswood- (Butternut Hickory) Forest	31.1	N/A
UPs23a – Mesic Prairie (Southern)	16.2	5.1
WPs54 – Southern Wet Prairie	26.1	N/A
WPs54b – Wet Prairie (Southern)	1.6	N/A
Total	**179.9**	**39.3**

The vast majority of the wind farm infrastructure will be located in agricultural fields. Less than one percent of the total site will be permanently converted to wind turbines or other project infrastructure. Details on the anticipated permanent impacts to vegetation and unique vegetation types within the project area are presented in **Table 12**. Temporary vegetation impacts will occur during the construction of access roads, crane walks, turning radii, equipment laydown areas, construction easements around turbines, and collection line installation (**Table 13**).[117]

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[114] Ibid.

[115] *Site Permit Application*, at p 97-104.

[116] Ibid.

[117] *Amended Site Permit Application*, at p. 20-22.

Table 12. Estimated Permanent Impacts to Vegetation

Land Cover Type	Turbines	Access Roads	O&M Facility	Substation	Total
Cultivated Crops	7.8	38.7	1.7	0.8	49.0
Developed, Open Space	0.0	1.4	0.0	0.0	1.4
Developed, Low Intensity	0.0	0.0	0.0	0.0	0.0
Developed, Medium Intensity	0.0	0.1	0.0	0.0	0.1
Herbaceous	0.0	0.6	0.0	0.	0.6
Emergent Herbaceous Wetlands	0.0	0.0	0.0	0.0	0.0
Native Plant Community	0.0	0.0	0.0	0.	0.0
Hay/Pasture	0.0	0.1	0.0	0.00	0.1
Sites of Biodiversity (Below)	0.0	0.0	0.0	0.0	0.0
Total	**7.8**	**40.9**	**1.7**	**0.8**	**51.2**

Infrastructure required for the wind farm will be sited to avoid Sites of Biodiversity Significance that are ranked as high or outstanding and designated native plant communities. Impacts to these features would result in a greater impact than to cropland as they contain the highest quality natural vegetation and potential habitat for species within an ecologically fragmented region. Currently, all temporary and permanent construction easements and infrastructure avoids Sites of Biodiversity Significance ranked as high or outstanding or native plant communities. However, approximately 0.87 acres of Sites ranked as below will be temporarily impact and 0.03 acres will be permanently impacted.[118]

Changes to land cover type is often used as a proxy for other effects. Changes in land cover type may indicate a loss of agriculturally productive lands, habitat fragmentation, and damage to ecological function.

[118] *Amended Site Permit Application*, at p. 20-22..

Table 13. Estimated Temporary Impacts to Vegetation

Land Cover Type	Turbines	Access Roads	O&M Facility	Substation	Collection	Laydown Yard	Crane Paths	Total
Cultivated Crops	439.3	381.9	1.7	4.5	139.0	13.2	19.6	999.2
Developed, Open Space	0.0	23.8	0.0	0.5	7.85	1.8	0.0	33.9
Developed, Low Intensity	0.0	0.7	0.0	0.0	0.3	0.0	0.0	1.0
Developed, Medium Intensity	0.0	0.8	0.0	0.0	0.02	0.0	0.0	0.8
Herbaceous	1.5	7.7	0.0	0.0	2.29	0.0	0.0	11.5
Emergent Herbaceous Wetlands	0.0	0.0	0.0	0.0	0.61	0.0	0.0	0.6
Deciduous Forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hay/Pasture	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.9
Woody Wetlands	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Native Plant Community	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sites of Biodiversity (Below)*	0.0	0.9	0.0	0.0	0.14	0.0	0.0	1.0
Total	**440.8**	**415.8**	**1.7**	**5.0**	**150.2**	**15.0**	**19.6**	**1,048.0**

Generic 170 MW Wind Farm

The potential impacts to vegetation, including native prairie, native plant communities, and sites of biodiversity significance, are difficult to assess for a generic 170 MW wind farm located elsewhere in Minnesota without a full understanding of the specific project's environmental setting and site specific information.

170 MW Solar Farm

As with a wind farm impacts to vegetation from solar farm development depend upon site-specific characteristics; it is difficult to assess the degree and ecological significance of vegetative impacts for a solar farm without knowledge of the land cover types, topography, and general environmental setting of a hypothetical project site. During the site preparation phase for utility-scale solar facilities, developers often grade land (cut and fill) and remove all vegetation to minimize installation and operational costs, prevent plants (including crops) from shading panels, and minimize potential fire or wildlife risks.

Ground-mounted PV solar farms require approximately 7 to 10 acres per MW; the North Star 100 MW solar farm project occupies approximately 800 acres, of which approximately 170 acres required

grading (i.e., cut and fill).[119] Given the larger footprint required for solar farms, it would be expected that the impacts to vegetation would be greater than that for a comparable capacity wind farm.

Mitigation

In both wind farm wind farm and solar farm projects the potential impacts to vegetation can be mitigated by using BMPs and standard construction practices to minimize soil erosion (including the prompt revegetation of disturbed soils) and micro siting of the various project components and infrastructure to avoid sensitive plants and plant communities.

Preparation and development of a Vegetation Management Plan, in consultation with resources agencies, is a common requirement of Commission issued site permits. If sensitive plants or communities are identified during plant surveys, individual avoidance (i.e., micro siting) and minimization measures would be evaluated by the appropriate resource agencies.

Continuing mitigation measures to reduce the spread of nonnative plant species during construction should be employed and include: regular, frequent cleaning of construction equipment and vehicles; minimization of ground disturbance to the greatest degree practicable and rapid revegetation of disturbed areas with native or appropriately certified weed-free seed mixes; conducting field surveys prior to construction to identify areas that currently contain noxious weed; attending to new infestations of noxious weed within the project areas by identifying and eradication as soon as practicable in conjunction with property owners input.

The impacts arising from the common site preparation practice of removing vegetation from solar farm sites can be minimized in certain circumstances by co-locating solar farms with agricultural operations (i.e., harvestable crops, grazing, and apiary).[120] There have been successful examples where solar facilities are co-located with these type of agricultural operations.

3.3.4.4 Rare and Unique Natural Resources

There are various governmental programs and agencies which provide resources to effectively evaluate potential environmental impacts of proposed activities.

The MBS and the Minnesota Natural Heritage Information System (NHIS) provide information on federal and state listed species, Species of Greatest Conservation Need and unique or rare habitat types in Minnesota. The MBS systematically collects, interprets and delivers baseline data on the distribution and ecology of rare plants, rare animals and native plant communities.[121] The NHIS database provides information on Minnesota's rare plants, animals, native plant communities and

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[119] *North Star Solar EA*

[120] Macknick et al. (2013).*Overview of Opportunities for Co-Location of Solar Energy Technologies and Vegetation*. National Renewable Energy Laboratory, NREL/TP-6A20-60240.

[121] DNR. *Minnesota County Biological Surveys*, http://www.dnr.state.mn.us/eco/mcbs/index.html

other rare features. The NHIS is continually updated and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities and other natural features.[122]

The USFWS provides information for use in National Environmental Policy Act (NEPA) documents, and reviews and provides comments on these documents. Through this process, the USFWS seeks to ensure that impacts to plant and animal resources are adequately described and necessary mitigation is provided. One such resource is the distribution lists of federally-listed threatened, endangered, and candidate species on a county-by-county basis.

DCW Wind Farm

DNR records contained 47 records of 10 different types of rare plants or animals within the site or within one mile of the site. The mapped occurrences include three records of an invertebrate animal and 44 records of vascular plants (**Table 14**). Additionally, 50 occurrence records of 11 native plant community types were recorded (**Table 15**).[123]

Based on preliminary project data and coordination with DNR, targeted sensitive grassland breeding bird surveys were conducted during June, 2017. In addition to the observation of the Henslow's sparrow documented in the Dodge County portion of the site during the summer of 2016, surveys conducted in June 2017, confirmed the presence of Henslow's sparrows at two locations within the Steele County portion of the site (**Appendix B**).[124]

The native plant communities have the potential to provide habitat for rare species of flora and fauna. Review of the DNR native plant community data identified a total of 11 native plant communities within one mile of the project area, six of these are located within the project area[125] (**Appendix B**).

The USFWS county lists indicate that Dodge and Steele counties are within the range (*i.e.*, has documented records and/or has the potential to harbor critical habitat for the designated species) of the federally threatened northern long-eared bat and prairie bush-clover (*Lespedeza leptostachya*). In the state of Minnesota, the prairie bush clover is also listed as state threatened.[126]

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[122] DNR. *Minnesota Natural Heritage Information System Database*, http://www.dnr.state.mn.us/eco/nhnrp/nhis.html
[123] *Site Permit Application*, at p 108-119, and Appendix C.
[124] Ibid.
[125] Ibid.
[126] Ibid.

Table 14. NHIS Species Recorded within the Project Area and vicinity

Type	State Status	Common Name (*Scientific Name*)	Number of Mapped Occurrences		Most Current Observation (Year)
			Within Project Area	Within One Mile of Project Area Boundary	
Invertebrate animal	Special Concern	Creek Heelsplitter *(Lasmigona compressa*)	2	1	1988
Invertebrate animal	Endangered	Henslow's Sparrow± (*Ammodramus henslowii±)*	3±	0±	2017±
Vascular Plant	Special Concern	Green Dragon (*Arisaema dracontium)*	0	2	2009
Vascular Plant	Threatened	Tuberous Indian-plantain (*Arnoglossum plantagineum)*	1	2	1997
Vascular Plant	Threatened	Sullivant's Milkweed (*Asclepias sullivantii)*	4	1	2009
Vascular Plant	Special Concern	Plains Wild Indigo (*Baptisia bracteata var. glabrescens)*	1	2	2010
Vascular Plant	Special Concern	Small White Lady's-slipper (*Cypripedium candidum)*	1	2	2014
Vascular Plant	Special Concern	Rattlesnake Master (*Eryngium yuccifolium)*	10	9	2016
Vascular Plant	Endangered	Butternut (*Juglans cinerea)*	0	1	2009
Vascular Plant	Threatened	Tubercled Rein Orchid (*Platanthera flava var. herbiola*	0	1	1999
Vascular Plant	Threatened	Edible Valerian (*Valeriana edulis var. ciliate)*	3	4	2016

Table 15. NHIS Native Plant Communities Recorded within One Mile of the Project Area Boundary

Native Plant Community Type	NHIS Records within the Project Area	NHIS Records within One Mile of the Project Area Boundary	Year of Most Current Observation
Black Ash - (Red Maple) Seepage Swamp	0	1	2009
Elm - Ash - Basswood Terrace Forest	2	3	2010
Elm - Basswood - Black Ash - (Hackberry) Forest	2	2	2010
Mesic Prairie (Southern)	8	13	2010
Seepage Meadow/Carr	0	1	2009
Seepage Meadow/Carr, Tussock Sedge Subtype	0	2	2009
Southern Mesic Oak-Basswood Forest	2	3	2010
Southern Wet Prairie	2	0	2008
Southern Wet-Mesic Hardwood Forest	0	1	2010
Sugar Maple - Basswood - (Bitternut Hickory) Forest	2	3	2009
Wet Prairie (Southern)	2	1	2008

Northern long-eared bat

The northern long-eared bat is listed as a threatened species under the federal Endangered Species Act. Listing a species affords it the protections of the Act and also increases the priority of the species for funds, grants, and recovery opportunities. Northern long-eared bats have a broad geographic range that encompasses much of the eastern and northern portions of the United States, but the species' has declined extensively largely due to white nose syndrome, a fungal disease that has affected several bat populations.

Northern long-eared bats spend winter hibernating in caves and mines (hibernacula). They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. The northern long-eared bat was listed as federally threatened by the USFWS on May 4, 2015, primarily because of the threat posed by white nose syndrome (WNS).[127]

[127] USFWS. *Midwest Region Endangered Species. Northern Long-Eared Bat.* https://www.fws.gov/Midwest/endangered/mammals/nleb/nlebFactSheet.html

Northern long-eared bats migrate regionally between hibernacula and summer habitat. Studies have reported northern long-eared bat migration movements range between 30 to 60 miles. Once northern long-eared bats arrive at summer habitat, forested areas greater than 1,000 feet from contiguous suitable habitat are not commonly utilized. According to the USFWS Resource Equivalency Model, a minimum of 46 acres of forested habitat is required to support a female northern long-eared bat during summer roosting activities.[128]

Tree species located within woodlots on the site consist generally of cottonwood, American elm, oak, green ash, and black willow, and while several larger woodlots are present, the largest being approximately 60 acres, the average woodlot size is less than 3.5 acres. A review of USFWS records and DNR databases indicated that there are no known northern long-eared bat summer roost trees or hibernaculum within Dodge or Steele counties. The nearest documented northern long-eared bat summer roost tree to the site is located in Fillmore County approximately 30 miles to the southeast and the nearest documented northern long-eared bat hibernaculum is located in Fillmore County approximately 25 miles to the southeast of the site.[129]

Due to the relatively small average woodlot size within the site, high cropland concentration, location of the project in relation to Minnesota's forested region, and locations of known summer roost trees and hibernacula, summer roost trees for northern long-eared bats are unlikely to be found within the site.[130] In correspondence to the Applicant, dated May 26, 2017, the DNR stated that no further bat studies were required for the DCW Wind Farm.[131]

Prairie bush clover

Prairie bush clover is federally protected under the Endangered Species Act as a threatened species. It is a plant in the pea family and is native to tallgrass prairies of four Midwestern states: Iowa, Illinois, Minnesota and Wisconsin. Like all native species, prairie bush clover has its own specific niche in the ecosystem and its own unique relationships to other plants and animals with which it lives. The loss of prairie bush clover could result in the disappearance of as yet unknown dependent species such as tiny predatory insects specialized to live on its seeds.[132][133]

Prairie bush clover possesses a unique genetic and chemical makeup, different from that of any other species. This genetic information has an unknown potential value. For example, cultivated crops such

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[128] *Site Permit Application*, at p 108-119.
[129] Ibid.
[130] Ibid.
[131] Ibid., at Appendix C.
[132] DNR. *Prairie Bush Clover: A Threatened Midwestern Plant.* http://files.dnr.state.mn.us/natural_resources/ets/prairie_bush_clover.pdf.
[133] USFWS. *Midwest Region Endangered Species. Prairie Bush Clover.* https://www.fws.gov/midwest/endangered/plants/prairiebushclover/index.html

as wheat and corn have been developed and improved by using wild relatives as breeding stock. Native and imported bush clovers are important fodder in the southern states. Prairie bush clover and round headed bush clover provide the only potential native genetic stock for breeding of cold tolerant bush clovers suitable for the Midwest.

Today, it is only known to occur in less than 100 locations across Iowa, Illinois, Minnesota, and Wisconsin, with the largest population occurring in southwestern Minnesota and northwestern Iowa. While the DNR county maps and the USFWS data indicate that the species is found within Dodge County, Minnesota, the more spatially refined NHIS database review does not indicate any occurrence records within the site or within one mile of the site.[134]

Generic 170 MW Wind Farm

A generic 170 MW wind farm sited elsewhere in Minnesota could have potentially very different unique and rare natural resources depending on location. Mitigation techniques would be site specific and would likely include avoidance as the primary mitigation technique.

170 MW Solar Farm

As with wind farms, impacts to rare and unique natural resources from solar farm development depends upon site-specific characteristics.

Mitigation

The preferred mitigation measures are to avoid known areas of rare and unique plant or animal communities. The following generic measures would help prevent potential impacts to rare and unique natural resources in both wind farm and solar farm sites.

- Conduct a pre-construction inventory of existing biological resources (including existing WMAs, WPAs, WIAs, other recreation areas, native prairie, native plant communities, and forests) in the proposed project area to inform micro siting;
- Avoid or minimize disturbance of individual wetlands or drainage systems during construction; and
- Avoid or minimize placement of the project's components in high quality native prairie and MBS "Sites of Biodiversity Significance" ranked as "Outstanding," "High" or "Medium."

In addition to the mitigation measures to minimize impacts to wildlife outlined in **Section 3.3.4.2**, DCW has committed to the following mitigation measures intended to minimize impacts to rare and unique natural resources.[135]

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[134] *Site Permit Application*, at p 108-119.
[135] Ibid., at pp. 117-119

- The Applicant will prepare a prairie protection and management plan in coordination with the DNR;
- The Applicant will voluntarily comply with activity and cutting restrictions (June 1-July 31) outlined in the USFWS 4(d) rule for wooded habitat impacts within the project area;
- Maintain water and soil conservation practices during construction through the
- Control the introduction of invasive species to natural plant communities, as designated by the Minnesota Department of Agriculture through the implementation of BMPs:
    - These BMPs include limiting invasive species spread *via* maintenance equipment and vehicles *via* early detection of invasive species;
    - Cleaning mowers and bladed equipment;
    - Minimizing disturbance to native areas;
    - Limiting traffic through weed-infested areas;
    - Frequently inspecting equipment storage areas for weeds; and
    - In the event that invasive weeds are detected in areas where Project disturbance occurs, control through properly timing, cutting and using targeted herbicide consistent with the herbicide BMPs published by the MnDOT and MDA.
- Complete the second year of avian studies that are currently underway consistent with USFWS Eagle Conservation Plan Guidance and DNR's May 26, 2017 letter of recommendations for the Project. Results of this study are expected in June 2018. This will provide a more complete understanding of eagle and threatened/endangered species avian use within the Project;
- Avoid impacts to grassland habitats identified as having confirmed records of the state endangered Henslow's sparrow between May 15 and July 15;
- Avoid siting turbines within 2 miles of known bald eagle nests;

3.3.5 Human and Social Environment

Wind farms have the potential for effects real or perceived on a local area, including impacts to human, community and social environments. The human setting into which this wind project is being proposed to be set is rural and predominately agricultural. From a larger landscape perspective there are already a number of commercial wind turbines operating to the east, south, and southwest of the proposed project.

3.3.5.1 Comprehensive Planning and Project Compatibility

A comprehensive plan is an official public document that translates community input and ideas into policies or actions and is approved by a decision making body, such as a board or commission. Comprehensive plans can affect budgets, direct zoning, lead to the development of ordinances, and is a primary tool for directing future growth and development in an area (e.g. county, municipality, or city). Comprehensive plans are based on detailed analyses of economic, social, demographic, and land and natural resources present in the community. Comprehensive plans provide a "road map" not only for growth and development but for decision makers; land developers; existing and prospective residents; employees; and business operators.

DCW Wind Farm

The proposed wind farm is consistent and compatible with Dodge and Steele counties' respective comprehensive plan goals to conserve farmland and natural resources and support economic and sustainable development. The proposed wind farm will be compatible with the rural and agricultural character of the counties. In Dodge County, the project will be sited in the Agricultural District. In Steele County, the project will be sited in areas primarily zoned agricultural, with some parcels zoned as rural residential and conservation. Even though the wind farm is sited outside of incorporated areas, all of the infrastructure will be located at least one mile from all identified urban expansion areas.[136]

Table 16 provides an inventory of governing bodies within and adjacent to the site, along with their respective comprehensive plans, if available.[137]

Table 16. Comprehensive Plan Inventory for Local Governments

Governing Body	Name of Plan	Year Adopted/Updated	Associated Development Plan(s)
Dodge County	County Wide Comprehensive Plan	2001	Dodge County Zoning Ordinance, Chapter 16; Comprehensive Water Management Plan
Steele County	Steele County Comprehensive Land Use Plan	2007	Steele County Zoning Ordinance, Section 15; Steele County Water Plan; Transportation Plan
City of Owatonna	Owatonna Development Plan	2006	Owatonna, MN Code of Ordinances, Chapter 157; Stormwater Management Plan; Steele County Transportation Plan
City of Claremont	None Adopted	N/A	Claremont City Code, Chapter 4
City of Hayfield	None Adopted	N/A	Zoning Ordinance
City of Blooming Prairie	Blooming Prairie Comprehensive Plan	2017	Zoning Ordinance, Land Use Plan, Capital Improvement Plan
City of Dodge Center	City of Dodge Center Comprehensive Plan	Unknown	Dodge Center City Code, Chapter 4
Ashland Township, Claremont Township, Hayfield Township, Ripley Township, Westfield Township, Aurora Township, Havana Township, Owatonna Township	None Adopted	N/A	N/A

[136] *Site Permit Application*, at p 31.

[137] Ibid., at p 24-34.

The 2018 Draft Comprehensive Plan for Dodge County establishes the following goals: maintain the county's rural values and character; protect prime agricultural land; grow and sustain a diversity and housing options; provide increased opportunity for business growth and increased jobs; support improved access to quality broadband in the rural areas of the county; increase recreational opportunities; allow for growth without jeopardizing clean air and water; improve and maintain transportation infrastructure for the county's economic development.[138] Most of the soils in Dodge County are highly productive and considered "Prime Farmland" by the US Department of Agriculture criteria, resulting in a predominately agricultural landscape and economy.

Zoning is the primary tool the county uses to implement the comprehensive plan. The majority of land in the unincorporated area of Dodge County is zoned Agricultural. Chapter 8 of the Dodge County Zoning Ordinance states: "The purpose of the Agricultural District is to retain, conserve, and enhance agricultural land in Dodge County and to protect this land from scattered residential development." Conditional uses in the agricultural district include wind and solar installations.[139]

Dodge County is experiencing an increase in newly permitted activities in the Agricultural District that are less agricultural in nature such as limited rural businesses and solar energy facilities. Since 2015, Dodge County has approved eight (8) solar facilities generating 15 Megawatts and occupying approximately 117.5 acres, most of it cropland or on soils that are considered "prime farmland".[140]

The broad goals of the 2007 Steele County Comprehensive Land Use Plan are to: protect, preserve and enhance the quality of the natural environment and require development to take place in a manner, which makes wise use of Steele County's resources without degradation; make the most efficient and economical use of public funds and investments; and protect agricultural lands from encroachment by incompatible uses and provide assurance that such areas will remain agricultural in nature.[141] While the Steele County comprehensive plan does not address renewable energy, the county zoning ordinance expressly provides for the development of wind and solar infrastructure.[142]

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[138] Dodge County, *Draft Comprehensive Plan, Dodge County, Minnesota*. 2018, (https://www.co.dodge.mn.us/EnvironmentalServices/Complete%20Draft%2012-15.pdf)
[139] Dodge County. *Dodge County Zoning Ordinance, Chapter 8* (https://www.co.dodge.mn.us/EnvironmentalServices/Chapter%208%20Ag%20District%202-1-17approved.pdf)
[140] Dodge Country. *Draft Comprehensive Plan, Dodge County, Minnesota*. 2018, (https://www.co.dodge.mn.us/EnvironmentalServices/Complete%20Draft%2012-15.pdf, p 87.
[141] Steele County *Comprehensive Land Use Plan*, 2007, (https://www.co.steele.mn.us/Planning%20Zoning/comprehensive%20land%20use%20plan.pdf)
[142] Steele County. *Steele Counting Zoning Ordinance*, p 109 and 116 (https://www.co.steele.mn.us/Planning%20Zoning/steele%20county%20zoning%20ordinance.pdf)

Setback requirements for commercial wind installations are outlined in Section 16.51 of the Dodge County Zoning Ordinance and Section 1527 of the Steele County Zoning Ordinance. The proposed wind farm meets each county's minimum setback requirements for commercial wind farms (**Table 5**).

Generic 170 MW Wind Farm

Unless a county has assumed permitting authority (delegation) for wind farm, a permit from the Commission supersedes county zoning. A well planned and sited wind farm should account for local land use and planning during the design phase and include known setback requirements in the project layout.

170 MW Solar Farm

A 170 MW solar farm would require a site permit from the Commission. Although the Commission permit supersedes local zoning, solar farms would be reviewed for compatibility with local land uses.

Mitigation

No mitigation is proposed for the wind farm in regards to zoning. The wind farm is compatible with existing land use and zoning. Meeting all set back requirements and properly siting a wind farm in areas zoned for wind mitigates impacts to zoning. Alternate turbine locations provide some flexibility in micrositing and if necessary, can be used to mitigate setback requirements.

3.3.5.2 Demographics

Broadly defined, demography is the study of the characteristics of populations through statistical data. It provides a description of a population and how those characteristics change over time. Where there are foreseeable impacts, the incorporation of demographic data into environmental review may be useful in the evaluation of these potential impacts to the host community. These impacts may be beneficial or adverse. The discussion should address whether any social group is disproportionally impacted and identify possible mitigation measures to avoid or minimize any adverse impacts.

DCW Wind Farm

The wind farm site is located in southeastern Minnesota in a rural agricultural region in Dodge and Steele Counties. The 2010 census population for Dodge County was 20,087, while the U.S. Census 2016 American Community Survey (ACS) population estimate for Dodge County was 20,361, representing an increase of approximately 1.4 percent.[143] The 2010 census population for Steele County was 36,576, while the U.S. Census 2016 ACS population estimate for Steele County was 36,541, representing a decrease of approximately 0.1 percent.[144] The 2010 census population for

[143] *Site Permit Application*, at p 23
[144] Ibid.

Minnesota was 5,303,925, while the U.S. Census 2018 population estimate for Minnesota was 5,611,179. **Table 17** compares county and state level population and economic data.

Table 17. Population and Economic Characteristics

Location	Population	Housing Units (Occupied)	Per Capita Income	Families Below Poverty Line (%)
Minnesota	5,450,868	2,135,310	$33,225	6.9
Dodge County	20,361	7,583	$30,495	4.5
Ashland Township	350	128	$38,668	0.0
Claremont Township	489	191	$34,806	3.2
Hayfield Township	431	142	$44,010	0.8
Ripley Township	215	91	$44,782	5.8
Westfield Township	436	167	$32,250	3.1
Steele County	36,541	14,354	$28,736	8.0
Aurora Township	505	198	$34,976	0.0
Havana Township	666	243	$31,148	6.2
Owatonna Township	585	291	$34,636	5.6

The population of Dodge County, is 92.5 percent White Alone, 4.91 percent Hispanic or Latino, and 1.22 percent Two or More Races. 4.04 percent of the people in Dodge County, speak a non-English language, and 98.8 percent are U.S. citizens.[145] The population of Steele County, is 87.2 percent White Alone, 7.46 percent Hispanic or Latino, and 3.16 percent Black or African American Alone. 8.25 percent of the people in Steele County, speak a non-English language, and 98.5% are U.S. citizens.[146]

According to the Minnesota Department of Economic Development (DEED), the 11-county Southeast Minnesota region was home to 656 manufacturing establishments providing 38,554 jobs through the third quarter of 2016. That was 12 percent of total manufacturing employment in the state. Manufacturing accounted for 15.9 percent of total employment in the region, making it the second largest industry in the region behind health care and social assistance (63,176 jobs) and ahead of retail trade (27,476 jobs). Southeast has the second largest concentration of manufacturing employment of the 6 regions in the state. These manufacturers provided about $536 million in total payroll in the

[145] Data USA, *Dodge County, Minnesota Profile*, retrieved from https://datausa.io/profile/geo/dodge-county-mn.
[146] Data USA, *Steele County, Minnesota Profile*, retrieved from https://datausa.io/profile/geo/steele-county-mn.

third quarter of 2016, making it the largest industry in terms of payroll. Average weekly wages in manufacturing were $1,069 in 2016, which was 13.1 percent higher than the total of all industries.[147]

According to the ACS 2012-2016 estimates, educational services, health care, and social assistance accounted for 24.8 percent of jobs statewide in Minnesota, followed by manufacturing at 13.5 percent and retail trade at 11.2 percent. According to the ACS 2012-2016 estimates, educational services, health care, and social assistance accounted for 32.5 percent of jobs in Dodge County, followed by manufacturing at 14.0 percent and retail trade at 8.9 percent. According to the ACS 2012-2016 estimates, manufacturing accounted for 24.4 percent of jobs in Steele County, followed by educational services, health care and social assistance at 18.4 percent, and retail trade at 12.1 percent.[148]

There is no indication that any minority or low-income population is concentrated in any one area of the wind farm, or that the wind turbines will be placed in an area occupied primarily by any minority population.

Generic 170 MW Wind Farm

The potential impacts on the host community of a generic 170 MW wind farm, located elsewhere in Minnesota, is dependent on the social and economic characteristics that make up the specific population. It is anticipated, given the set-back requirements for wind farms, that a wind farm of similar capacity would have similar land requirements (52,085 acres in the case of the DCW project). This large, unobstructed land requirement dictates a rural, agricultural setting, which should approximate that found in the DCW project area.

170 MW Solar Farm

As with a wind farm, impacts on the host community of a 170 MW solar farm would be dependent on the social and economic characteristics of the local population and surrounding area.

Mitigation

No mitigation measures are proposed for the DCW Wind Farm; the project is compatible with current land uses and the socioeconomic impacts associated with the project are generally expected to be positive.

3.3.5.3 Local Economy

Utility scale wind developments provide economic benefits across all phases of development and across industries, such as manufacturing; construction, operation and maintenance. Minnesota ranks

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[147] Minnesota Department of Employment and Economic Development (DEED). *Regional Labor Markets: Southeast Region*. https://mn.gov/deed/data/regional-lmi/southeast-lmi.jsp.
[148] *Site Permit Application*, at p 23.

seventh in the country for installed wind capacity (3,845 MW), with a total capital investment of $7.4 billion.[149] Minnesota is also home to wind–related manufacturing facilities that supply turbine components and other parts to the industry supply chain and that contribute to the state's economy.

Because utility scale wind developments are usually located in rural areas, they can provide noticeable economic impacts on the smaller, rural communities that host them. At the local level, wind energy projects provide short-term construction wages to workers and increased spending in the local economy for food, lodging, fuel, and incidental expenditures. Over the long-term, while the project is operating, the project owner pays production tax revenues to local government; and lease payments to landowners. The project also provides long-term jobs for a small number of permanent operation and maintenance workers.

The local economic benefit of construction-period wages is difficult to quantify, and the conclusions drawn can vary depending on the assumptions made to conduct the economic model. Site-specific variables are also relevant, including the availability of local labor and the extent to which the construction contractor recruits and hires the local labor that is available.

This section provides an overview of the regional economy based on available data, a summary of several potentially relevant studies that examine the economic impacts of energy projects on local economies, including the impact of the local and non-local labor, and a discussion of the potential short-term and long-term economic impacts of the DCW Wind Farm.

Labor Impacts and Regional Economies

The proposed wind farm is located in Minnesota's Economic Development Region 10. Employment in the southeast region has increased steadily since the 2008 recession, with more jobs in 2017 than in 2007. After hitting a low of 225,090 jobs in 2010, the region fully recovered all the jobs lost during the recession by 2013 and peaked in 2017 at 242,632 jobs.[150] Most of the employment gains are occurring in health care and social assistance, manufacturing, construction, and educational services sectors.

Although most workers in the region also live in the region, the region imports 43,629 workers while 56,010 workers commute outside the region for work.[151] Rochester, in Olmsted County has the greatest employment opportunities due to the Mayo Clinic. It draws workers from within the region and from the Twin Cities Metro area. The Twin Cities and the LaCrosse, Wisconsin area also draws workers from Region 10.

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[149] American Wind Energy Association, *Factsheet: Wind Energy in Minnesota* (https://www.awea.org/Awea/media/Resources/StateFactSheets/Minnesota.pdf).
[150] Schultz, Mark. 2018.DEED *2018 Regional Profile, Region 10,September 4, 2018 Update*. Minnesota Department of Economic Development.https://mn.gov/deed/assets/rp_edr10_090418_tcm1045-133257.pdf)
[151] Ibid. at p.8

Regional wages are slightly lower than the rest of the state. The median hourly wage for all occupations in the region was $18.91, just below the state's median hourly wage $20.07. The lowest paying jobs are in food service, personal care and services, and building maintenance and grounds keeping. Such jobs require less education than higher paying skilled jobs, such as management, engineering, and health care, all of which offer median wages of over $35 per hour.[152] In 2017, construction jobs in Region 10 accounted for just under four percent of all jobs by industry, and had an average annual wage of $55,529.[153]

Wind Farm Construction Labor

Construction of the wind farm will require different types of skilled and non-skilled construction workers. In 2010, the US Bureau of Labor and Statistics profiled careers in the wind energy industry. The profiles include job types, education and training requirements, and wages. Typical types of labor for construction of wind farms includes construction laborers, equipment operators and electricians. Education for these jobs can be a combination of on-the-job training, certifications, apprenticeships, and post-secondary education.[154] Types of construction jobs, median wages, and training are included in **Table 18**.

[152] Ibid.

[153] DEED *2018 Regional Profile, Region 10*, (https://mn.gov/deed/assets/rp_edr10_090418_tcm1045-133257.pdf), at p. 14

[154] Hamilton, James, Liming, Drew. 2010. *Careers in Green Energy*. US Bureau of Labor and Statistics. https://www.bls.gov/green/wind_energy/wind_energy.pdf

Table 18: General Types of Labor, Wages, and Education

Labor Type/Occupation	National Median Annual Wage[155]	MN Prevailing Wage[156]	Education and Training
Construction Laborers	$29.1	25.74	On the job training and apprenticeships
Operating Engineers and other construction equipment operators	$39,530	$36.34	On-the-job training, apprenticeships, union instruction
Crane and Tower Operators	$47,170	Not specified	On-the-job training, apprenticeships, union instruction
Electricians	$49,800	$35.61	Apprenticeship programs that combine on-the-job training with related classroom instruction
Project Managers	$82,000-$100,000+	Not specified	Direct experience, undergraduate degree in related field, business degree

Impact of Wind Farms on Local Economies

Several case studies have examined the economic impact of utility-scale wind power development on local economies.[157] These studies have used a variety of methodologies (modeling, observation, post-construction data). The research on the impacts of wind farms on local economies is evolving, but based on the studies to date, several key factors appear to influence the overall impact a project has on the local economy:

- the remoteness of a project and its proximity to population centers;
- the ownership structure of the project (locally developed and owned, compared to non-local or "absentee" ownership); and
- access to a skilled labor pool.

Local economies that are “well-linked” are those that are nearer other communities, more diversified in terms of types of businesses, and tend to be more stable.[158] As a result, they also tend to have access to a larger, more diverse labor pool. This was also evident in a case study from Texas, which found that in areas where nearby businesses and services are lacking, there is "leakage" outside the

[155] Ibid.
[156] Hatt, Katie; Franco, Lucas. *Catching the Wind: The impact of Local vs. Non-Local Hiring Practices in Construction of Minnesota Wind Farms.* North Star Policy Institute. 2018. http://northstarpolicy.org/wp-content/uploads/2018/06/Catching-the-Wind-North-Star.pdf
[157] See references section for full citations on Brown et al (2011), Slattery et al (2011), Constani (2004), Lantz (2009), Hatt and Franco, 2018, Kildegaard (2013), and UMD Labovitz School of Business and Economics (2017).
[158] Constani, 2004.

project area to areas where those services can be acquired.[159] The same study did find overall economic benefits to rural communities because of utility scale wind development.

Most of these studies use standardized input/output models such as IMPLAN or NREL's wind-project specific JEDI model to estimate local economic impacts. All models have limitations, however, based on one comparison study, these economic models do appear to provide a reasonable estimate of real world impacts. The study Ex *Post Analysis of Economic Impacts from Wind Power Development in U.S. Counties* compared data from a range of constructed wind projects to modeling results and found that the results were similar to those of the common input/output models when using default assumptions and developer projections. Given the similarities between post construction data and modeled projections, the common input/output models such as IMPLAN and JEDI appear to provide reasonable projections regarding the economic impacts of a project.

Construction Period Impacts

Depending on the size of the development and the duration of construction activities, the total number of jobs created varies. A recent study in Minnesota, compared Jedi model predictions and developer projections to determine the number of construction workers hired. The study found an average of between 150 and 200 construction workers for Minnesota wind projects during the approximately six month construction period. The study estimates that a generic 150-megawatt project in Minnesota would provide about $12 million in local wages in benefits—about $60,000 per worker.[160]

When local economies are well linked and diversified, there is a greater likelihood that a local labor pool is present. Generally the more that a contractor uses local labor to construct the project, the greater the local economic impact for the community because a greater proportion of money earned is circulated back into the local economy. In areas where the local economy is not as well developed or linked, outside inputs are necessary, and the economic benefits "leak" to areas that can provide the necessary labor, goods, and services. However, to hire local labor, not only must the right labor pool exist in the project area, but it must be available. Estimating the economic benefit of local labor to the local community would require detailed cost information from the construction contractor by cost category, the availability of local skilled and non-skilled labor, and information about the capacity of local restaurants, hotels, and other local businesses to accommodate non-local labor spending.

Educational and training opportunities for those seeking careers in wind energy and other trades are offered through Minnesota State Colleges and Universities, the North American Building Trades Union, and local unions. These programs train the next generation of tradespeople in energy and other fields

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[159] Slattery et al., 2011.

[160] *Catching the Wind: The impact of local vs. non-local hiring practices in construction of Minnesota wind farms* at pp. 9 10

including: energy technologies and natural resources, architecture and construction, and various certification programs.[161]

Operation and Maintenance Impacts

Lease payments to landowners and energy production taxes to local units of government where wind projects are located provide additional benefits from wind development. Landowners negotiate leases with project developers for the life of the project. Assuming the landowner lives in the project area, the lease payments provide a direct benefit to the local economy.

In addition, in Minnesota, local units of government receive an energy production tax as a result of wind development. These payments have a significant impact on rural economies during the life of the project. Over time, these payments are greater than the economic impacts generated during construction of the project.

Statewide, wind projects generate approximately $15.5 million in annual state and local tax payments and approximately $10 - $15 million in annual lease payments.[162]

DCW Wind Farm

During construction, the project will require approximately 200 temporary construction workers. DCW anticipates construction of the wind farm will take approximately 6 months from the time a permit is issued to in-service date. At the peak of construction, Dodge County Wind anticipates the following types of labor:[163]

- 65 Laborers
- 41 Equipment Operators
- 12 Crane Operators
- 52 Electricians
- 30 Management

The total projected construction cost is $250 million. Of that, DCW estimates that 25% of the cost, approximately $62.5 million, will be for labor, 55% for material, and 20% for permitting and land acquisition.[164] The median hourly wages in **Table 18**, are greater than the median wage of $18.91 in

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[161] Minnesota State Colleges and Universities (https://www.minnstate.edu/campusesprograms/index.html) and the North American Building Trades Union (https://nabtu.org/school-resources/).
[162] *Catching the Wind: The impact of local vs. non-local hiring practices in construction of Minnesota wind farms* at pp. 9 10
[163] Response to Data Request 7 (**Appendix M**)
[164] Response to Data Request 8 (**Appendix M**)

southeastern Minnesota and the Twin Cities ($21.92). At the higher end of the wage scale, the median hourly income is on par with occupations requiring technical skills and advanced degrees in the region.

While some of these workers will be from the local area (within 150 miles), some portion is likely to be from outside the region and will only remain in Dodge and Steele counties over the duration of construction (approximately 5-7 months). It is anticipated that most of the wages earned by local workers will circulate through the local economy. Non-local workers will also inject money into the local economy for food, lodging, fuel, and incidental expenditures. Local contractors and suppliers will be used for portions of the construction. Additional income will be generated for the county and state economy through the circulation and recirculation of dollars paid out by the developer for business expenditures and for state and local taxes. Payments for equipment, fuel, operating supplies, and other products and services benefit local and regional businesses.

Once operational, the wind farm will need approximately five permanent operations and maintenance staff.

During operations the wind project owner will make lease payments to local landowners as well as production tax payments to local government. On average, each turbine only requires 1.5 acres to 2 acres of land for the turbine foundation and access road. Annual lease payments compensate for potential financial losses due to small areas of land being removed from agricultural production and the inconvenience of farming around the new obstacles in the farm fields. All participating landowners will receive compensation for facilities constructed on their land, as will landowners who signed a setback waiver.[165]

The energy production tax payment is $1.20 per MWh of electricity produced. For the DCW Wind Farm, the annual wind energy production tax payment is estimated to be between $570,000 and $700,000 to Dodge County and between $130,000 and $160,000 to Steele County.[166]

Generic 170 MW Wind Farm

The economic benefits of a generic 170 MW wind farm would be similar to those of the proposed project.

170 MW Solar Farm

During construction, a 170 MW Solar Farm would be expected to have similar socioeconomic impacts to that of a generic wind farm due to the influx of wages and expenditures made at local businesses during the construction and increased tax revenue for the life of the project.

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[165] *Site Permit Application*, at p 85-86.

[166] Ibid

For example, the North Star Solar Project developer anticipated that approximately 250-300 jobs would be directly created during the construction phase of the project, and once operational, would require up to 12 permanent employees.[167]

The solar farm would also pay property taxes and production taxes. Solar projects, like wind projects, pay production tax of $1.20 per MWh. Production taxes are calculated based on energy production, and are paid to the local governments where the facility is located; 80 percent to the county and 20 percent to the city or township. Based on the North Star Solar Project's estimated annual electricity production of approximately 200,000 MWh, the production tax would produce approximately $240,000 annually for local governments.[168]

3.3.5.4 Aesthetic Impact and Visibility Impairment

Large energy projects can pose an impact aesthetically or on visual resources. Aesthetic, or visual resources, are generally defined as the natural and built features of a landscape that may be viewed by the public and contribute to the visual quality and character of an area. Aesthetic resources form the overall impression that an observer has of an area or its landscape character. Distinctive landforms, water bodies, vegetation, and human-made features that contribute to an area's aesthetic qualities are elements that contribute to an area's visual character. Visual quality is generally defined as the visual significance or appeal of a landscape based on cultural values and the landscape's intrinsic physical elements.

Visual sensitivity is a measure of viewer interest and concern for the visual quality of the landscape and potential changes to it, which is determined based on a combination of viewer sensitivity and viewer exposure. Viewer sensitivity varies for individuals and groups depending on the activities viewers are engaged in, their values and expectations related to the appearance and character of the landscape, and their potential level of concern for changes to the landscape. High viewer sensitivity is typically assigned to viewer groups engaged in: recreational or leisure activities; traveling on scenic routes for pleasure or to and from recreational or scenic areas; experiencing or traveling to or from protected, natural, cultural, or historic areas; or experiencing views from resort areas or their residences. Low viewer sensitivity is typically assigned to viewer groups engaged in work activities or commuting to or from work.

Viewer exposure varies for any particular view location or travel route depending on the number of viewers and the frequency and duration of their views. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. Other factors, such as viewing angle and viewer position relative to a feature or area, can also be contributing factors to viewer exposure.

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[167] *North Star Solar EA*
[168] Ibid.

DCW Wind Farm

The wind farm would alter the current landscape through the introduction of large wind turbines. Many factors influence how a wind energy facility is perceived. Factors may include levels of visual sensitivity of individuals, viewing conditions, visual settings, and individual ideas and experiences. Distance from a turbine(s) and activities within and near the project area, landscape features such as hills and tree cover, as well an individual's personal feelings about wind energy technology can all contribute to how a wind energy facility is perceived. The wind farm would be located in a predominantly rural, agricultural area characterized by flat to gently undulating topography.

Developing a method to assess the impacts to aesthetics of wind projects is difficult. Current methods of assessing visual impacts include viewshed mapping, photographic simulations, and video animation. All of these methods depend, to some extent, on assessing the current aesthetic resources of the project area, i.e., the aesthetics of the area before construction of a wind farm. Such assessments can be subjective; however, state and federal agencies often perform such assessments in the development of parks that have valuable aesthetic resources.

Three commercial wind farms (Oak Glen Wind, G. McNeilus, and Pleasant Valley) are located within ten miles of the project area and contain turbines of various heights and rotor diameters. The Oak Glen Wind farm is located less than a mile southwest of the Project and contains 24 turbines that generate 1.8 MW each. The G. McNeilus Wind Farm is located approximately one mile east of the Project and contains 41 turbines that generate 0.9 MW, 0.95 MW, 1.5 MW and 1.65 MW. The Pleasant Valley Wind Farm is located approximately six miles southeast of the Project and contains 100 turbines that generate 2.0 MW each.

In addition to the turbines, the wind farm includes a new collector substation (DCW Substation) with a graveled footprint anticipated to be no more than an acre in size. The DCW Substation will include 345 kV buses, transformers, circuit breakers, reactive equipment, steel structures, a control building, metering units, and air break disconnect switches. A 345 kV generation tie line will exit the collector substation. The DCW Substation's general vicinity currently includes farmsteads, overhead transmission lines, distribution lines, a railroad, and wind turbines. In addition, highways and county roads are an existing part of the man-made alterations to the environment. Collection lines bringing the power from the turbine strings to the DCW Substation will be buried 36-48 inches below the surface.[169]

The O&M facility will provide office space for the crews, as well as a shop/storage area for spare parts and vehicles. It will also house the central monitoring equipment for the wind farm. The footprint of the facility is anticipated to be approximately 2 acres and will include an access road, parking lot and O&M building. The O&M building will be a one-story structure with an attached garage for vehicle

[169] *Site Permit Application*, at p 40-44.

storage and maintenance. Similar to the substation, residents located near the O&M facility are expected to have a higher sensitivity to the potential aesthetics impacts than temporary observers.

The FAA requires obstruction lighting or marking of structures more than 200 feet above ground to provide safe air navigation. FAA requires synchronized flashing of red lights for wind turbines. All lights will flash at the same time so that nocturnal migrating birds are not disoriented by lights. Lighting at the O&M facility, the DCW Substation, and other installations will be minimized and designed so that light is directed downward (toward the access or work area) and will be hooded to prevent light from shining into the sky and attracting or disorienting nocturnal migrants.

170 MW Generic Wind Farm

The potential impacts of a generic 170 MW wind farm located elsewhere in Minnesota would have similar impacts if sited in an agricultural setting with other wind farms, such as DCW Wind Farm. The impacts could vary in other settings or be perceived as more impactful, such as in a more populated area.

170 MW Solar Farm

Because they are generally large facilities with numerous highly geometric and sometimes highly reflective surfaces, solar energy facilities may create visual impacts; however, being visible is not necessarily the same as being intrusive. The installation of a solar farm will result in visible landscape changes and given that the foot print is larger than that for wind farm (800 acres for the 100 MW North Star Solar Project) more land surface would be converted in a solar farm application. However, due to their relatively low profile, PV solar facilities will not be visible from great distance; the aesthetic impacts will be experienced primarily by nearby residents and people using the roads adjacent facilities. Perimeter fencing for solar farms in Minnesota are typically eight foot wood pole and woven wire fence (i.e. "deer fence" or an "agricultural fence").

Mitigation

Mitigation of impacts to aesthetic and visual resources is best accomplished through micrositing of wind turbines and maintaining designated setbacks from participating and non-participating landowners. In general, siting wind projects in rural areas minimizes human impacts. Aesthetic impacts to public lands can be mitigated by siting wind projects outside of these areas, and utilizing natural features such as topography and vegetation to reduce visual intrusions.

Setbacks for individual turbines assist in mitigating visibility impacts. Wind turbines must be set back from non-participating property lines a minimum distance of 5 rotor diameters (RD) on the prevailing wind direction and 3 RD on the non-prevailing wind direction. Turbines are designed to be a uniform off-white color to blend in with the horizon and reduce visibility impacts.

Specific to the DCW project, and in addition to the above measures, the Applicant has stated that it will incorporate the following measures:[170]

- Turbines will be uniform in color.
- Turbines will not be located in biologically sensitive areas such as public parks, WMAs, Scientific and Natural Areas ("SNAs"), and WPAs.
- Turbines will meet the minimum FAA requirements for obstruction lighting of wind turbine farms (e.g. reduce number of lights on turbines and synchronized red strobe lights).
- Collector lines will be buried to minimize aboveground structures within the turbine array.
- Existing roads will be used for construction and maintenance where possible to minimize the amount of new roads constructed.
- Access roads created for the Project will be located on gentle grades to minimize erosion, visible cuts and fills.
- Temporarily disturbed areas will be converted back to cropland or otherwise reseeded with native seed mixes appropriate for the region.

The primary strategy for minimizing aesthetic impacts associated with solar farm development is choosing a site where the solar facilities are compatible with the existing landscape, separated as far as possible from existing homes or shielded from view by terrain or existing vegetation. Landscaping plans can be developed to identify site-specific landscaping techniques including vegetation screening, berms or fencing to minimize visual impacts to adjacent land uses.

Wind turbines are known to create shadow flicker. Shadow flicker is the intermittent change in light intensity due to rotating wind turbine blades casting shadows on the ground. Three conditions must be present for shadow flicker to occur:

- the sun must be shining with no clouds to obscure it;
- the rotor blades must be spinning and located between the receptor and the light source; and
- the receptor must be close enough to the turbine to be able to distinguish the shadow created by the turbine.

Shadow intensity, or how "light" or "dark" a shadow appears at a specific receptor, will vary with distance from the turbine. The closer a receptor is to a turbine, the more turbine blades block out the sun's rays, and shadows will be wider and darker. Receptors located farther away from a turbine experience thinner and less distinct shadows since the blades block out less sunlight. Shadow flicker is reduced or eliminated when buildings, trees, blinds, or curtains are located between the turbine and receptor.

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[170] *Site Permit Application*, at p 48.

While there are no rules for a Minnesota "light standard" defining the amount of shadow flicker that is acceptable for a commercial wind project, the default industry standard is for no occupied residence to receive more than 30 hours per year of shadow flicker. No other states have adopted a standard for shadow flicker, however, other countries have examined the issue and have adopted standards. Standards depend on assumptions about how flicker impacts are to be calculated:[171]

- Germany has established a "norm" for shadow flicker that does not exceed 30 hours/yr. or 30 minutes/day at a receptor. It is unclear whether this is a worst-case scenario (e.g., clear skies every day) or a real-case scenario (e.g., weather representative of the Project area).
- Belgium has adopted the German norm, adding a requirement for modeling in an EIA.
- Denmark recommends a maximum of 10 hours/yr. assuming average cloud cover in the Project area.
- France has adopted no standard but requires shadow flicker modeling.
- The Netherlands have adopted a yearly maximum of 5 hours and 40 minutes assuming clear skies.
- The State of Victoria, Australia, has adopted a shadow flicker standard of 30 hours/yr.

DCW Wind Farm

The Applicant conducted a shadow flicker assessment on the proposed site layout to determine impacts and later amended this information to account for the changes to the project. The Shadow Flicker Report provides details regarding the methodology (WindPRO modeling) and results of the assessment.[172]

The maximum expected shadow flicker of 39 hours, 29 minutes per year occurs at receptor #125, a participating receptor. The maximum expected annual duration of shadow flicker at a non-participating location (#116) is 33 hours, 56 minutes per year. The majority of the receptors (546 out of 694) were predicted to experience no annual shadow flicker. Ninety-seven (97) locations were predicted to experience some shadow flicker but less than 10 hours per year. The modeling results showed that 39 locations would be expected to have 10 to 30 hours of shadow flicker per year. Twelve receptors are modeled to be above 30 hours per year, one of which is non-participating (#116) and one of which is participation pending (#170).

The results of the shadow flicker assessment are shown graphically in Appendix D.

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[171] Haugen, Katherine M.B. 2011. *International Review of Policies and Recommendations for Wind Turbine Setbacks from Residences: Setbacks, Noise, Shadow Flicker, and Other Concerns*. Minnesota Department of Commerce. https://mn.gov/eera/web/project-file?legacyPath=/opt/documents/International_Review_of_Wind_Policies_and_Recommendations.pdf

[172] *Site Permit Application,* at Appendix E; *Amended Site Permit Application*, at pp. 13-15

Generic 170 MW Wind Farm

A generic 170 MW wind farm would have similar shadow flicker modeling results; depending on the surrounding landscape (relative receptor locations, availability of natural shielding, etc.) and topography, the potential impacts and mitigation may vary. Shadow flicker could be reduced in an area with greater variation in topography and vegetation, such as a landscape with hills and greater tree cover.

170 MW Solar Farm

Shadow flicker is not produced by solar panels and is not applicable.

Mitigation

The applicant's computer modeling of the proposed layout can be used to minimize shadow flicker at receptors within and adjacent to the project area by using micrositing of wind turbines and maintaining designated setbacks from participating and non-participating landowners.

A number of mitigation options are available and have been proposed by the applicant to reduce the potential for shadow flicker impacts. DCW indicates they will:

- Meet with the homeowner to determine the specifics of their complaint;
- investigate the cause of the complaint; and
- provide the homeowner with mitigation alternatives including shades, blinds, awnings or plantings (vegetation buffers).[173]

Other mitigation includes utilizing operational software adjustments (brief, temporary shutdown of specific turbines), although this has not been suggested by the applicant.

It is important to note that none of the proposed turbine models being considered for the project pose a health risk to photosensitive individuals, including those with epilepsy. The frequency of shadow flicker anticipated to be generated by the proposed turbine models is expected to be no greater than 1.5 flashes per second. According to the Epilepsy Foundation it is generally thought that a flashing light must have a frequency of between 5 and 30 flashes per second to trigger seizures.[174]

3.3.5.5 Facility and Turbine lighting

Large electric generating facilities would generally have some type of lighting at the facility to ensure safe operation of the facility. The Federal Aviation Administration (FAA) requires that all structures more than 200 feet above the ground have proper lighting or marking to allow for safe air

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[173] *Site Permit Application*, at p 44-48.

[174] Ibid.

navigation.[175] To meet this requirement wind turbines are typically lighted with red flashing lights, which can create an undesirable nighttime view in a rural setting for some individuals.

DCW Wind Farm

The wind farm will have some non-turbine facilities (e.g. O&M facility and DCW Substation) which must be lit at times to allow for worker safety. Lighting of the wind turbines will be consistent with FAA guidelines and is similar to that for other tall structures in rural areas, such as communication towers.

Generic 170 MW Wind Farm

A generic 170 MW wind farm located elsewhere in Minnesota would have lighting impacts similar to the DCW Wind Farm.

170 MW Solar Farm

Because of the relatively low profile of PV solar farms FAA lighting requirements are not applicable to solar farms.

Temporary lighting would be expected during the construction phase of any solar farm project. After construction, any temporary service poles/lights would be removed. Permanent motion-activated lighting is anticipated to be installed near O&M areas, security gates and in perimeter areas. Standard downward lighting should be utilized to minimize impacts to adjacent land uses.

Mitigation

All non-turbine facilities should only be lit when workers are present, or at other times when lighting is absolutely necessary. Additionally, downward facing lights should be used at non-turbine facilities.

DCW must submit and receive FAA approval of lighting plan. A lighting plan will be provided prior to construction.

An additional mitigation measure available for wind turbine lighting is the aircraft detection lighting system (ADLS). The FAA-has approved commercial operation of ADLS for use at wind farms. The ADLS is designed to mitigate the impact of nighttime lights by deploying a radar-based system around a

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[175] Federal Aviation Administration. 2000. *Proposed construction or alteration of objects that may affect the navigable airspace. FAA Advisory Circular AC 70/7460-2K*, http://rgl.faa.gov/REGULATORY_AND_GUIDANCE_LIBRARY/RGADVISORYCIRCULAR.NSF/0/22990146db0931f186256c2a00721867/$FILE/ac70-7460-2K.pdf

wind farm, turning lights on only when low-flying aircraft are detected nearby.[176] The ADLS can be designed for a single wind farm, or to serve multiple wind farms (**Figure 7**).

Figure 7. Aircraft Detection Lighting System[177]

Approval was received from the Federal Communications Commission (FCC) and FAA Spectrum Office for the Vestas Intelilight system on January 11, 2017. The Vestas InteliLight system was installed at a wind park near Hancock, Maine in October 2017.[178]

3.3.5.1 Noise

Large electric generation facilities produce noise. Potential human impacts due to noise include hearing loss, stress, annoyance, and sleep disturbance. Noise can be defined as unwanted or inappropriate sound. Sound has multiple characteristics which determine whether a sound is too loud or otherwise inappropriate. Sound travels in a wave motion and produces a sound pressure level. This sound pressure level is commonly measured in decibels (dB). Sounds also consists of frequencies, e.g., the high frequency (or pitch) of a whistle. Most sounds are not a single frequency but a mixture of frequencies. Finally, sounds can be constant or intermittent. The perceived loudness of a sound depends on all of these characteristics.

A sound meter is used to measure loudness. The meter sums up the sound pressure levels for all frequencies of a sound and calculates a single loudness reading. This loudness reading is reported in decibels, with a suffix indicating the type of calculation used. The A-weighted decibel scale (dBA) is

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[176] Patterson, James. *Performance Assessment of the Laufer Wind Aircraft Detection System as an Aircraft Detection Lighting System*. FAA. 2018. http://www.airporttech.tc.faa.gov/DesktopModules/EasyDNNNews/DocumentDownload.ashx?portalid=0&moduleid=3682&articleid=26&documentid=1203

[177] Electronics 360. *Video: Lighting Up Wind Turbine Airspace.* https://electronics360.globalspec.com/article/8760/video-lighting-up-wind-turbine-airspace

[178] Patterson, James; Canter, Garrison. *Performance Assessment of the Vestas InteliLight X-Band System as an Aircraft Detection Lighting System (ADLS)*. FAA. 2018. https://www.airporttech.tc.faa.gov/Products/Airport-Safety-Papers-Publications/Airport-Safety-Detail/ArtMID/3682/ArticleID/165/Performance-Assessment-of-the-Vestas-InteliLight%E2%84%A2-X-Band-System-as-an-Aircraft-Detection-Lighting-System-ADLS

commonly used to measure the selective sensitivity of human hearing. This scales the physical sound levels that are measured as a pressure wave to match an equivalent "loudness" level across the audible spectrum that more closely resembles what a human ear would perceive. The A-weighted scale effectively puts more relative weight on the range of frequencies that the average human ear perceives clearly (e.g., mid-level frequencies) and less weight on those that humans do not perceive as well (e.g., very high and lower frequencies).

Noise levels depend on the distance from the noise source and the attenuation of the surrounding environment. Table 19 below provides an estimate of decibel levels of common noise sources.

Table 19. Common Noise Sources and Levels (A-weighted Decibels)[179]

Sound Pressure Level (dBA)	Common Indoor and Outdoor Noise Sources
100-110	Rock band (at 16.4 ft [5 m]) Jet flyover (at 984.3 ft [300 m])
90-100	Gas lawnmower (at 3.28 ft [1 m])
80-90	Food blender (at 3.28 ft [1 m])
70-80	Shouting (at 3.28 ft [1 m]) Vacuum cleaner (at 9.84 ft [3 m])
60-70	Normal speech (at 3.28 ft [1 m])
50-60	Large business office Dishwasher next room, quiet urban daytime
40-50	Library, quiet urban nighttime
30-40	Quiet suburban nighttime
20-30	Bedroom at night
10-20	Quiet rural nighttime Broadcast recording studio
0	Threshold of hearing

The State of Minnesota has promulgated noise standards designed to ensure public health and minimize citizen exposure to inappropriate sounds. The rules for permissible noise vary according to land use, i.e., according to their noise area classification (NAC).

In a residential setting, for example, noise restrictions are more stringent than in an industrial setting. Rural residential homes are considered NAC 1 (residential), while agricultural land and agricultural

[179] Minnesota Pollution Control Agency (MPCA). 2015. *A Guide to Noise Control in Minnesota: Acoustical Properties, Measurement, Analysis and Regulation*. pca.mn.us

activities are classified as NAC 3 (industrial). The rules also distinguish between nighttime and daytime noise; less noise is permitted at night. Sound levels are not to be exceeded for 10 percent and 50 percent of the time in a one-hour survey (L_{10} and L_{50}) for each noise area classification. **Table 20** lists Minnesota's noise standards by area classification.

Table 20. MPCA Noise Standards - Hourly A-Weighted Decibels

Noise Area Classification	Daytime		Nighttime	
	L50	L10	L50	L10
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

The C-weighted scale (dBC) is used to measure human sensitivity at louder levels. C-weighted decibels are often used as a proxy to estimate the impact of low frequency noise. This scale puts more weight on the lower frequencies than the A-weighted scale.[180]

The G-Weighted scale (dBG) is designed for sound or noise whose spectrum lies partly or wholly within the frequency band of 1 Hz to 20 Hz.[181]

The numerical value of the results will, in general, differ between the A-weightings, C-weightings and G-weightings. Numerical values across weightings should be compared with caution, since the respective results relate to different frequencies of the noise spectrum. Measurement programs for wind turbine noise have documented a significant correlation between dBA and dBC levels. Additionally, measurements comparing A-weighted noise levels and G-weighted noise levels show a significant correlation between the dBA and dBG as well.[182]

Low frequency noise is considered audible but only at high amplitudes. Low frequency noise is commonly considered to be in the range of 20-200 Hz. Infrasound occurs in even lower frequency ranges (less than 20 Hz), and is generally inaudible to the human ear. However, it may still interact with the body and may be felt as vibrations. Studies have shown that pain from infrasound can result when sound levels are 165 dB or above at 2 Hz and 145 dB or above at 20 Hz. (Massachusetts Department of Public Health 2012). The magnitude of existing background low frequency noise/infrasound levels vary, but can be of sufficient strength to mask the low frequency noise and infrasound contributions from wind

[180] Ibid.
[181] State Government of Victoria Department of Health. 2013. *Wind Farms, Sound, and Health: Technical Information.* https://www2.health.vic.gov.au/public-health/environmental-health/environmental-health-in-the-community/wind-farms-sound-and-health.
[182] Ibid.

turbines. Common background sound sources of low frequency noise and infrasound include wind interacting with vegetation, agricultural machinery and roadway noise.[183]

DCW Wind Farm

The operation of wind turbines will produce noise. Turbines produce mechanical noise (noise due to the gearbox and generator in the nacelle) and aerodynamic noise (noise due to wind passing over the turbine blades).[184] Perceived sound characteristics would depend on the type/size of turbine, the speed of the turbine (if turning), and the distance of the listener from the turbine.

Wind turbines produce audible, low frequency sound and sub-audible sound (infrasound). These sounds can have a rhythmic modulation due to the spinning of the turbine blades. Impacts due to these sound characteristics are subjective, i.e., human sensitivity, especially to low frequency sound, is variable. However, low frequency sounds may cause annoyance and sleep disturbance for more sensitive individuals.[185]

The site is located in a predominately rural agricultural landscape. The ground cover is primarily farmland and open fields, with residential dwellings interspersed throughout the area. Typical agricultural noise pollution sources include farm machinery, agricultural vehicle operations, recreational activities, (such as hunting and all-terrain vehicles), motor vehicle traffic, and road construction activities.

DCW conducted a preliminary noise assessment of the proposed project, which models (Cadna/A sound level calculation software) the anticipated sound levels that will be experienced at noise-sensitive receptors throughout the project area.[186]

The predicted worst-case L50 sound level from the project wind turbines is below the 50 dBA limit at all modeled NAC 1 receptors. Modeled sound level isolines are shown in Appendix D. The predicted worst-case L50 sound level is 47 dBA at participating receptors #119, 120, and 121 and non-participating receptor #210. The highest predicted worst-case L50 sound level of 47 dBA remains below the most restrictive MPCA sound limit of 50 dBA.[187]

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[183] Ibid.

[184] Minnesota Department of Health, *Public Health Impacts of Wind Turbines*. 2009, http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf

[185] Ibid.

[186] *Amended Site Permit Application*, at p. 11-13

[187] Ibid.

Generic 170 MW Wind Farm

A generic 170 MW wind farm would have noise impacts and mitigation similar to the proposed project. Depending on location, surrounding vegetation, topography, and turbine selection, impacts from noise could be more or less than those expected of the proposed Project.

170 MW Solar Farm

Noise concerns for a generic 100 MW PV solar farm are related primarily to the construction phase as the result of heavy equipment operation and increased vehicle traffic associated with the transport of construction materials and personnel to and from the work area. As in the North Star Solar project it is anticipated that construction activities will only occur during daylight hours.

During operation of the PV solar farm, the primary source of noise will be from the inverters, and to a lesser extent from the transformers and rotation of tracking systems, located at each facility. All electrical equipment would be designed to National Electrical Manufacturer Association standards; anticipated inverter noise for the North Star Solar Project was predicted to produce 65 dBA at the source.[188]

Noise from the PV solar farm's electric collection system would not be expected to be perceptible. Because the solar facilities do not generate electricity at night, the tracking systems would not be rotating and noise from inverters would be at less than peak levels. While most maintenance activities would be performed during the day, it may be preferable to perform some maintenance activities after the sun is down in order to limit impacts to energy production.

Mitigation

The primary means of mitigating sound (noise) produced by wind turbines is siting. Turbines must be sited to comply with noise standards in Minnesota Rule 7030.[189] For rural residential of the area, this means sound levels must meet an L_{50} standard of 50 dBA.

DCW has incorporated in to the project design a 1,400-foot setback from residences for compliance with MPCA noise standards. Additionally, consistent with the 3 RD by 5 RD setback and Dodge County Zoning Ordinance requirements, the turbines in Dodge County will be set back from nonparticipating properties (measured at property line, not residence) by at least 1,147 feet or 3 RD in the non-prevailing wind direction and at least 1,911 feet or 5 RD, in the prevailing wind direction. Turbines in Steele County will be set back from non-participating properties by at least 1,911 feet or 5 RD in order to comply with Steele County's 5 RD by 5 RD setback.[190]

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[188] *North Star Solar EA*

[189] Minn. Rules 7030.0040, Noise Standards, https://www.revisor.leg.state.mn.us/rules/?id=7030.0040

[190] *Amended Site Permit Application*, at p. 11-13.

Setback requirements are enforced by the Site Permit issued by the Commission. The Commission continuously reviews public health setbacks related to wind farms to determine if they remain appropriate and reasonable.[191]

3.3.5.2 Property values

Large electric generation facilities have the potential to impact property values. Because property values are influenced by a complex interaction between factors specific to each individual piece of real estate as well as local and national market conditions, the effect of one particular project on the value of one particular property is difficult to determine.

The placement of infrastructure near human settlements has the potential to impact property values. The impacts can be positive and negative. The type and extent of impacts depends on the relative location of the infrastructure and existing land uses in the project area. For example, a new highway may increase the value of properties anticipated to be used for commercial purposes, but decrease the value of nearby residential properties.

Potential impacts to property values due to large energy facilities are related to three main concerns:

- potential aesthetic impacts of the facility,
- concern over potential health effects from emissions (e.g,.air emissions, wastewater discharges, electric and magnetic fields, etc.), and
- potential interference with agriculture or other land uses.

DCW Wind Farm

The impacts on property values due to the development of the DCW Wind Farm are difficult to quantify. Numerous factors influence a property's market value, including acreage, schools, parks, neighborhood characteristics and improvements. The overall status of the housing/land market at the time of sale is an important factor on the value of a property.

In December 2009, the United States Department of Energy Lawrence Berkeley National Laboratory released a technical analysis of wind energy facilities' impacts on the property values of nearby residences. Using a variety of different analytic approaches, the report found no evidence that sales price of homes surrounding wind facilities were measurably affected by either the view of wind facilities or the distance of the home to those facilities. Though the analysis acknowledged the possibility that individual homes or small numbers of homes may be negatively impacted, it concluded

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[191] Commission *Investigation into Large Wind Energy Conversion Systems Permit Conditions on Setbacks and the Minnesota Department of Health Environmental Health Division's White Paper on Public Health Impacts of Wind Turbines*, CI-09-845, found on eDockets, https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showeDocketsSearch&showEdocket=true&userType=public, enter "09" for year and "845" for number

that if these impacts do exist, their frequency is too small to result in any widespread, statistically observable impact.[192]

Southern and southwestern Minnesota have experienced the greatest development of wind energy facilities in the state and several wind farms exist in the region – three within 10 miles of the DCW Wind Farm. Six counties in southern Minnesota (Dodge, Jackson, Lincoln, Martin, Mower and Murray counties) with large wind energy conversion systems responded to a Stearns County survey asking about impacts on property values as a result of wind farms. That survey showed that neither properties hosting turbines nor those adjacent to those properties in the counties listed, have been negatively impacted by the presence of wind farms. [193]

Generic 170 MW Wind Farm

A generic 170 MW wind farm would have property value impacts similar to that of the proposed project. If a generic 170 MW wind farm were constructed and operated in an area of the state with minimal or no wind energy facilities present on the landscape there could be more noticeable impacts on property values, but this impact is difficult to quantify or estimate for comparison purposes.

170 MW Solar Farm

Electrical generating facilities have the potential to impact property values. Often, negative effects from these facilities are the result of impacts that extend beyond the immediate footprint. Examples include noise, emissions and visual impacts. Unlike fossil-fueled electric generating facilities however, a PV solar farm would have no emissions and essentially no noise impacts to adjacent land uses during operation of the facility. The installation of PV facilities would create a visual impact, but lacking the height of smokestacks or wind turbines, the visual impact at ground level, or within a neighboring building, would be more limited.

A review of the literature found no research specifically aimed at quantifying impacts to property values based solely on proximity to utility-scale PV facilities. As the recently permitted Aurora Distributed Solar and North Star Projects involve the first utility-scale PV facilities across Minnesota, comparable sales data are just becoming available. Very initial results from Chisago County (North Star) show no impact.

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[192] Hoen et al. 2009. *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis*. https://emp.lbl.gov/publications/impact-wind-power-projects

[193] Stearns County Board of Commissioners. 2010.*Stearns County Resolution No. 10-46: Resolution Adopting Findings of Fact for the Proposed Stearns County Interim Ordinance No. 444 Imposing a Moratorium on Large Wind Energy Conversion Systems (LWECS) for Projects 5 MW or Greater.* https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B84D17419-28C1-4D3F-AAE0-5D4DE117F9E4%7D&documentTitle=20106-52067-01

As the industry continues to develop comparable data should become available.

Mitigation

Negative impacts to property value due to the development of the DCW Wind Farm are not anticipated. In unique situations it is possible that specific, individual property values may be negatively impacted. Such impacts may be mitigated by siting turbines away from residences. Impacts to property values can be mitigated by reducing aesthetic impacts (i.e., micro-siting turbines, education concerning the perceived health risks, and reducing encumbrances to future land use).

For PV solar facilities, property values can also be mitigated through proper siting, BMPs (restoration and vegetation management) and screening the site (berms, deer fencing, and vegetation).

3.3.6 Public Health and Safety

Construction and operation of large energy facilities may have the potential to impact human health and safety. This section discusses potential health and safety concerns.

3.3.6.1 Electromagnetic Fields

Electromagnetic fields (EMF) are invisible regions of force resulting from the presence of electricity. EMF is often raised as a concern with electric transmission facilities. Naturally occurring EMF are caused by the earth's weather and geomagnetic field. Man-made EMF are caused by any electrical device and found wherever people use electricity.

- Electric fields are created by the electric charge (i.e., voltage) on a transmission line. Electric fields are solely dependent upon the voltage of a line (volts), not the current (amps). Electric field strength is measured in kilovolts per meter (kV/m). The strength of an electric field decreases rapidly as the distance from the source increases. Electric fields are easily shielded or weakened by most objects and materials, such as trees and buildings.
- Magnetic fields are created by the electrical current moving through a transmission line. The magnetic field strength is proportional to the electrical current (amps). Magnetic field strength is typically measured in milliGauss (mG). Similar to electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases. However, unlike electric fields, magnetic fields are not easily shielded or weakened by objects or materials.

Although EMF is often raised as a concern with electrical transmission projects, the Commission has consistently found that there is insufficient evidence to demonstrate a causal relationship between EMF exposure and human health effects.

DCW Wind Farm

EMF related to the associated transmission project is discussed in Section 6.5.1. EMF from underground electrical collection lines dissipates close to the lines because they are installed below ground, geometrically close to each other, and wound with copper wires in their jackets. The electrical

fields around these lines are negligible and the small magnetic field directly above the lines dissipates within 20 feet on either side of the installed cable, based on engineering analysis. Collection lines will be buried underground to a depth of at least 42 inches (with the exception of junction boxes) and will be located no closer than 110 feet from a residence. EMF associated with the transformers within the nacelle dissipates within 5 feet, so the 1,500-foot turbine setback from residences will be adequate to avoid any EMF exposure to homes.

Generic 1700 MW Wind Farm

A generic 170 MW wind farm will generally require transmission facilities to an interconnection point, similar to those of the proposed project. EMF impacts from collector and feeder lines located within the wind farm are expected to be negligible.

Any transmission lines and substation associated with the generic 170 MW wind farm would likely be similar to those of the DCW Wind Farm. Depending on the size of the transmission line, it is likely that the associated transmission line would be subject to the Power Plant Siting rules.

170 MW Solar Farm

As with wind farm, a generic 170 MW PV solar farm would also require the installation of similar infrastructure (transmission lines and substation) beyond on-site facilities (i.e., PV arrays, including electrical cables and conduit, electrical cabinets, step-up transformers, SCADA systems and metering equipment, and access roads) to deliver the generated power to the overall grid.

Mitigation

The DCW Wind Farm will design, construct, and operate all electrical equipment, including turbines, transformers, collection lines, and transmission lines in accordance with applicable codes, manufacturer specifications, and required setbacks. Because no impacts due to EMF are anticipated, no mitigation is warranted.

3.3.6.2 Stray Voltage

Stray voltage is sometimes raised as an issue associated with electric transmission. Stray voltage (also referred to as neutral to earth voltage) is an extraneous voltage that appears on metal surfaces in buildings, barns and other structures, which are grounded to earth. Stray voltage is typically experienced by livestock who simultaneously come into contact with two metal objects (i.e. feeders, waterers, stalls). If there is a voltage between these objects, a small current will flow through the livestock.

The fact that both objects are grounded to the same place (earth) would seem to prevent any voltage from existing between the objects. However, this is not the case – a number of factors determine whether an object is, in fact, grounded. These include wire size and length, the quality of connections, the number and resistance of ground rods, and the current being grounded. Thus, stray voltage can

exist at any house or farm which uses electricity, independent of whether there is a transmission line nearby.

Stray voltage is more commonly associated with small electrical distribution lines, which connect homes to larger transmission lines, and provide electricity to individual residences, farms, businesses, etc. Data analysis has determined that there does not appear to be any link between the distance between a farm (residence) and substation, or the electrical magnitude of the primary power line, leading to increased risk of stray voltage impacts.[194]

DCW Wind Farm

Potential impacts from stray voltage can result from a person or animal coming in contact with neutral-to-earth voltage. Stray voltage does not cause electrocution and is not related to ground current, EMF, or earth currents. Where distribution lines have been shown to contribute to the propagation of stray voltage on farm facilities, the distribution system was either directly under or parallel to an existing transmission line. These factors are considered in design and installation of transmission lines and can be readily mitigated. Potential impacts to animal agriculture are discussed in Section 3.3.9.2.

Problems related to distribution lines are also readily managed by correctly connecting and grounding electrical equipment. To address stray voltage, electrical systems, including farm systems and utility distribution systems, must be adequately grounded to the earth to ensure continuous safety and reliability, and to minimize this current flow. Wind energy collection systems mitigate any such issue by running a continuous bare ground conductor from the furthest turbine to the substation.

Generic 170 MW Wind Farm

A generic 170 MW wind farm will generally require transmission facilities to an interconnection point, similar to those indicated for DCW Wind Farm. Stray voltage concerns from collector and feeder lines located within the wind farm are addressed in the design of these systems.

170 MW Solar Farm

As with wind farm, a generic 170 MW PV solar farm would also require the installation of similar on-site facilities (i.e., PV arrays, including electrical cables and conduit, electrical cabinets, step-up transformers, SCADA systems and metering equipment, and access roads) to gather the power produced from the individual components (PV arrays, turbines).

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[194] Wisconsin Public Service. *Answers to Your Stray Voltage Questions: Backed by Research*. 2011. http://www.wisconsinpublicservice.com/business/pdf/farm_voltage.pdf

As with wind farm, stray voltage concerns from collector and feeder lines located within the solar farm are addressed through project design of these systems.

Mitigation

Due to low risk, mitigation measures are not proposed.

3.3.7 Associated Electrical Facilities and Existing Infrastructure

Electric generation facilities (fossil fuel power plants, wind farms, and solar farms) typically require construction of electrical facilities beyond the project boundaries, such as transmission lines and substations to deliver the generated power to the overall grid.

Impacts associated with construction of new transmission lines and substations can include impacts to plants and animals due to the loss of vegetation, habitat fragmentation, potential migratory bird collisions with the transmission line, visual impacts due to placement of poles or structures, and additional impacts to farmland.

DCW Wind Farm

Impacts from the 345 kV transmission project associated with the DCW Wind Farm are discussed in Chapter 6.

Generic 170 MW Wind Farm

A generic 170 MW wind farm may require construction of transmission facilities to an interconnection point, or may require new transmission infrastructure at existing facilities.

170 MW Solar Farm

As with wind farm, a generic 170 MW PV solar farm would also require the installation of similar infrastructure beyond on-site facilities (i.e., PV arrays, including electrical cables and conduit, electrical cabinets, step-up transformers, SCADA systems and metering equipment, and access roads) to deliver the generated power to the overall grid.

Mitigation

The primary measures to reduce the potential impacts from the construction and operation of these associated facilities is avoidance. This is accomplished largely through siting and routing, to the extent practicable, followed by the implementation of BMPs to minimize potential impacts and finally, the mitigation (e.g. restoration, direct compensation, wetland banking) of those impacts which are unavoidable.

Potential impacts and mitigation strategies would be similar to those for any energy project. The extent of impacts would be determined by the length and voltage of the transmission line required to

connect the electric generating facility to the transmission grid. A relatively longer line or higher voltage would increase the potential construction and operation impacts.

3.3.7.1 Infrastructure

The Project is located in rural southeastern Minnesota. A network of roads and utilities provide access, electricity, water supply, and telephone service to rural residences, farmsteads, small industry, and unincorporated areas. Two railroad tracks, operated by Canadian Pacific, are found on the northern and eastern borders of the site. Water wells and septic systems are typically used within the Project Area to provide household needs.

Roads

Electric generation facilities (fossil fuel power plants, wind farm, and solar farms) typically require that the existing transportation infrastructure to be adequate, or improvable, to handle heavy loads and oversized vehicles delivering large equipment or structures (turbine generators, tower segments, blades, etc.) to the site. Delivery of such equipment may require roadways to be upgraded or repaired post-delivery.

DCW Wind Farm

Dodge and Steele Counties have an established transportation network of state, county and township roads. County and township roads generally follow section lines. Private roads, mostly used for agricultural purposes, are also common. The County State Aid Highways (CSAHs) and Interstate Trunk Highways are two-lane paved roads. The remaining roads within the project area are two-lane gravel roads. Access from surrounding roadways will reduce the need for extensive access roads and allow existing primarily agricultural uses to continue relatively unaltered.

Within the site, road surfaces vary, and gravel roads are common. Traffic volumes in the area are fairly light. Traffic within the area has been summarized in Table 21, based upon MnDOT data. Of the roads within or adjacent to the project area, the highest Average Annual Daily Traffic (AADT) count is less than 400 vehicles per day with the lowest traffic counts below 30 cars per day. Dodge County CSAH 10 has the highest AADT count with 540 vehicles per day, using 2013 data, while the lowest count was at County Road Y in Dodge County with 25 vehicles per day, using 2013 data. The remainder of roads within the project area contained traffic counts between 40 and 390 vehicles per day with the higher counts in closer proximity to nearby cities.[195]

Construction traffic would use the existing county and state roadway system to access the project area and deliver construction materials and personnel. During construction peak, the applicant estimates

[195] *Site Permit Application*, at p 49-50.

there will be an additional 500 vehicle trips per day.[196] Current traffic levels in the project area are below roadway capacities.

During operations, only the maintenance crew workers will utilize roads within the site for regular inspections and maintenance. Nearby county roads have AADTs between 25 and 540 and traffic is not expected to noticeably increase during the operations phase of the wind farm.[197]

Impacts to traffic will be short-term, intermittent, and occur during the construction phase of the DCW wind farm. Impacts will be from the transport of project components to the project site and from the movements of construction workers. Equipment and materials used in construction of wind farms can be extremely heavy and/or oversized loads. Therefore, increased wear and tear of local roads may be expected from delivery of materials and equipment. Possible weight related impacts to roads include physical damage to the structure of the road itself and/or damage to culverts and bridges.

Depending on final turbine location and established haul routes, intersections may be temporarily widened to accommodate oversize loads. Any improvements to existing roads would consist of re-grading and filling of gravel surfaces. Any temporary modifications to the existing road system would be restored following construction.

Constructing the wind farm will require the construction of approximately 22 miles of gravel access roads, the final mileage will depend on the wind turbine model selected and final design. Access roads would be used by operation and maintenance crews while inspecting and servicing the wind turbines throughout the life of the project. The access roads would be between towers and one road would be required for each turbine string. The roads will be primarily gravel with varying thickness and may contain a geofabric layer, depending on specific soil conditions. The roads will initially be wide enough for construction traffic, but the permanent access road will be approximately 16 feet wide with a low profile to allow cross travel by farm equipment.[198]

Dodge and Steele counties will require permits for installations or modification of road approaches, overweight and over-dimension loads to transport equipment and materials over county highways.[199]

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[196] Ibid., at p 54-55.

[197] Ibid.

[198] *Site Permit Application*, at p 130-132.

[199] Ibid., at Table 54.

Table 21. Existing AADT Levels in the Project Area

Roadway Segment Description		Approx. Miles Within Project Boundary	Traffic Volume	Year Data Collected
Steele County	CR 157	4.96	125/185	2011/2011
Steele County	CR 159	2.64	305	2011
Steele County	CSAH 4	2.37	145	2011
Steele County	CSAH 6	5.56	285/385	2011/2015
Steele County	CSAH 16	6.77	380/325/185	2011/2015/2015
Steele County	CSAH 47	0.28	160	2015
Dodge County	CR O	3.06	40	2013
Dodge County	CR J	3.46	40	2013
Dodge County	CR W	3.01	40	2013
Dodge County	CR Y	2.01	25	2013
Dodge County	CSAH 1	3.16	270	2013
Dodge County	CSAH 3	6.23	350/390	2013/2013
Dodge County	CSAH 5	5.80	280/360	2013/2013
Dodge County	CSAH 6	5.30	30/170	2013/2013
Dodge County	CSAH 10	3.49	235/540	2013/2013

Generic 170 MW Wind Farm

A generic 170 MW wind farm will generally require similar utilization of regional roadways to those identified for proposed project. Impacts and mitigations associated with the use of available roadways for the generic 170 MW wind farm would be similar to those identified for the DCW Wind Farm.

170 MW Solar Farm

As with wind farm, a generic 170 MW PV solar farm would also require utilization of regional roadways for delivery of employees, materials and equipment to the solar farm site.

Mitigation

The Applicant will coordinate with the applicable local and state jurisdictions to ensure that the weights being introduced to area roads are acceptable.[200]

[200] Ibid.

The applicant must obtain, file and submit all required MnDOT permits, including permits to complete the necessary work in MnDOT's right-of-way, such as transportation of turbines and equipment to and from the site.[201]

Airports and Aviation

Airports are valuable transport, tourism, employment, and business assets for the local and national economy. The development of large energy projects need to consider the potential impacts to air service and operations (airports, landing strips, crop spraying activities, etc.) within a project area. Developments around airports and under flight-paths can constrain operations, either directly where they conflict with safety/operational requirements, or indirectly where they interfere with radar or other navigational aids.

The aviation industry is concerned that the growth of wind energy development will endanger agricultural aviators and restrict the business opportunities for aerial application of seeds, fertilizers and crop protection chemicals. A wind turbine in a farm field subject to aerial spraying represents an obstacle for the pilot; agricultural aviators fly below the height of turbine blades while distributing (as low as 10 feet above ground level), but need to rise to a higher altitude to turn around for their next pass. This turn can take a half mile to complete. In addition to collision risk, the vortices and the turbulence that the wind turbines generate can also be a concern for agricultural aviators.

According to the National Agricultural Aircraft Association (NAAA), there are about 1,560 aerial agricultural application businesses within the United States.[202] Minnesota has approximately 150 agricultural aircraft pilots.[203] Fixed-wing aircraft account for 87 percent of the aircraft used by agricultural applicators, helicopters and other rotorcraft account for the rest. Approximately 208 million acres of U.S. croplands are treated with crop protection products; aerial application accounts for about a fifth to a quarter of that acreage.[204]

The NAAA reports that between 2009 and 2019, nine (9) percent of aerial application fatalities were the result of collisions with various types of towers and 13 percent were the result of collisions with wires.[205] The Minnesota Agricultural Aviation Association noted in their scoping comment letter that

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[201] Ibid.

[202] National Agricultural Aviation Association. 2019. *Industry Facts*, https://www.agaviation.org/industryfacts, accessed March 26, 2019.

[203] Minnesota Agricultural Aircraft Association. https://mnagaviation.com/

[204] National Agricultural Aviation Association. 2019. *Industry Facts*, https://www.agaviation.org/industryfacts, accessed March 26, 2019.

[205] National Agricultural Aviation Association. 2014. *Fact Sheet on the Dangerous Effects Low Level Obstacles Pose to the Aerial Application Industry.* https://www.agaviation.org/Files/policyinitiatives/Advocacy%20Papers/Tower%20Issue%20Paper%20FINAL.pdf, accessed March 26, 2019

nationwide, in the past 10 years, there have been 102 aerial collisions with towers and wires, 21 of these have been fatal.[206]

The development of wind farm provides numerous economic and environmental benefits to both individuals and surrounding communities. Less apparent are the negative consequences of these projects, especially when they constrain a landowner's agribusiness. Both participating and non-participating landowner's operations may be affected; if one landowner erects a wind tower that resides too close to an adjacent landowner's field, the second landowner may lose their current or future opportunity to spray their crops, detrimentally affecting agricultural production.

Additionally, where aerial applications in the vicinity of wind farms are still possible, the increased complexity and time required results in higher cost (most spray policies charge premiums up to 50 percent above standard costs on fields within a mile of the towers, whether a participating landowner or not) to the farmer.[207]

While ground application can be just as effective as aerial spraying, there are certain circumstances where aerial application is preferred or required, such as specific stages of growth (i.e., height of corn and sunflower), weather conditions (i.e., wet, saturated soils subject to compaction), areas requiring split applications of fertilizer (i.e., for groundwater protection), and where timing is urgent (i.e., emergency pest control). Furthermore, ground sprayers can increase the spread of disease by carrying it through the crop on the sprayer components after it brushes by diseased plants.

A Purdue University study shows ground applicator rigs damage approximately 1.5 to 5 percent of soybean crops.[208] Building on the Purdue study, Russ Gasper (Nebraska Department of Aeronautics) calculated a potential economic loss due to trampling from ground applicator rigs on Nebraska corn harvest of 25 million dollars.[209]

Meteorological towers (MET), (**Figure 8**) used to collect wind data at wind farm sites, can pose a special threat. These towers are typically 197 feet, which fall just under the requirements for FAA lighting and marking.

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[206] Minnesota Agricultural Aviation Association, Comment Letter November 1, 2018. eDocket No. 201811-148027-08
[207] Illinois Agricultural Aviation Association. 2019. *Wind Farms.* https://agaviation.com/wind-farms/
[208] Hanna et al. 2007. *Managing Fungicide Applications in Soybeans*. Bulletin SPS-103-W. Purdue University Extension Service. https://www.extension.purdue.edu/extmedia/sps/sps-103-w.pdf
[209] Gaspar, Russ. 2015. *Agriculture, Aerial Applicators, and Airports.* Agricultural Aviation. September-October, 2015. http://www.agaviationmagazine.org/agriculturalaviation/september_october_2015?pg=54#pg54

Figure 8. Typical Meteorological Tower[210]

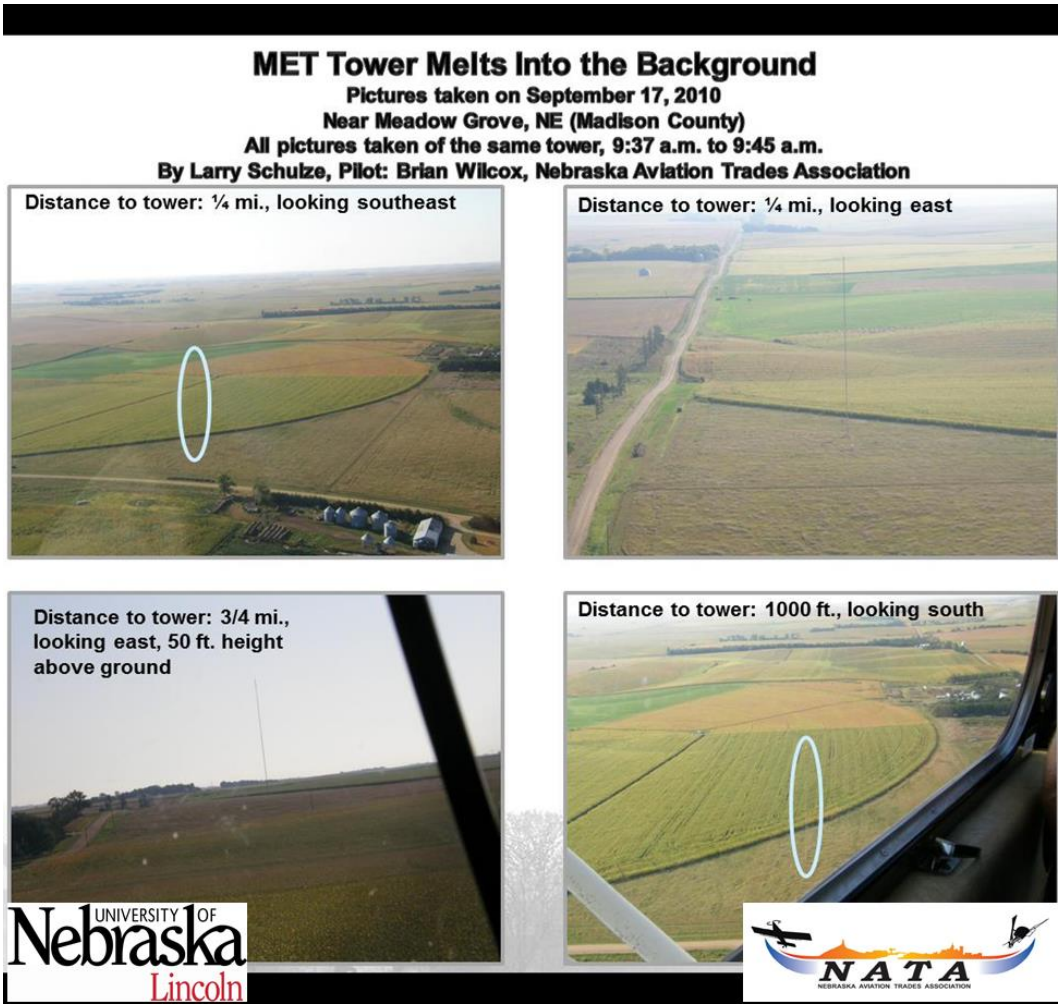
The type of MET towers that are used in development and siting (pre-construction) typically consist of sections of galvanized tubing that are assembled at the site and raised and supported using guy wires. These towers can be erected or removed in as little as a few hours. The tower may be at one location for a short period of time and then moved to a different location, as the wind developer checks the area for the best wind conditions for the placement of wind turbines. The fact that these towers are narrow, unmarked and grey in color makes for a structure that is nearly invisible under some atmospheric conditions. The temporary and mobile nature of these MET towers makes their location difficult to maintain in a database. In some cases, a wind company may install a temporary met tower to gather information on a potential site without general public knowledge. In some cases, the landowner's contract requires the landowner to keep this information confidential.

Post-construction MET towers are used to transmit to the control center the meteorological situation in the location and it has a principal importance for the management of the site. The type used during the operation of a wind conversion facility is built heavier and may or may not use guy wires; they usually still fall under the height required for FAA lighting and marking.

The major risk factor for pilots is that the dull metal used for the tower, and the supporting guy wires, are difficult to see from the air (Figure 9). The tower and wires easily blend into the surroundings, making them a hazard to pilots of low-flying aircraft.

[210] Meteorological (MET) Tower Installation and Wind Data Collection Services. https://www.prlog.org/10197661-meteorological-met-tower-installation-wind-data-collections-services.html

Figure 9. Met Tower Visibility[211]



DCW Wind Farm

There are no registered public airports located within the site. There are nine active registered airports and six active heliports located within 20 miles of the site. The closest registered airport is the Dodge Center Airport (TOB), located approximately 3.4 miles away from the northeastern extents of the site boundary. This is a public-use airport with one concrete runway and one turf runway which require permission prior to landing. Runway 16/34 is concrete and is 4,500 feet in length, and runway 4/22 is turf and is 2,383 feet in length.[212]

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[211] Nebraska Institute of Agriculture and Natural Resources. *Wind Measurement (MET) Towers.* https://cropwatch.unl.edu/bioenergy/met-towers

[212] *Site Permit Application*, at p 73-77

Due to the agricultural use within the region, small private runways associated with crop dusting activities may exist within or near the project area.

Under 14 CFR Part 77.9, all structures exceeding 200 feet above ground level must be submitted to the FAA so that an aeronautical study can be conducted. The purpose of the study is to identify obstacle clearance surfaces that could limit the placement of wind turbines. The end result of the aeronautical study is the issuance of a determination of Hazard or No Hazard. Additionally, a Tall Towers Permit and approval may be required by the MnDOT prior to constructing the project to ensure the safety of airspace within Minnesota.[213]

Generic 170 MW Wind Farm

A generic 170 MW wind farm sited elsewhere in Minnesota would also have to comply with FAA and the MnDOT Office of Aeronautics and Aviation requirements, requiring both turbines and meteorological towers to be identified and fitted with the appropriate markings and lights. Pre-screening of potential wind farm sites must take into consideration the potential for conflicts between the use of airspace and project infrastructure.

170 MW Solar Farm

Because of the relatively low profile of PV solar farms, FAA lighting requirements would not be anticipated to be necessary; however, appropriate siting of PV solar projects is necessary to ensure they do not cause safety problems for aviation or otherwise interfere with aeronautical and airport activities. Specifically, the FAA wants to ensure solar systems do not create glint or glare conditions (glint is a momentary flash of bright light, and glare is a continuous source of bright light). The FAA has determined that glint and glare from typical ground-mounted solar energy systems, in the vicinity of airports, could result in an ocular impact to pilots and/or air traffic control facilities and compromise the safety of the air transportation system. While the FAA supports PV solar energy systems near, and even on airports grounds, the FAA seeks to ensure safety by eliminating the potential for ocular impact to pilots and/or air traffic control facilities due to glare from such projects.[214]

It is anticipated that an FAA review of a 170 MW solar farm, with proper site prescreening, would result in a “No Hazard” determination.

Mitigation

Site permits granted by the Commission contain requirements for the design and siting of meteorological towers (**Appendix B**). Permanent towers for meteorological equipment are required to be free standing (no guy wires). Permanent meteorological towers shall not be placed less than 250

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[213] Ibid.

[214] Kandt, A; Romero, R. *Implementing Solar Technologies at Airports*. NREL. 2014. https://www.nrel.gov/docs/fy14osti/62349.pdf

feet from the edge of the nearest public road right-of-way and from the boundary of the Permittee's site control, or in compliance with the county ordinance regulating meteorological towers in the county the tower is built, whichever is more restrictive. Meteorological towers shall be placed on property the Permittee holds the wind or other development rights. Meteorological towers shall be marked as required by the Federal Aviation Administration.

Project planning, construction, and operation will be coordinated with the FAA, local airports and state air traffic agencies to ensure public safety is not negatively impacted by the Project. The Applicant will follow FAA guidelines for marking towers and implement the necessary safety lighting. Notification of construction and operation of the wind farm will be sent to the FAA and steps will be taken to ensure compliance with FAA requirements.

3.3.7.1 Communication Systems

Large electric generation facilities have the potential to impact electronic communications (radio, television, internet, cell phone, and microwave). This section discusses potential impacts on communications systems due to the operation of a large electric generation facility in the Project area.

DCW Wind Farm

Wind turbines can cause interference with electronic communications by obstructing the reception of communication signals. Wind turbines do not impact digital signals (e.g., digital television, internet, cell phones), unless the turbines directly obstruct the signal, such as being located in the line-of-sight.[215] Analog signals (e.g., amplitude Modulated (AM) and frequency modulated (FM) radio, microwaves) can be interfered with by direct obstruction and by indirect signal interference, resulting in ghosting of television pictures or signal fading.

Radio

Land mobile and radio facilities are wireless communication systems intended for use by users in vehicles, such as those used by emergency first responder organizations, public works organizations or companies with large vehicle fleets or numerous field staff. FM radio is not impacted by wind turbines or transmission facilities; AM radio can be impacted near transmission facilities, e.g., signal fading underneath a transmission line. Potential communications impacts due to the wind farm are anticipated to be minimal.

[215] Polisky, Lester. *Post Digital Television Transition - The Evaluation and Mitigation Methods for Off-Air Digital* Television Reception in-and-around Wind Energy Facilities. Wireless Pulse, December 2009; http://acvamoonqa.comsearch.com/newsletter/archiveWP/WirelessPulseDec09.html

WindLogics conducted an Electromagnetic Interference Analysis and did not identify AM or FM radio towers within the site boundaries. There are 11 AM towers and 15 FM towers within 15.5 miles of the site.[216]

The Electromagnetic Interference Analysis indicated that interference to AM or FM signals are expected to be minimal. Some AM/FM signal loss may occur in close proximity to individual turbines, but most AM/FM radio receptors near residences and residences should have sufficient setback to minimize signal interruptions. Interference to AM towers would be limited to a distance equal to one wavelength from non-directional antennas and 10 wavelengths, or 1.9 miles, from directional antennas. The closest AM tower, KRFO, is located 1.6 miles from the site and has a wavelength of 0.13 miles. Thus, the closest AM tower is greater than 10 wavelengths from the site and would not be impacted. Interference to FM towers would be constrained to approximately 2.5 miles from the FM tower. Two FM towers (KCJL-LP and KRFO-FM) are located less than 2.5 miles from the site, but the closest wind turbines would be located over 2.9 and 4.3 miles from the FM towers.[217]

Microwave Beam Paths

Wind turbines can interfere with microwave paths by blocking or partially blocking the line-of-sight path between microwave transmitters and receivers. Microwave bands are a telecommunication system that provides long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services. To prevent disruption of the microwave beam path, turbines should not be sited the centerline of a beam path.

The Electromagnetic Interference Analysis examined microwave beam paths in the vicinity of the project and identified ten microwave beam paths that cross into the site (see map in **Appendix D**)

Radar

The federal government has a large number of departments and agencies that operate a set of communication systems that are not part of any public databases. The United States Department of Commerce National Telecommunications and Information Administration (NTIA) coordinates government communication systems for all departments and agencies. NTIA reviewed the DCW Wind Farm layout for concerns with radio frequency transmission blockage and issued a finding that No Harmful Interference Anticipated.[218]

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[216] *Site Permit Application*, at p 50-58; *Amended Site Permit Application*, at p. 16

[217] Ibid.

[218] *Site Permit Application*, at pp. 50-51

Telephone Service

Telephone service in the project area is provided both through landlines and wireless signals. Carriers include Alltel Communications, AT&T, CenturyLink, CenturyLink Business, Charter Spectrum, Cox Communications, Sprint, T-Mobile Time Warner Cable, U.S. Cellular, and Verizon Communications.[219]

Operation of the wind farm will not impact the telephone service in the project area. However, physical damage to underground telephone lines may incidentally occur during construction of the wind farm. In order to avoid potential physical impacts to underground telecommunication lines, all lines will be located using a utility locate service, and collection line locations will be coordinated with local telecommunications providers to ensure there will be no direct impacts to existing telephone lines. If inadvertent impacts identified during or after construction, DCW will address these impacts on a case-by-case basis.[220]

Land mobile systems are designed with multiple base transmitter stations; therefore, any signal blockage caused by the wind turbines would not perceptibly degrade their reception. Construction and operation of the proposed wind farm is not expected to impact telephone service to the area.

Broadcast Facilities

There is a possibility that broadcast facilities (HDTV and digital television) would be impacted by the wind farm. Outdoor antennas pointed through the turbine area, "rabbit ear" antennas or older HDTV receivers would be more likely to experience signal disruption (in the form of pixilation or “freezing” of a picture). Interference would be more likely to occur where there is direct interference with digital broadcast paths of local television stations. Occasionally, multipath interference from one or more turbines can cause video failure in HDTV receivers, especially if the receiver location is in a valley or other place of low elevation.

Windlogics performed an analysis of electromagnetic interference from the wind farm. The analysis determined that digital or analog television towers are not located within the site.[221] There are 35 licensed television towers within approximately 62 miles of the site, including 14 towers that are within 31 miles of the site and are likely to be broadcasting to the region. Most of the television towers within approximately 62 miles of the site are low power stations or translator stations that have limited range and would not be expected to experience reception interference. Six full power towers (KXLT-TV, KSMQ-TV, KAAL, KIMT, KYIN, and KTTC) have a possibility of experiencing reception interference via line-of-sight between a transmitting tower and a TV receptor; these towers are located between 16 and 34 miles from the site.

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[219] *Site Permit Application*, at pp 50-58

[220] Ibid.

[221] Ibid. at Appendix F

GPS

Global positioning systems (GPS) use satellite signals to determine locations on the earth's surface and are commonly used to guide agricultural operations. Because GPS uses multiple digital satellite signals, interference with the signals or subsequent uses is not anticipated. Obstruction of any one satellite signal would require direct line-of-sight obstruction due to a wind turbine. Such an obstruction would be temporary (i.e., there is concurrent GPS receiver movement, satellite movement, and wind turbine blade movement such that the obstruction should be resolved).

Wireless Broadband Internet

It is unclear if there are impacts to wireless broadband internet signals due to operation of a wind farm. For a previous wind project, the Department contacted engineers at the local wireless broadband internet service provider (StarCom/StarNet) for further information.[222] StarCom representatives stated that it is possible that a wind turbine operating along the "line of sight" between a broadband signal tower and residential antenna can cause intermittent signal loss, but that such cases were rare.

Generic 170 MW Wind Farm

A generic 170 MW wind farm would have communications impacts similar to the proposed project depending on a variety of factors such as the proximity of homes in relation to the project, number of turbines and the number of communication facilities and types in the area. Mitigation efforts at a generic 170 MW wind farm for impacts to communication services would also be similar to the mitigation efforts at the DCW Wind Farm.

170 Solar Farm

Given the relatively low profile of PV solar farms, no impact to digital signals (e.g., digital television, internet, cell phones) or analog signals (e.g., AM and FM radio, microwaves) would be anticipated. However, if O & M building components or associated transmission line towers were to be constructed within the "line of sight" between a line-of-sight signal and residential antenna, it is possible the customer could experience intermittent signal loss.

Mitigation

DCW commissioned a microwave beam path analysis, an off-air television analysis, and a radio blockage review from NTIA for the DCW project area. DCW has indicated that, where possible, turbines and associated facilities will be sited in manner that does not interfere with microwave beam paths, radio transmissions, or television reception. If the turbines or associated facility infrastructure

[222] Elm Creek II Wind Project, Environmental Report, P. 30, eDocket ID: 200911-44359-01

are the cause of disruption or interference with television reception or microwave patterns the DCW will work with affected residents to establish a comparable alternative to the previously existing service.[223]

3.3.8 Fuel Availability

Large electric power generating facilities require some type of fuel. Depending upon the amount and type of fuel required and the location of the fuel relative to the proposed project, the project can create impacts related to harvesting and delivery of the fuel.

DCW Wind Farm

Wind farms rely on wind, a renewable energy source, to generate electricity. Wind turbine blades extract kinetic energy as the wind passes through the blades and creates turbulence downstream. To operate effectively, turbines must be setback from other turbines to compensate for this turbulence known as wake loss.[224]

Wind capacity varies across Minnesota. Extensive wind measurements have been taken and analyzed by the Minnesota Department of Commerce (**Figure 5**). Local data collection suggests the mean annual wind speeds at the turbine locations is approximately 7.8 m/s.[225] Power generation by the DCW project depends not only on wind speed (how much energy it contains), but also the frequency of attaining optimal wind speeds. Wind turbines generate power only when the wind is blowing, and the developer anticipates a net capacity factor of approximately 38.7% to 47.5% annually. Additionally, the projected average annual output of approximately 636,605 megawatt hours (MWh) is anticipated for the wind farm.[226]

Generic 170 MW Wind Project

To be economically feasible, a 170 MW wind farm sited elsewhere in Minnesota would need to be sited in an area with sufficient wind resources to meet generation projections. Few areas of the State have wind resources that are equal to the southern portion of the State where the DCW project is sited. Although areas with the highest areas of good wind resources are located in southwestern Minnesota (**Figure 5**), due to transmission constraints in that region, as well as advances in turbine technology, wind projects have become operational, and more have been proposed throughout the state. Productive, undeveloped wind resources in Minnesota are still available.

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[223] *Site Permit Application*, at p 50-58

[224] Commission. *Order Establishing General Permit Standards*. January 11, 2008 https://mn.gov/commerce/energyfacilities/documents/19302/PUC%20Order%20Standards%20and%20Setbacks.pdf

[225] *Amended Site Permit Application*, at p. 23

[226] Ibid., at p. 26

170 MW Solar Farm

PV systems convert both direct and indirect solar energy (direct and scattered sunlight) to electrical energy by capitalizing on nature's inherent desire to keep electrical charges in balance. At the most basic level, electrical current is the flow of electrons through a conductor. When solar radiation strikes a PV cell some of it is absorbed exciting electrons within the cell. Some of these electrons move freely between layers from negative to positive. In the process, electrons from the positive layer are disrupted and "flow" back to the negative layer through the external load creating a continuous flow of electrons, or, a continuous flow of electric current. Solar farms of varying sizes are operational and in development throughout many regions of the state.

Mitigation

Renewable energy is energy that is collected from renewable resources (fuel), which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. Renewable energy plays an important role in reducing greenhouse gas emissions. When renewable energy sources are used, the demand for fossil fuels is reduced. Unlike fossil fuels, non-biomass renewable sources of energy (hydropower, geothermal, wind, and solar) do not directly emit greenhouse gases.

Overall, using wind to produce energy has fewer effects on the environment than many other energy sources. Wind turbines do not release emissions that can pollute the air or water, and they do not require water for cooling.

Solar energy does not produce air or water pollution or greenhouse gases, although present technology requires large areas of land. Solar energy can have a positive, indirect effect on the environment when using solar energy replaces or reduces the use of other energy sources that have larger effects on the environment.

3.3.9 Agriculture

Large generation facilities in agricultural areas will have impacts on cropland and possibly on livestock operations.

3.3.9.1 Cropland

Wind farms placed in cultivated areas do take a limited amount of acreage out of production for turbine placement, access roads, DCW Substation, and the O&M facility. However, agricultural cropping and "wind farming" are generally compatible uses.

DCW Wind Farm

Land use within the site is primarily agricultural and is the use that accounts for approximately 45,530 acres, or approximately 87 percent of the site (Appendix D). An additional 5 percent of land is indicated as hay/pasture/herbaceous land cover, much of which is used for livestock grazing.[227]

According to the 2012 USDA Agricultural Census Report, over 80 percent of the land in Dodge County was used for agriculture on approximately 621 farms. Corn, soybeans, and wheat are the primary crops grown in Dodge County, while swine and cattle are the predominant livestock raised in the county. The market value of agricultural products sold in the county for 2012 was approximately $288.1 million, with crop markets at approximately $177.6 million and livestock markets at approximately $110.5 million.[228]

In Steele County, approximately 86 percent of land is used for agricultural purposes; approximately 237,986 acres are used for agricultural purposes on approximately 796 farms. The market value of agricultural products sold in Steele County in 2012 was nearly $293 million, with crop markets comprising $196 million and livestock markets comprising $97 million.[229]

Approximately 42 percent of the total Project Area is classified as prime farmland, while approximately 52 percent is classified as prime farmland, if drained. Additionally, approximately 2.1 percent of land within the Project Area is not prime farmland and approximately 3.5 percent is considered farmland of statewide importance.[230]

The DCW Wind Farm is not expected to significantly impact agricultural land use or the general character of the area. While an estimated 0.7 acres of land per turbine will be taken out of agricultural production for the life of the project to accommodate the turbine pad, access roads, DCW Substation, O&M facility, and ancillary facilities, landowners may continue to plant crops near, and graze livestock up to the gravel roadway around each turbine pad.

This estimate is based on an 80-foot diameter area of permanent impact at each turbine location (including the concrete foundation and gravel ring around the foundation), 16-foot wide permanent access roads, approximately two acres for the O&M facility, and one acre for the substation. The primary permanent impact to active agricultural land will be the reduction of crop production on a total of approximately 49 acres of cultivated crop in the Project Area. Collector lines will not result in permanent impacts as they will be installed entirely underground below the plow zone. Large-scale

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[227] *Site Permit Application*, at p 80-83

[228] Ibid.

[229] Ibid.

[230] Ibid.

impacts to agriculture or agricultural lands are not anticipated with the placement of turbines, access roads, and ancillary facilities in agricultural fields.

Generic 170 MW Wind Farm

Impacts to farming at a generic 170 MW wind farm would be similar to those of the proposed project if placed in a predominantly agricultural area.

170 MW Solar Farm

Ground-mounted PV solar farms require approximately 7 to 10 acres per MW; the North Star 100 MW solar farm project occupies approximately 800 acres, of which approximately 170 acres required grading (i.e., cut and fill).[231] Given the larger footprint required for solar farms, it would be expected that the impacts to croplands would be significantly greater, in the neighborhood of 1,200 to 1,700 acres, than an equivalent capacity wind farm.

Mitigation

Farming activities will continue on the land surrounding turbines and access roads. Impacts to drain tile in the from construction of the DCW Wind Farm are not anticipated, however, any damages sustained as a result of construction would be repaired according to agreement with the landowner. Areas temporarily removed from agricultural crops production during construction will be restored back to farmable conditions after construction is complete. Additionally, landowners will be reimbursed, by the project developer for any crop damages and losses that occur during construction or maintenance activities during operation.

3.3.9.2 Livestock

Large electric generation facilities have the potential to impact domesticated animals and livestock indirectly through environmental impacts.

Livestock health depends on ecosystem health (clean water, fresh air, healthy soils and crops). Generation facilities that impair ecosystem functions can also negatively impact livestock health, such as through emissions of hazardous air pollutants or through the contamination of water systems. Potential ecosystem impacts due to generation facilities are discussed elsewhere in this report.

Other potential impacts to livestock health include annoyance or stress. Stress may result from a variety of impacts related to generation facility operations, such as lights, noise, and stray voltage.

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[231] *North Star Solar EA*

The primary concern with stray voltage has been its potential effect on farm animals that are confined in areas where electrical distribution systems supply the farm. A great deal of research on the effects of stray voltage (neutral to earth voltage) on dairy cows has been conducted over the past 40 years.[232]

With respect to agriculture, stray voltage is defined by the U.S. Department of Agriculture (USDA) as a small voltage (less than 10 volts) measured between two points that can be contacted simultaneously by an animal.[233] For example, this effect is experienced when livestock come into contact with two metal objects between which a voltage exists, such as feeders, water troughs, or stalls, thereby causing a small current to flow through the livestock. The fact that both objects are grounded to the same place (earth) would seem to prevent any voltage from existing between the objects. However, this is not the case—a number of factors determine whether an object is, in fact, grounded. Factors that could influence the intensity of stray voltage include wire size and length, the quality of connections, the number and resistance of ground rods, and the current being grounded.

The direct effect of animal contact with electrical voltage can range from mild behavioral reactions indicative of sensation, to involuntary muscle contraction (or twitching), to behavioral responses indicative of pain. The indirect effects of these behaviors can vary considerably depending on the specifics of the contact location, level of current flow, body pathway, frequency of occurrence, and other factors related to the daily activities of the animals. Common situations of concern in animal environments include the following:[234]

- Animals avoiding certain exposure locations that may result in reduced water or feed intake if painful exposure occurs while accessing watering or feeding devices or locations.
- Difficulty of moving or handling animals in areas of annoying voltage/current exposure.
- Release of stress hormones produced by contact with painful stimuli.

Studies have been conducted to investigate the potential direct physiological effects that may produce behavioral changes. Research has also been conducted to describe the potential effects that may result from the animal's exposure to voltages less than those which produce sensation and behavioral responses. Reinemann conducted a detailed literature review and synthesis of research findings on the impact of stray voltage on farm operations.[235] Through different controlled and field experiments,

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[232] Reinemann, Douglas. *Literature Review and Synthesis of Research Findings on the Impact of Stray Voltage on Farm Operations. Ontario Energy Board. 2*008 https://www.oeb.ca/oeb/_Documents/EB-2007-0709/report_Reinemann_20080530.pdf

[233] Wisconsin Public Service. *Answers to Your Stray Voltage Questions: Backed by Research*. 2011. http://www.wisconsinpublicservice.com/business/pdf/farm_voltage.pdf

[234] Reinemann, Douglas. *Literature Review and Synthesis of Research Findings on the Impact of Stray Voltage on Farm Operations. Ontario Energy Board. 2*008 https://www.oeb.ca/oeb/_Documents/EB-2007-0709/report_Reinemann_20080530.pdf.

[235] Ibid.

these studies have found that sensitive dairy cows may experience mild behavioral modifications at current levels exceeding 2 milliamps and voltages exceeding 1 to 2 volts.

DCW Wind Farm

Livestock in and adjacent to the site would be exposed to noise and shadow flicker created by wind turbines. Exposure levels would depend on factors such as grazing, housing, and the distance between livestock and the turbines. Health impacts from turbine noise and shadow flicker are uncertain. Information about impacts to livestock is anecdotal and indicates that livestock are not impacted by turbine operations. Animals do graze near, under and up to turbine towers.

The MPCA is the state agency charged with regulating animal feedlots in Minnesota. There are 608 registered feedlots in Dodge County and 627 registered feedlots in Steele County. Roughly, 91 of the aforementioned registered feedlots are within the site.[236]

The electrical collection system proposed for the DCW Wind Farm is designed to be a separately derived system as defined in the NESC. The system would have no direct electrical connection (including grounded circuit conductors) to conductors originating in another system. The wind farm collection system would have its own substation and transformers.[237]

Because of the type of transformers used at each turbine and the design of the collection system, there are no ground currents in the collection system, whether the system is operating at zero generation or maximum generation. Therefore, under normal operating conditions, the grounding for the wind farm collection system has no current with which to create stray voltage.[238]

Potential impacts to livestock can arise during construction, or during O&M activities. Gates restricting livestock can inadvertently be left open, and livestock fences can be damaged. Cattle, in particular, can be put at risk of walking on to a public roadway and being struck by a vehicle if gates are left open or fences are damaged.

Generic 170 MW Wind Farm

A generic 170 MW wind farm located elsewhere in Minnesota would have impacts to livestock similar to the proposed project.

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[236] *Site Permit Application*, at p 80-83.

[237] Ibid., at p 71-73.

[238] Ibid.

170 MW Solar Farm

While offering some siting and design challenges, solar farms can be compatible with livestock operations.[239] Cattle and other large livestock would require physical barriers to separate the livestock from the solar farm arrays; the panels are fixed relatively low to the ground, so cattle cannot graze beneath them. Sheep have been used to manage vegetation at some solar facilities in Minnesota.

Mitigation

Mitigation of potential stray voltage impacts would include that all safety requirements are met during the construction and operation of the project. There are a number of strategies for mitigating stray voltage, including improved grounding.[240]Good electrical connections and choosing proper wiring materials for wet and corrosive locations will improve grounding and reduce stray voltage levels.

The Draft Site Permit (**Appendix B**) has specific conditions requiring the protection of livestock during all phases of the proposed project, and also the immediate repair of any fences or gates damaged during Project construction or O&M activities.

3.4 Availability and Feasibility of Alternatives

Having analyzed comparative impacts of alternatives, an Environmental Report is required to offer an assessment of the availability and feasibility of those alternatives (Minn. Rule 7849.1500 subp. 1F). This section describes the feasibility and availability of alternatives to the DCW Wind Farm.

3.4.1 DCW Wind Farm

The DCW Wind Farm is located in a rural area with a primarily farm-based economy. Wind projects have typically been well integrated into similar settings. Wind resources are among some of the best in the State of Minnesota. In addition, convenient access to the grid is available in the area, with the need to construct only minimal new transmission facilities, including the DCW Substation. DCW is in the final stages of obtaining a MISO Large Generator Interconnection Agreement, and additional studies are being conducted to determine interconnection details and engineering designs.[241]

The proposed wind farm is feasible and available to be implemented once interconnection details and designs have been completed.

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[239] Kellner, Chelsea. 2018. *Got Sheep? Want a Solar Farm?* North Carolina State University College of Agriculture and Life Sciences News. https://cals.ncsu.edu/news/got-sheep-want-a-solar-farm/

[240] Wisconsin Public Service. *Answers to Your Stray Voltage Questions: Backed by Research*. 2011. http://www.wisconsinpublicservice.com/business/pdf/farm_voltage.pdf

[241] *Site Permit Application*, at p. 17.

3.4.2 Generic 170 MW Wind Farm

An alternative to the DCW wind farm is a large wind energy conversion system sited elsewhere in Minnesota. There are good wind resources in other parts of the state, and wind farms could be placed in these areas. Such a project could be a single 170 MW project or a combination of smaller dispersed projects.

In addition to wind resource availability, access to transmission interconnection is also important for a project to be viable; in the past transmission access has been a constraint for the development of wind energy in Minnesota.

3.4.3 170 MW Solar Farm

A 170 MW Solar Farm is potentially feasible, however a site with adequate space and interconnection to the grid has not been identified as part of this review process. Recently permitted solar farms include the 100 MW Aurora Distributed Solar Project (eDocket No. 14-515), the 100 MW North Star Solar Project (eDocket No. 15-33), and the 62.25 MW Marshall Solar Project (eDocket 14-1052).

In 2013, Minnesota established a Solar Energy Standard that mandates Minnesota's investor-owned electric utilities to generate 1.5 percent of their electric power from solar by the end of 2020. Minnesota Power and Otter Tail Power are planning for additional solar development to reach their solar targets by 2020. In addition, Xcel Energy included a target of 650 MW of solar generation by 2020 and an additional 750 MW by 2030 in its 2016-2030 resource plan approved by the Minnesota Public Utilities Commission in 2016 as a least-cost plan for the utility's system needs.[242]

The cost and reliability of wind power continues to be more favorable than for solar power despite recent substantial decreases in cost for solar. Wind continues to be more cost-effective than solar-powered electricity and remains the lowest-cost new source of renewable energy. The United States Energy Information Administration projects the levelized total system cost for new generation resources entering service in 2023 to be $42.8/MWh (36.6 with tax credit) for onshore wind compared with $48.8/MWh ($37.6/MWh with tax credit)for solar photovoltaic entering service .[243]

From a land-use perspective, a MW of solar requires more land be temporarily used for the life of the project to achieve the same number of MW. Additionally, crop production with the proposed project will not be significantly impacted, whereas for a solar facility a large area of land would be taken out of production for the life of a solar plant.

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[242] Minnesota Department of Commerce. 2018. *Minnesota Renewable Energy Update*. https://mn.gov/commerce-stat/pdfs/2017-renewable-energy-update.pdf

[243] U.S. Energy Information Administration. 2019. *Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook* 2018, *available at:* https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf.

3.4.4 No-build Alternative

The no build alternative is feasible and available.

The DCW Project has been proposed to meet growing electric demand in Minnesota and growing demand for additional renewable resources in Minnesota and neighboring states. Minnesota has committed to a renewable energy objective of generating 25 percent of its electricity from eligible renewable sources by the year 2025.[244] Minnesota utilities had approximately 3,700 MW of wind generation in their portfolios at the end of 2017, with an additional 3,000 MW of wind generation planned for the Minnesota Market.[245] In addition to Minnesota's renewable energy objective, there is a regional need and desire for wind energy. It is not clear what the effect of a no-build alternative would be on meeting Minnesota and regional demand for electric power and for renewable generation in particular.

[244] Minn. Statute 216B.1691

[245] Minnesota Department of Commerce. 2018. *Minnesota Renewable Energy Update*. https://mn.gov/commerce-stat/pdfs/2017-renewable-energy-update.pdf

4 Proposed Transmission Project and System Alternatives

DCW proposes to connect the wind farm to the electrical grid through approximately 21 to 26 miles (depending upon the route selected) of new 345 kV transmission line between the wind farm and SMMPA's Byron Substation, located immediately west of Byron in Olmstead County (**Figure 2, Appendix E**). The transmission line would originate at a new collector substation (DCW Substation) in the eastern portion of the wind farm (Ripley Township, Dodge County). In addition to the construction of the DCW Substation and the 345 kV transmission line, the transmission project will require equipment additions and reconfigurations within the Byron Substation to connect the new 345 kV line. DCW proposes to use monopole structures ranging from 80 to 140 feet in height, with spans of 400 to 1200 feet between structures. [246]

This portion of the document reviews potential impacts and mitigation from a 345 kV transmission project as well as system alternatives (no-build, other voltages, and alternative endpoints) to the proposed 345 kV transmission project. The Commission's decision on the certificate of need will determine whether a transmission line is needed and, if needed, the size and type of the line.

4.1 Proposed 345 kV Project

The proposed transmission project includes construction of the 345 kV transmission line, the DCW Substation, and improvements to the Byron Substation. This section discusses the design, construction, operation and maintenance of these elements of the proposed transmission project.

4.1.1 Engineering and Design

DCW proposes to use steel single circuit (carrying one three-phase conductor set) monopole structures for the transmission project. This section describes the structures and configurations that may be used for this transmission project.

4.1.1.1 Transmission Lines

Alternating Current (AC) transmission lines, such as that proposed by DCW, consist of three separate phase, each phase requiring a conductor to carry the electrical power. A phase consists of one or more conductors: single, double, or bundled. For higher voltage transmission lines, such as that proposed by DCW, multiple sub-conductors are often bundled together in each phase. Although final conductor selections have not been made, DCW anticipates using aluminum conductor steel reinforced (ACSR) cable, although a final determination on conductors will be made during final design.

DCW anticipates installing either optical ground wire or 3/8 inch extra high strength steel as shield wires strung above the phases to prevent damage from lightning strikes. The shield wire could also

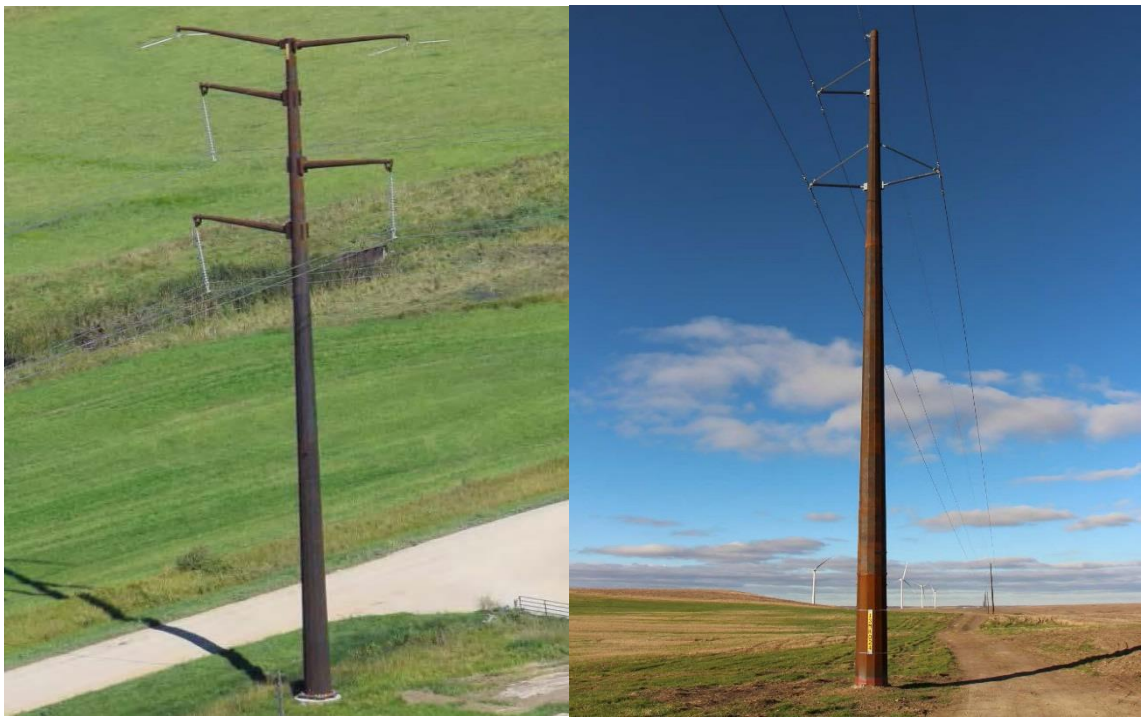
[246] *Route Permit Application*, at Table 5

include a fiber optic cable that allows substation protection equipment to communicate with other terminals on the line.

4.1.1.2 Structures

DCW proposes to use steel single circuit (carrying one three-phase conductor set) monopole structures for the majority of the transmission line's length (Figure 10, Appendix H). The steel structures will be either galvanized or weatherizing steel. As proposed, structure heights range from 80 to 140 feet above ground, depending upon terrain, span length, and the location of the structure (e.g angle structures or structures located with road right-of-way may be taller).

Figure 10. Example of 345 kV Structures



For the portions of the transmission project located within county road ROW (approximately 7.8 miles, for Route A and 11.2 miles for Route B, DCW proposes to use a braced post design with shorter spans between structures in order for the alignment to be located within the road ROW. Road ROW widths along these segments range from approximately 66 to 100 feet in width for Route A and approximately 66 to 150 feet for Route B.

DCW anticipates that tangent (straight-line) structures will be direct embedded, unless detailed design determines that concrete piers should be used. Table 22 provides a summary of the design features associated with each structure type.

Table 22. 345 kV Structure Design Summary[247]

Structure Type	Measurement in feet				
	ROW width	Structure Height Above Ground	Structure Base Diameter	Excavation Diameter	Span Between Structures
Tangent Single Pole Delta (0° -2°)	150	80-135	3-4	4-5	500-1,200
Tangent Single Pole Braced Post Vertical (0° -2°)	75-150	100-135	3-4	4-5	400-1,200
Guyed Dead-end (35° -95°)	150	80-140	3-4	4-5	500-1,100
Self-Support Dead-end (0° -90°)	75-150	80-140	6-8	10-12	400-1,100
Light Angle (2° -15°)	75-150	80-140	3-5	5-10	500-1,200
Medium Angle (15° -40°)	75-150	80-140	3-5	5-10	500-1,200
3-Pole Dead-end (0° -90°)	100-150	80-130	3-5	5-10	500-1,100

Depending upon soil conditions and the angle the structure supports, some poles may be anchored with concrete piers. Angle and terminal (dead-end) structures will be direct-embedded and supported by guy wires.

4.1.2 Route Width, Right-of-Way and Anticipated Alignment

When the Commission issues a route permit, it approves a route, a route width, and an anticipated alignment within that route width.

- Route: The path the transmission line will follow between the DCW Substation to the Byron Substation. Under Minnesota Statute 216E, subd. 8, the route may have a variable width of up to 1.25 miles.
- Right-of-Way (ROW): The ROW is the physical land area within a route that is needed to construct and operate an energy facility
- Route Width: The area along the route within which the actual ROW will be placed. The route width is typically larger than the ROW to provide flexibility to address engineering, human and environmental concerns that arise after the permit has been issued
- Anticipated Alignment: A representation of the location of the poles and conductors within the ROW. In many cases, the poles would be placed in the center of the ROW, but in some areas, such as along certain roads, DCW proposes to place the structures within, but near the edge of

[247] *Route Permit Application*, at p. 72-73

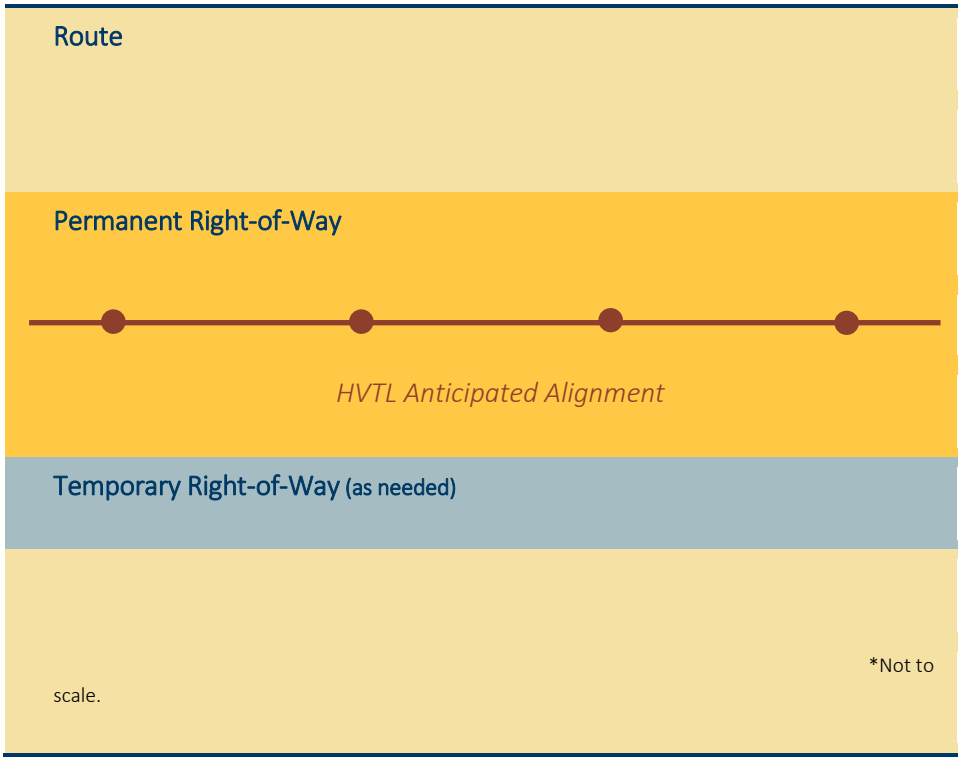
existing road ROW, outside of the travel lanes.

The Commission may include conditions in a route permit (see sample route permit in **Appendix C**). These conditions could address the route width or anticipated alignment in a specific area of the project, for example, requiring the alignment of a specific portion of the route to be north rather than south of a road, or requiring that the route width be narrower than initially requested in certain areas.

4.1.2.1 Route Width

The route width is typically larger than the actual ROW needed for the transmission line (**Figure 11**). This additional width provides flexibility in constructing the line, yet is not of such extent that the placement of the line is undetermined. The route width allows DCW to work with landowners to address their concerns and to address engineering issues that may arise after a permit is issued. The route width, in combination with the anticipated alignment, is intended to balance flexibility and predictability.

Figure 11. Route Width, ROW, and Alignment Illustration



The transmission line must be constructed within the route designated by the Commission unless, after permit issuance, permission to proceed outside of the route is sought by DCW and approved by the Commission.

DCW requests a 1,500-foot route width for the majority of each proposed route. DCW requests a wider route width of 3,000 to 4,000 feet along certain segments of both proposed routes in areas

where easements had not been secured at the time of application. Areas where wider route width have been requested are noted in **Table 23** and shown in greater detail in the maps in **Appendix E**.

Table 23. Areas with Wider Routes

Route	Requested Route Width (feet)	Description
A	3,000	A 2.8 mile segment from approximately 0.7 miles west of 170th Avenue to 0.1 miles east of Highway 56. At the time of application, DCW had not been able to secure voluntary easements along the north side of 670th Street. The expanded route width allows for alternative alignments across parcels where easements had been, or were deemed likely to be secured.
A	4,500	A 1.2 mile segment beginning approximately 0.7 miles west of Highway 56 through portions of Section s 21-23 and 26-29 of Ashland Township to approximately -0.2 miles east of 200th Avenue. The expanded route width in this area provides flexibility in routing through an area where easements had not been secured at the time of application, as well as additional space to identify an alignment through the McNeilus Wind Farm.
A	3,000	A 2-mile segment beginning approximately 0.2 mile east of 200th Avenue and ending approximately 0.2 miles east of 220th Avenue. The expanded route width in this area provide routing flexibility in the area of 680th Street, where easements had not been secured at the time of application.
A	3,000	A 1.5 mile segment beginning approximately 0.4 miles east of 250th Avenue and ending approximately 0.1 miles west of 270th Avenue. The expanded route width in this area provide routing flexibility in the area of 670th Street and 260th Avenue.
A & B	3,000	The expanded route width in the area of the Byron Substation is requested to provide additional flexibility in obtaining voluntary easements, and also to provide design flexibility for the connection to the Byron Substation and space of potential changes to the substation necessitated by the new transmission line.
B	4,500	An approximately 0.8-mile segments, beginning approximately 0.4 miles east of 160th Avenue and extending eastward to approximately 0.1 miles west of 170th Avenue. The expanded route width in this area provides flexibility in routing through an area immediately south of 660th Street where easements had not been secured at the time of application,
B	3,000	DCW requests an expanded route width for a an approximately 3.4 mile segment of route B from just west of Highway 56 to 0.3 miles east of 220th Avenue. The additional route width is requested to provide flexibility in in an area where easements had not been secured at the time of application
B	3,000	DCW has requested an expanded route width for an approximately 2.5 mile segment of Route B, from just south of 250th street to the Byron Substation to provide for routing flexibility in the areas of 270th Avenue and Highway 14.

4.1.2.2 Right of Way

The ROW is that specific area required for the safe construction and operation of the transmission line, where such safety is defined by the National Electric Safety Code (NESC) and the North American Electric Reliability Corporation (NERC) reliability standards. The ROW must be within the designated route and is the area for which the applicant obtains rights from private landowners to construct and operate the line.

Once a route permit is issued by the Commission, DCW will conduct detailed survey and engineering work, including, for example, soil borings. DCW would also contact landowners to gather information about their property and their concerns and discuss how the transmission line ROW might best proceed across the property. Use of a ROW for a transmission line across private property is typically obtained by an easement agreement between the applicant and landowner.

DCW anticipates using a varied ROW width along regardless of the route is selected. The proposed ROW varies depending upon location. For the majority of all proposed routes, DCW proposes to center transmission structures within a 150-foot ROW, with 75 feet of ROW either side of the alignment. For portions of the proposed routes, DCW proposes to locate the structures within, but near the edge of the existing road 60' to 150' ROW (**Figure 12**, see also illustrations in **Appendix I**). More detail on the location of shared ROW is shown in the maps in **Appendix E**, and discussed in Section **6.5.9**.

Figure 12. Alignment Sharing Road ROW[248]

4.1.2.3 Anticipated Alignment

The anticipated alignment is the anticipated placement of the transmission line within the route and ROW, i.e., where the transmission line is anticipated to be built.

After coordinating with landowners and completing detailed engineering plans, the applicant will establish the final alignment for the project and designate pole placements. These final plans, known

[248] *Route Permit Application,* at p. 47

as "plans and profiles," must be provided to the Commission so that the Commission can confirm that DCW's plans are consistent with the record the Commission has based its decision, the route permit and all permit conditions prior to construction of the project.

4.1.3 Transmission Line Construction and Maintenance Procedures

Construction of the project would not begin until all necessary federal, state, and local approvals have been obtained, easements have been acquired for rights-of-way, and final plans and profiles have been approved by the Commission. The precise timing and order of ROW clearing and construction along the line would depend on the receipt of all necessary approvals for each segment of the line being constructed, system loading issues, and available workforce.

4.1.3.1 Right-of-Way Acquisition

Unlike most high voltage transmission projects before the Commission, DCW states it does not have the authority to exercise eminent domain. With this understanding, DCW has developed the route proposals by reaching voluntary agreements with landowners.[249]

Following preliminary routing studies, DCW began approaching landowners in the project area in 2017 with a goal of securing voluntary easements along both routes A and B. As of March 1, 2019, DCW had obtained approximately 95 percent of land rights required for Route A and 85 percent of land rights required for Route B.[250] The sequencing of easement acquisitions is somewhat unusual compared to other transmission projects in Minnesota, which typically secure land rights until after a route permit is issued.

Although the timing of the easement acquisitions is somewhat unusual, the overall transmission acquisition process is typical. DCW engaged a title company to search the public records for targeted parcels to identify all persons and entities with a recorded interest in the parcel. DCW then prepared a title report for each parcel to document the legal description, owners of record, easements, liens, restrictions, encumbrance, and other conditions of record. Once ownership is determined, a ROW agent from DCW contacted each landowner or landowner representative. During the initial meeting, the ROW agent described the transmission project and the proposed impact to the particular property and the agent and landowner review specific landowner concerns or issues regarding the construction, operation, and maintenance of the transmission line on the property.

If permitted by the landowner, preliminary surveys to establish ROW, natural and manmade features, and elevations to be used during the design of the transmission line. Soil borings may be taken to assess soil conditions and inform foundation design. The ROW agent discusses the number and location of individual structures on the landowner's property and specific boundaries of the easement

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[249] *Route Permit Application*, at pp. 23, 32

[250] Michael Weich Testimony, March 1, 2019, at p. 9, eDockets ID: 20193-150807-05.

area. If requested or permitted by the landowner, DCW will stake the proposed transmission line location.

The ROW agent collects area land value data to determine the amount of just compensation to be paid for the rights to construct, operate, and maintain the transmission line in the easement. Sometimes an appraisal is obtained to resolve more complicated valuation issues. Based on this data, a fair market value offer would be developed, necessary documents to acquire the easement would be prepared, and an offer made to the landowner by the ROW agent.

As noted above, DCW has stated it does not have the authority to exercise eminent domain. It should be noted that in cases where the transmission proposer has the power to exercise eminent domain pursuant to Minnesota Statutes, Chapter 117, the proposer may acquire an easement through the exercise of the power of eminent domain (also referred to as condemnation) if a negotiated settlement could not be reached with a landowner.

Before commencing condemnation, the proposer would provide the landowner with a copy of each appraisal it had obtained for the property interests to be acquired. To begin the formal condemnation process, the proposer would file a petition in the district court where the property is located and serve that petition on all owners of the property.

If the court grants the petition, the court would appoint a three-person condemnation commission to determine the compensation for the easement. The condemnation commission would schedule a viewing of each parcel identified in the petition. Next, the condemnation commission would schedule a valuation hearing where the project proposer and landowner present testimony and evidence about the just compensation for acquiring the easement. The condemnation commission would then make an award of just compensation and file it with the court. The applicant and the landowner would both be bound by the award. At any point in this process, the case could be dismissed if the parties reach a settlement.

There may be instances where a landowner elects to require the proposer to purchase their entire property rather than acquiring only an easement for the transmission facilities. The landowner is granted this right under Minnesota Statutes section 216E.12, subdivision 4. This statute, sometimes referred to as the “Buy-the-Farm” statute, applies only to transmission lines with a voltage of 200 kV or more and to properties that meet certain other criteria; thus, this statute could apply to many of the properties crossed by the proposed 345 kV transmission line.

Once a ROW is acquired, and prior to construction, the ROW agent would contact each landowner to discuss the construction schedule and requirements. To ensure safe construction, special considerations may be needed for fences, crops, or livestock. Fences or livestock, for example, may need to be moved or temporary or permanent gates may need to be installed. In each case, the ROW agent would coordinate with the landowner, who would be compensated for any project-related construction damages.

4.1.3.2 Right-of-Way Access

Access to the ROW is typically made directly from existing roads or paths that run parallel or perpendicular to the route. However, in some locations improvements to existing access (e.g. temporary culverts) or construction of new access could be required to accommodate construction equipment. DCW would evaluate construction access opportunities by identifying existing transmission line easements, roads, or trails adjacent to the permitted route.

Where feasible, DCW indicates it would limit access and construction activities to the ROW acquired for the project to minimize impacts to landowner and adjacent properties. In some situations, however, private field roads, trails, or farm fields may be used to gain access to construction areas. Where no current access is available, where existing access is inadequate, or when access requires incorporation of areas outside the ROW, permission from landowners would be obtained prior to using any of these areas to access the ROW for construction. Permits from MnDOT or local road authorities may be required for new access roads.

4.1.3.3 Equipment and Staging Area

Construction activities will require the use of many different types of equipment, including, but not limited to, tree removal equipment, mowers, cranes, backhoes, line trucks, drill rigs, dump trucks, front-end loaders, bulldozers, flatbed trucks, concrete trucks, helicopters, cranes, and various trailers for hauling equipment. Excavation equipment is often set on wheel or track-driven vehicles.

DCW anticipates two separate construction staging areas would be identified after a route is permitted. Staging areas for the transmission project will be selected for their proximity to the route, ease of access, security, ability to efficiently and safely store supplies, and sites that require minimal grading or excavation. To the extent practicable, staging areas would be located on previously disturbed sites and would be used as receiving locations for delivery and storage of construction materials and equipment until they are needed for the project. For staging areas outside the project ROW or not located on property owned by DCW, rights to use these areas would be obtained individually from affected landowners through separate construction easement agreements.

4.1.3.4 Construction

DCW estimate that construction of the transmission project will take approximately six months and employ approximately 30 to 40 construction workers at peak.[251]

Construction would begin after all necessary federal, state, and local approvals are obtained and where property and rights-of-way are acquired for a specific segment of the permitted route. Construction in areas where approvals are not needed or where already obtained could proceed while approvals for other areas were in progress. Construction would progress, generally, as follows:

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[251] *Route Permit Application*, at p. 113, Response to Data Requests 7 and 10 (Appendix M)

- Survey marking of the ROW, pole locations, and environmental constraints (e.g. wetlands).
- Establishment of laydown and staging areas.
- ROW clearing and access preparation.
- Grading or filling as necessary.
- Excavation of holes for structures, and Installation of culverts and concrete foundations for select structures.
- Installation of poles, insulators, and hardware.
- Conductor stringing.
- Installation of any markers required by state or federal permits on conductors or shield wires.

Given the transmission project's setting in a largely agricultural area, tree clearing and extensive route excavation is expected to be minimal. In areas of difficult terrain, more extensive leveling using bulldozer or front-end loaders may be required to provide a level location for equipment operation. Structure foundations will be installed after the structure pads are stabilized.

After ROW clearing and access preparation has been completed, pole and foundation installation can begin. DCW anticipates that most structures would be direct buried. Concrete caissons may be required for dead-end or angle structures in locations where guying is not feasible. For the direct-embed steel pole structures, a hole of approximately 5 to 6 feet in diameter and 20 to 30 feet deep will be augured or excavated. For locations where structures require concrete caissons, holes would be 8 to 12 feet in diameter and 25 to 50 feet deep. The actual diameter and depth of a foundation depends on structure design and soil conditions.

Once foundations are constructed, structures (poles), insulators, hardware, clamps, and grounding equipment are moved from staging areas and delivered to the foundation locations. Steel arms and/or insulator assemblies, mast arms for shield wires, additional hardware and pulling blocks will all be attached to the structures while on the ground. After attachment of component parts, structures are lifted into place with a crane or similar heavy-lift equipment and secured. Holes will be backfilled with aggregate or concrete delivered from a local batch plant.

Once structures are in place, conductors are strung. Stringing setup areas are established to store spools of conductor cables approximately every two miles. Where conductors cross streets, roads, or highways, temporary guard or clearance poles will be used to ensure that conductors do not obstruct or otherwise interfere with traffic. Conductor pulling lines are secured through stringing blocks suspended from insulators on the poles either by helicopter or ground crews. The conductors are pulled through each block by the pulling lines. Once final sag is established conductors are clipped by workers in bucket trucks or helicopters. Conductor-marking devices, e.g., bird flight diverters, will be installed, as necessary, once conductors are in place. Shield wire is installed in a similar manner.

Some soil conditions and environmentally sensitive areas may require unique construction techniques. The most effective way to minimize impacts to these areas is to avoid placing structures in these areas, e.g., spanning the transmission line over wetlands, streams, and rivers. When spanning sensitive

areas is not feasible, one or more of the following practices may be required by the Commission's route permit to minimize impacts:

- Using the shortest route to access wetlands
- Assembling structures in upland areas before transporting to site for installation
- Constructing during frozen ground conditions.
- Using construction mats when winter construction is not possible and wetlands and other sensitive areas could be impacted.
- Avoiding equipment fueling and maintenance activities in or near environmentally sensitive areas.
- Implementing the best management practices in the project's Stormwater Pollution Prevention Plan (SWPPP), which may include use of silt fences, bio logs, erosion-control blankets embedded with seeds, and other measures.

The Minnesota Noxious Weed Law defines a noxious weed as an annual, biennial, or perennial plant that the Commissioner of the Minnesota Department of Agriculture's (MDA) designates to be injurious to the public health, the environment, public roads, crops, livestock, or other property. DCW states it will limit the spread of noxious and invasive weeds by cleaning construction equipment before it enters the construction work area and by using only invasive-free mulches, topsoil, and seed mixes.

4.1.3.5 Restoration

DCW indicates that construction crews would attempt to minimize ground disturbance during construction, consistent with BMPs required as part of the SWPPP and other permits and approvals. Nonetheless, parts of the project area would be disturbed during the normal course of construction. DCW indicate that once construction is completed in an area, disturbed areas not needed for maintenance access would be re-graded and restored to their original condition to the maximum extent feasible. In accordance with Minnesota Pollution Control Agency (MPCA) construction permit requirements, temporary restoration before the completion of construction in some areas along the ROW could be required.

Once construction is complete and restoration activities have commenced, a DCW representative will contact the landowner to discuss any damage that has occurred as a result of project construction. If fences, drain tile, or other property have been damaged, DCW says it (or a contractor) will repair damages or provide the landowner reimbursement for repairs, consistent with the conditions in the easement agreement. Commission route permits require permittees to compensate landowners for damage to crops and drain tile (Appendix C).

Once construction of the transmission project is complete, temporary road approaches, access roads, and staging areas will be removed, revegetated, and restored to their original condition to the extent practicable, and as negotiated with each landowner or responsible agency/official.

Areas where vegetation is disturbed or removed during construction will be allowed to naturally reestablish to pre-disturbance conditions. Resilient species of common grasses and shrubs typically reestablish with few problems after disturbance. Areas with significant soil compaction and disturbance from construction activities may require assistance to reestablish vegetation and control soil erosion. Commonly used methods to accomplish this include, but are not limited to, prompt reseeding of disturbed areas, erosion control blankets, silt fences, and weekly inspection of construction sites for compliance. Reseeding of non-cropped areas disturbed during construction will be done with a seed mix free of noxious weeds, similar to that which was removed. Vegetation that is consistent with substation site operation outside the fenced area would be allowed to reestablish naturally at substation sites.

Construction activities on agricultural land would be conducted in accordance with an agricultural impact mitigation plan (AIMP) developed in coordination with the Minnesota Department of Agriculture (**Appendix J**).

4.1.4 DCW Substation Construction

DCW proposes to construct a new collector substation (DCW Substation) in southwestern Dodge County, within the wind farm site. DCW has executed an option to purchase up to ten acres to construct the new DCW Substation on existing agricultural land along 140th Avenue in Ripley Township (**Figure 2**, see also,maps in **Appendix E**). Based on preliminary design, DCW anticipates the developed graveled area of the DCW Substation would be approximately one acre.[252]

Following survey and staking of the substation location, erosion control BMPs (e.g. straw wattles, silt fencing, and erosion control blankets/mats) will be implemented. Site access will also be prepared, including installation of any necessary culverts in adjacent road drainages. Due to its location in an agricultural field, minimal vegetation clearing is anticipated. The substation site will be graded and fenced. Concrete pads and footing for equipment will be installed and aggregate will be spread throughout the fenced area. Equipment will be delivered to the site and generally stored inside the fenced area to the extent feasible; some materials may need to be stored on the property outside the fence due to size or safety considerations. Equipment such as circuit breakers, bus work, capacitors, and dead-ends will be assembled and installed. Transformers will be delivered to the site and installed. Substation control house and supervisory control and data acquisition equipment will be installed. Upon completion of construction activities, disturbed areas outside the fence will be restored and erosion control measures removed.

4.1.5 Byron Substation Improvements

The transmission project will also require modification of the existing Byron Substation, located immediately west of Byron, Minnesota. The transmission project will add a new take-off structure,

[252] *Route Permit Application*, at p. 219

breaker, bus work, and ancillary equipment. DCW states the required improvements will be made inside the existing fence line and will not require expansion of the existing substation footprint.[253]

The Byron Substation currently serves four existing transmission lines –345 kV and 161kV transmission lines belonging to Xcel Energy, and 69 kV and 161 kV transmission lines belonging to SMMPA. The Byron Substation has sufficient space for the new 345 kV line and associated substation equipment, so the work at the Byron Substation would be done within the fenced area. As designed, the new 345 kV DCW transmission line will cross Xcel Energy's 345 kV line to enter the Byron Substation from the south. The four existing transmission lines will be modified to accommodate the new 345 kV line and equipment.

4.1.6 Operations and Maintenance

Transmission lines and substations are designed to operate for decades and require only moderate maintenance, particularly in the first few years of operation. Nationwide, the electric transmission system is very reliable. The average annual availability of transmission infrastructure is in excess of 99%. Protective relaying equipment automatically take a transmission line out of service when a fault is sensed on the system. Both system faults and scheduled maintenance are infrequent.

DCW would be responsible for the operation, maintenance, and, when necessary, repair of the transmission project. DCW, or its agents, will periodically access to the ROW to perform inspections, conduct maintenance, and repair damage over the life of the Project. Generally, DCW performs annual scheduled inspections of transmission lines. If problems are found during inspections, repairs will be performed, and the landowner will be compensated for damage that results.

DCW will remove vegetation within the ROW that interferes with the O&M of the Project. Native shrubs that will not interfere with the safe operation of the Project will be allowed to reestablish in the ROW. Clearing needs are determined from annual ROW inspection. When necessary, problem vegetation will be cleared through a combination of mechanical and hand clearing, along with herbicide application where allowed to remove or control vegetation growth.

DCW will use commercial pesticide applicators licensed by the MDA to apply herbicides approved by the U.S. Environmental Protection Agency (EPA) and the MDA. If during post-construction monitoring of the restored ROW a higher density and cover of noxious weeds on the ROW is noted when compared to adjacent off-ROW areas, DCW will obtain landowner permission and work to mitigate noxious weed concerns.

The principal O&M cost for transmission facilities is the cost of inspections. Actual line specific maintenance costs vary somewhat depending upon on the setting, the amount of vegetation

[253] *Route Permit Application*., at p. 214

management necessary, storm damage occurrences, structure types, materials used, and the age of the line.

Annual O&M costs for transmission lines in Minnesota and surrounding states vary. Based on Next Era's experience for voltages from 69 kV through 345 kV, DCW anticipates an annual maintenance cost of approximately $900 per mile.

A certain amount of maintenance would be required at substations to ensure proper operation within NESC and NERC standards. Transformers, circuit breakers, batteries, protective relays, and other equipment would need to be serviced periodically in accordance with the manufacturer's recommendations. The substation site must be kept free of vegetation, and adequate drainage must be maintained.

4.1.7 Transmission Project Decommissioning

Information in this section is adapted from the Draft Decommissioning Plan prepared by DCW for both the wind farm and transmission aspects of the project (**Appendix F)**. Decommissioning of the wind farm is also discussed in **Section 3.1.3**.

Because the transmission project is designed, operated, and constructed solely to deliver the output of the DCW Wind Farm to the electric grid, the anticipated lifespan of the transmission project is considered to be the same as for the wind farm – 30 years.

At the end of the project's useful life DCW will disconnect the Project from the grid by tripping the 345 kV breaker at the DCW Substation, opening the 345 kV circuit, and working with SMMPA to safely disconnect the conductors at the Byron Substation.

Once the project is de-energized, transmission structures will be dismantled from the top down and loaded onto trucks to be removed from the site. After dismantling, transmission poles typically retail sufficient value to be refurbished or sold for scrap. All unsalvageable materials will be disposed of at authorized sites in accordance with applicable regulations.

DCW estimates the decommissioning costs for the transmission line to be approximately $3.7 million out of a total cost of $10.2 million (salvage value for both the wind farm and transmission line was estimated at $2.2 million). DCW plans to establish performance bonds with Dodge, Steele, and Olmsted counties for the total amount of infrastructure located within each county. DCW is currently negotiating with counties to determine the specific requirements of the bond.

It should also be noted that in practice, because they have few mechanical elements and are designed and constructed to withstand the weather extremes typical of the region, high-voltage transmission lines are seldom completely retired. It is possible that, following the retirement or decommissioning of the wind farm, Southern Minnesota Municipal Power, or another entity may seek to leave the transmission line in place to support other transmission activities and the wind energy facility and the transmission line could be decommissioned separately.

4.1.8 Project Costs

DCW estimates the total cost for the transmission project to be between $40.5 and $46.5 million (based on 2020 dollars), +/- 35 percent (**Table 24**). The variation in cost between routes is due to the length of the transmission line; substation costs are equal between route alternatives.

Table 24 Estimated Project Cost ($ million)[254]

Facility	Route A	Route B
345 kV Transmission Line	33.0	39.0
DCW Substation	6.0	6.0
Byron Substation Expansion	1.5	1.5
Total Cost	40.5	46.5

Once the transmission project becomes operational, DCW anticipates annual maintenance costs of approximately $900 per mile, based on similar transmission lines.[255]

4.1.9 Project Schedule

It is anticipated that the Commission would make decisions on the applicant's CN, site, and route permit applications in early 2020. DCW anticipates completing all permitting requirements and land acquisition in early 2020, with construction of the transmission project occurring between May and October 2020. DCW anticipates both the wind farm and transmission project will have an in-service date of October 2020.[256]

4.2 Transmission – System Alternatives

The proposed transmission line project is one possible solution to the get the power from the wind farm to the electrical grid. There may be other alternatives— system alternatives—that also address this problem. The alternatives discussed here are those noted in the scoping decision for this EIS (**Appendix A**), including the no-build alternative and transmission lines of a different size or with different endpoints. The discussion here assumes that the need for the project is to transport the power from the wind farm to the electrical grid. Project alternatives for the wind farm are discussed in **Section3.2**.

4.2.1 No build alternative

Under the no build alternative, the transmission project would not be constructed. The no build alternative would not meet the need for the project. If a transmission line is not built the generation

[254] *Route Permit Application*, at p. 29, DCW Response to Data Request 9 (**Appendix M**).
[255] Ibid.
[256] DCW, Response to Data Request 10 (**Appendix M**)

would have no outlet; the wind farm would not be financially viable and the project would not be built.

There would be no direct human or environmental impacts as a result of this alternative. The no build alternative would avoid the potential impacts of the transmission project, as they are described in Chapter 6.

4.2.2 Transmission line of a different size or type

Under this alternative, the need for the transmission project would be met by a transmission line of a voltage other than 345 kV or a different type.

4.2.2.1 Transmission lines of a different size

In general, transmission lines with voltages greater than 345 kV, while technically feasible, are in excess of the need for the DCW Project. Although a 500 kV transmission line connects Manitoba with the transmission grid in northern Minnesota, there are no 500 kV transmission lines currently in use in southern Minnesota. Additionally, alternatives with voltages greater than 345 kV are anticipated to have greater costs and impacts than the proposed Dodge County Wind transmission project.

Alternatives with voltages less than 345 kV are feasible and available and meet the need for the project, although perhaps less efficiently and perhaps with a higher cost. Analysis by DCW indicates that a 161 kV line would be less efficient than a 345 kV line, resulting in greater line losses, a greater probability of curtailment of the wind farm production, and would be slightly more expensive due to required upgrades at the Byron Substation. DCW's analysis indicates that transmission losses for a 161 kV line would be about $1 to $2 million more than for a 345 kV line (Table 25). Structure and conductor costs area less expensive for a 161 kV line than for a 345 kV line, however using a 161 kV line would require a new step-up substation next to the Byron Substation, making the overall cost of the 161 kV option relatively more expensive.[257][258]

[257] Henry Chao, Direct Testimony, March 1, 2019, eDocket ID: 20193-150807-17

[258] Response to Data Request 3 (Appendix M)

Table 25. Alternative Voltage - Costs[259]

Project Facility	345 kV Transmission Line ($ millions)	161 kV Transmission Line ($ millions)
DCW Transmission Line	33.0 – 39.0	28.6 – 33.8
DCW Substation	6.0	5.5
New 161 kV – 345 kV substation (adjacent to Byron Substation)	N/A	7.0
345kV Byron Substation Expansion	1.5	1.5
TOTAL	40.5 - 46.5	42.6 – 47.8

Human and Environmental Impacts

The human and environmental impacts of a 161 kV line would be similar to those of a 345 kV line. However, there would be differences in the type and extent of impacts due to differences in structure heights and spans (Table 26). Structures for a 161 kV line are typically 70 to 100 feet tall, with a span of about 700 feet. Structures for a 345 kV line are 75 to 170 feet tall, with a span of about 1,000 feet.

Table 26. Typical 345 kV and 161 kV Monopole Structures[260]

Feature	345 kV	161kV
Right-of-Way Width (feet)	150	100 – 120 [261]
Typical Structure Height (feet)	75-170	70 - 100
Typical Span Length (feet)	1,000	700
Estimated Structure Count	125-198	244-394

There is a tradeoff between the voltages and their associated structures – a larger number of smaller structures (161 kV) compared to a smaller number of larger structures (345 kV). Aesthetic impacts are likely to be greater with a 345 kV line, because the structures are relatively taller, and more visible, than a 161 kV structures. Agricultural impacts are likely to be slightly greater for a 161 kV line, due to the greater number of structures required. More structures in more fields would lead to somewhat greater impediments to agricultural management. Impacts to natural resources would likely be similar for the two voltages. The 161 kV ROW is narrower than that of 345 kV line; thus impacts that are proportional to ROW width (e.g. acres of trees removed) would be less for a 161 kV line. Because of

[259] Response to Data Request 3 (Appendix M)
[260] Although several different types of structures can be used for both voltages, monopoles are used for comparison as that is what DCW has proposed for the 345 kV transmission line.
[261] AEP Ohio, *Encroachments on Transmission Rights of Way*, https://www.aepohio.com/global/utilities/lib/docs/info/facts/AEPOhio-Encroachment-onTransROW.pdf

the shorter spans between structures, there may be resources which could be spanned by a 345 kV line that could not be spanned by a 161 kV line. In these instances, a 161 kV line would have a greater impact on the resource, i.e., a 161 kV line would require that a structure be place in the resource. In the case of the DCW transmission project, the shorter span length does not appear be pose a problem in spanning these resources.

4.2.2.2 Double Circuit Transmission

There is no existing transmission line between the collector substation and the Byron Substation so a double circuit of existing transmission lines for the entire length of the transmission project is not feasible. Double-circuiting of the 345 kV transmission project with existing 69 kV and 161 kV transmission lines through Dodge Center and Kasson is evaluated in Section 5.3.

4.2.2.3 DC Transmission Line

Historically, the transfer of electricity between regions of the United States has been over high voltage alternating current (AC) transmission lines, which means that both the voltage and the current on these lines move in a wave-like pattern along the lines and are continually changing direction. In North America, this change in direction occurs 60 times per second (defined as 60 hertz [Hz]). The electric power transmitted over AC transmission lines is the same as the power we use every day from AC outlets, but at a much higher voltage.

Unlike an AC transmission line, the voltage and current on a direct current (DC) transmission line are not time varying, meaning they do not change direction as energy is transmitted. DC electricity is the constant, zero-frequency movement of electrons from an area of negative (-) charge to an area of positive (+) charge.

DC transmission lines are typically used to deliver generation over a long distance (generally hundreds of miles) to a load center. The DC technology is not a feasible solution to deliver 170 MW of power from a wind project to a nearby substation, such as the Byron Substation, located less than 30 miles from the power source.

4.2.3 Alternative Endpoints

During its initial project development, DCW considered three potential points of interconnection:

- the North Rochester Substation, just north of Pine Island in Goodhue County,
- A new substation to be constructed approximately six miles north of Byron, and
- SMMPA's Byron Substation

DCW ultimately selected Byron as the point of interconnection because of the proximity to the wind farm. The shorter line (approximately six miles shorter than the new substation location north of Byron and 10-12 miles shorter than the North Rochester Substation), would be less expensive, and could avoid crossing many of the sensitive resources located in the area between Dodge Center and Pine Island.

5 Transmission Project - Routing Alternatives

Under Minn. Rule 7850.1900, subpart 2.C. an application for a route permit must contain at least two proposed routes. In accordance with rule, DCW proposed Route A and Route B. Both routes pass primarily through agricultural lands and the two routes share four segments in common. During the scoping process additional alignment alternatives, route segment alternatives, and routes were proposed for evaluation.

5.1 Alternatives Evaluated

Commission rules require that a route permit application for a transmission line contain at least two proposed routes.[262] Accordingly, DCW proposed Route A and Route B. Both routes pass primarily through agricultural lands and the two routes share four segments in common. During the scoping process additional alignment alternatives, route segment alternatives, and routes were proposed for evaluation. All of these routing options for the transmission project are discussed here.

5.2 Alternatives Evaluated

Figure 2 illustrates an overview of the routing alternatives evaluated in this EIS. More detailed maps of the routing alternatives are shown in the maps in Appendix E.

5.2.1 Route A

Route A is approximately 21 miles long and parallels existing roads for approximately 9.4 miles and existing transmission lines for approximately 3.2 miles. The route proceeds eastward from the Dodge County Wind Substation along a half-section line for approximately 1.5 miles. The route then drops southward for approximately one-half mile before turning eastward and paralleling 670th Street for approximately 3.8 miles. The route then turns southward along Minnesota Highway 56 for approximately one mile. At 680th Street the route again turns eastward, paralleling the road for approximately three miles. At 220th Avenue, the route jogs north for approximately one-half mile before turning eastward and following the half-section line cross-country for approximately 3.5 miles. Approximately one-half mile east of 250th Avenue the route zigzags approximately 0.7 miles northeast along field lines to 670th Street. The route then follows 670th Street eastward for approximately one mile before jogging approximately one-quarter mile north of the road and turning eastward for approximately 1.8 miles. The last segment of the route heads northward, following existing 345 kV and 161 kV transmission lines, for approximately three miles to the Byron Substation.

[262] Minnesota Rule 7858.1900.

5.2.2 Route B

Route B is approximately 26 miles long and parallels existing roads for approximately 13.9 miles and existing transmission for approximately 0.1 miles. The route proceeds eastward from the Dodge County Wind Substation along a half-section line for approximately 1.5 miles. The route then jogs northward for approximately one-half mile before turning eastward along a field line and paralleling 680th Street for approximately 1.3 miles. The route then turns southward along 170th Street for approximately one mile, then eastward along 670th Street for one mile, before dropping south for approximately 2 miles along 180th Avenue and then cross-country along a field line before turning eastward for one mile along 690th Street. The route turns south for approximately one mile along Highway 56, then east for three miles paralleling 700th Street. The route then turns north along 220th Avenue for approximately a mile, then east for approximately one-half mile along 690th street, then zigzags north and east along field lines for approximately three-quarter of a mile before turning northward along 230th Avenue. The line parallels 220th Avenue for approximately one mile, then jogs away from the road to the east then north for approximately a mile, before turning eastward cross-country for approximately 1.3 miles. Approximately 0.4 miles east of 240th Avenue, the route then zigzags generally northeasterly along field lines until reaching 650th Street. The route then jogs eastward for 0.25 miles before turning north for approximately one mile along 270th Avenue. Shortly before reaching Highway 14, the route zigzags along field lines and cross country for approximately two miles, before turning north and then east across Highway 14 and into the Byron Substation.

5.2.3 West 270th Avenue Alignment Alternative

The West 270th Avenue alignment alternative is an alternative that could be used with Route B. just southwest of the Byron substation (**Figure 17,** description of the routing alternatives in the Byron area in **Section 6.1.2.3**). This alternative proceeds along field lines west of 270th Avenue, rather than following 270th Avenue itself. The alternative was proposed by citizens to avoid potential impacts to residences along 270th Avenue.

5.2.4 Salem Creek Alignment Alternative

The Salem Creek alignment alternative is an alternative that could be used with Route A, south of the city of Kasson near Salem Creek (**Figure 16,** description of the routing alternatives in the Salem Creek area in **Section 6.1.2.2**). This alternative proceeds along field lines and then diagonally across fields to make a fairly perpendicular crossing of Salem Creek. The alternative was proposed by citizens to avoid potential impacts to a residential area along 670th Street.

5.2.5 Crossover Route Segment

The crossover route segment facilitates a connection between routes A and B, south of the city of Kasson (**Figure 16,** description of the routing alternatives in the Salem Creek area in **Section 6.1.2.1** and **Figure 17,** description of the routing alternatives in the Byron area in **Section 6.1.2.3**). This connection could be used to crossover from one route to the other, switching from Route A to Route B or vise-versa. The crossover segment could be used to avoid specific impacts along routes A and B, south of the city of Kasson, by switching between the routes.

5.2.6 McNeilus Wind Farm Alignment Alternative

The McNeilus Wind Farm alignment alternative is an alternative that could be used with Route A near the McNeilus Wind Farm (**Figure 15,** description of the routing alternatives in the McNeilus Wind Farm area in **Section 6.1.2.1**). This alternative was introduced by DCW in their direct, pre-hearing testimony.[263] Unlike the proposed alignment for Route A, which proceeds south of the McNeilus Wind Farm along 680th Street, the McNeilus Wind Farm alignment alternative proceeds through the wind farm, cross country and along field lines. The alternative avoids potential impacts to residences along 680th Street.

5.3 Alternatives Not Carried Forward for Full Analysis

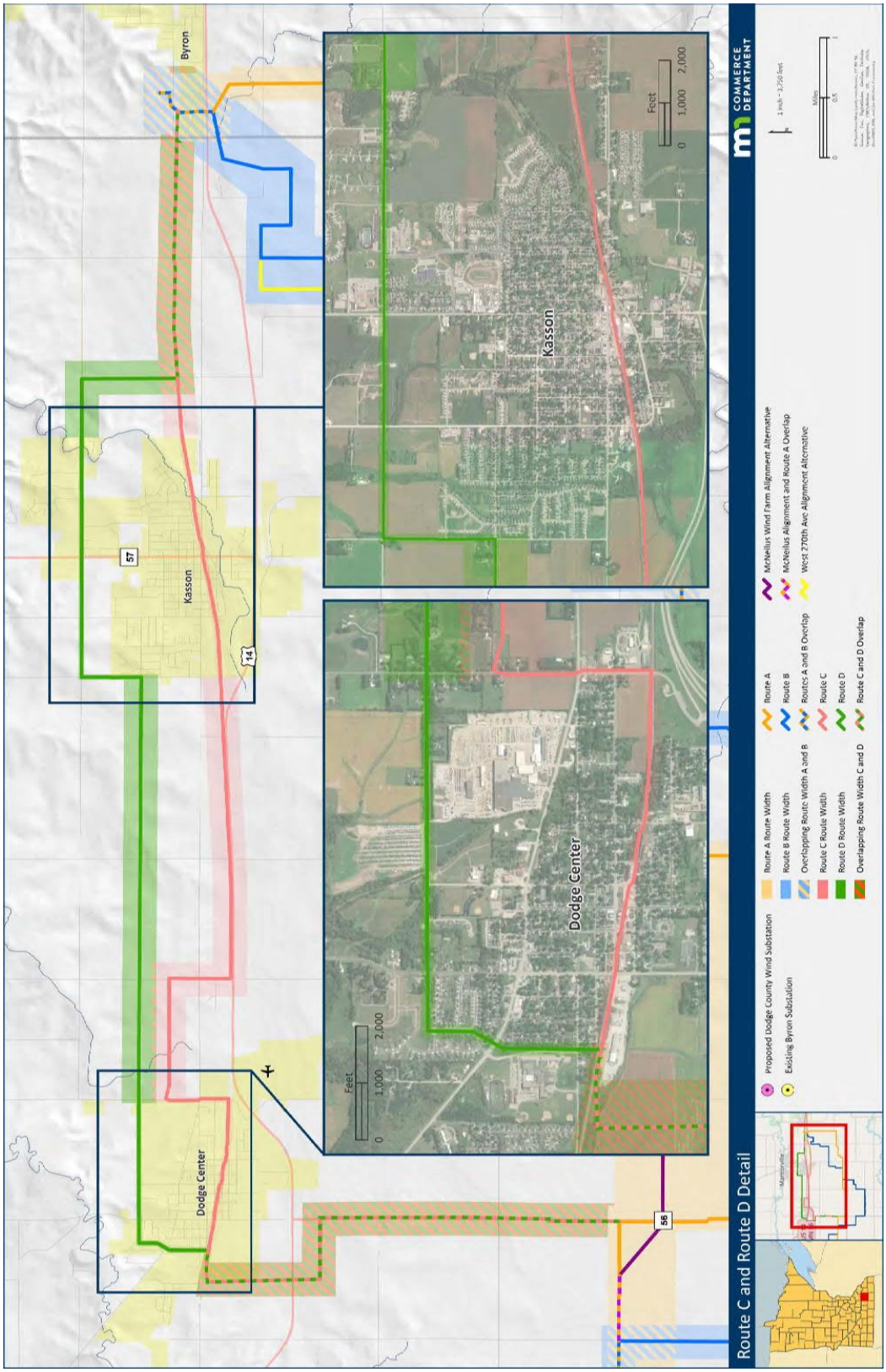
Routes C and D follow existing transmission lines, near U.S. Highway 14 and railways, and through the cities of Dodge Center and Kasson (**Figure 13**). These routes are discussed and analyzed here; however, because of their relatively greater impacts compared to other routing options, they are not carried forward for full analysis in this EIS.

Route C: Route C is approximately 21 miles long and follows an existing 161 kV transmission line for most of its length. Route C follows Route A eastward approximately 5.9 miles from the DCW Substation and then turns north to parallel Minnesota Highway 56 for approximately 2.5 miles. The route then turns westward along a field line for approximately one-half mile to avoid the Highway 56/Highway 14 interchange before turning north for approximately 0.9 miles to cross Highway 14 and reach an existing double-circuit 69 kV/161 kV transmission line and railroad. Route C follows the 69/161 kV transmission line for about 0.3 miles, and then continues generally eastward, with a jog to the north to avoid the Dodge Center airport, following the existing 161 kV transmission line and the railroad for approximately 10.9 miles to the Byron Substation.

Route D: Route D is approximately 21.7 miles in length. Route D follows Route A eastward approximately 5.9 miles from the DCW Substation and then turns north to parallel Minnesota Highway 56 for approximately 2.5 miles. The route then turns westward along a field line for approximately one-half mile to avoid the Highway 56/Highway 14 interchange before turning north for approximately 0.9 mile to cross Highway 14 and reach an existing double-circuit 69 kV/161 kV transmission line and railroad. Route D follows the 69/161 kV transmission line for about 0.3 miles, before turning north and then east, following the existing 69 kV transmission line for 11.6 miles to the Byron Substation.

[263] Jack Middleton - Direct Testimony. March 1, 2019.eDocket ID: 20193-150807-14

Figure 13. Routes C and D - Detail



5.3.1 Engineering and Design of Routes C and D

Detailed engineering has not been completed for routes C and D. Consequently, for purposes of analysis, where routes C and D follow existing transmission lines, their anticipated alignments are assumed to be the same as the existing transmission lines.

The 345 kV transmission project would not replace existing 69 kV and 161 kV transmission lines, as it serves a different purpose, but would either parallel existing transmission lines on separate structures, or would relocate the existing lines onto new multi-circuit structures; either of these alternatives would require an expansion of the existing ROW occupied by the existing 69 kV and 161 kV transmission lines. The analysis here evaluates monopole structures either parallel to or double-circuited (or, in some segments triple-circuited) with existing transmission lines.

Structures for the 345 kV transmission project would be larger than those currently carrying the 69 kV or the 161 kV transmission lines (**Table 27**). Depending upon whether structures are single- or multi-circuit, structures along routes C and D may be larger than those proposed for routes A and B.

Table 27. Structure Types[264]

Structure Type	ROW (feet)	Structure Height Above Ground (feet)	Width at Conductor Elevation (feet)	Structure Base Diameter (feet)	Span Between Structures (feet)
Existing 69 kV Line	0 (25)	50-60	5-10	2-3	150-350
Existing 161 kV Line	45-75	60-100	8-12	2-4	250-400
Monopole Single Circuit 345 Line	75-150	100-150	14 - 20	4 - 10	400-600
Monopole Double Circuit 345/69 kV or 345/161 kV Line	125-200	110-150	40 - 45	5 - 11	300-600

5.3.2 Route C and D – Discussion of Impacts

Routes C and D are anticipated to create a number of significant impacts and to have relatively greater impacts than routes A and B. This section discusses routes C and D with respect to the routing factors identified in Minnesota Rule 7850.4100. The evaluation of routes C and D can be summarized as follows:

- Significant human settlement impacts, including displacement of homes and businesses
- Moderate impacts to public health and safety

[264] DCW, Response to Data Request 12 (**Appendix M**); Jennifer Field, personal communications May 31, 2019 and July 12, 2019.

- Minimal impacts to land-based economies
- Significant impacts to historic resources
- Minimal to moderate impacts to the natural environment
- Minimal impacts to rare and unique natural resources
- Limited potential for design options that maximize efficiency
- Good use of existing ROWs
- Significant increased construction and operation costs
- Significant adverse human and environmental effects

5.3.2.1 Human Settlement

Construction of the transmission project along routes C or D would result in displacement of multiple homes and possibly some businesses, significant aesthetic impacts, moderate to significant temporary impacts to roads, railroads, and utilities. Route C would also result in moderate to significant permanent impacts to operation of the Canadian and Pacific Railroad.

Additionally, the proximity of these routes to the Dodge Center Airport means that transmission structures along either route are almost certain to be determined hazards by the Federal Aviation Administration (FAA). The proximity of routes C and D to the runway means that typical mitigation measures (e.g. lighting of structures) would be insufficient to remove the hazard, and more effective mitigation measures would either substantially increase the cost of the transmission project (e.g. placing the line underground in the vicinity of the airport) or displace more existing residences or businesses (e.g. reducing structure heights to an acceptable level which would substantially increase the ROW). Key impacts to human settlement are summarized below.

Aesthetics

Because routes C and D would require the installation of large structures and, at least in some areas, an expansion of the existing ROW through densely settled residential and commercial areas, routing along either of these routes would create significant permanent aesthetic impacts.[265] The anticipated alignment of Route C is within 1,000 feet of 1,259 residences, while 543 residences are within 1,000 feet of Route D's anticipated alignment (**Table 28**).

[265] A number of potentially affected landowners along routes C and D have provided photographs illustrating the proximity of the existing 69 kV and 161 kV transmission lines to homes and other buildings. See, for example, eDockets ID: 20196-153688-01,

Table 28. Residences in Proximity to Routes C and D

Distance from Anticipated Alignment	Number of Residences	
	Route C	Route D
Residences within 0 – 75 feet (within ROW)	6	34
Residences within 75 – 200 feet	70	73
Residences within 200 – 500 feet	428	174
Residences within 500 – 1,000 feet	755	262
Total	**1259**	**543**

In comparison, routes A and B have far fewer residences (41 and 54 respectively) within 1,000 feet of their anticipated alignments (**Section 6.5.1., Table 31**).

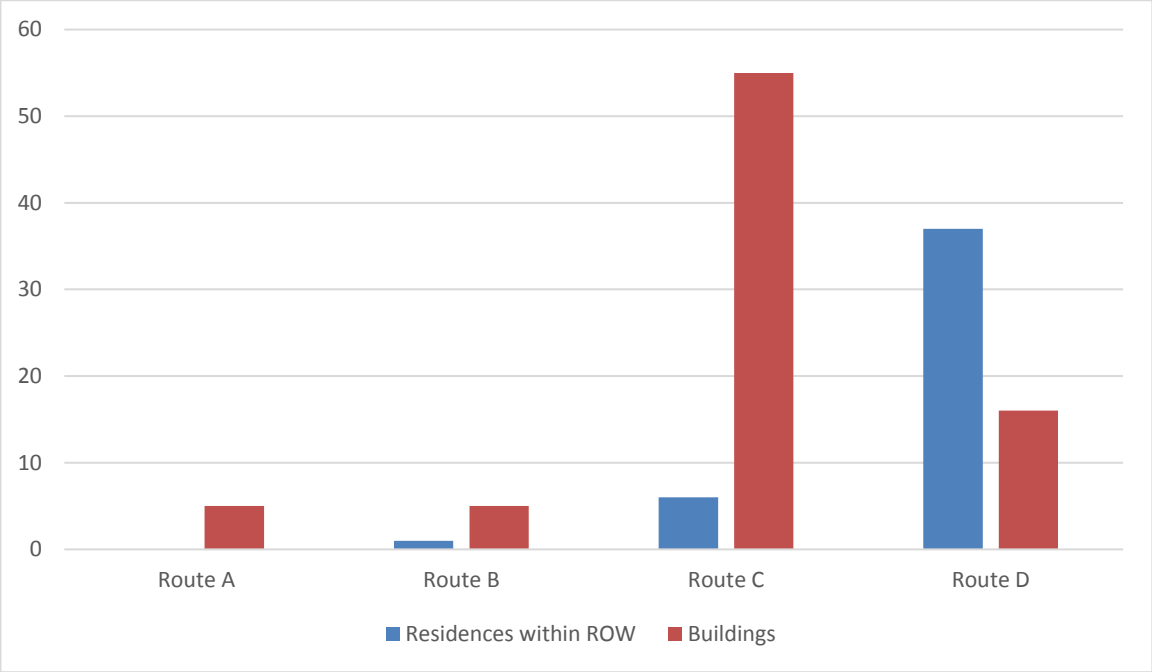
In addition to impacts to residences, Route C would significantly affect the aesthetics of the downtown areas of Dodge Center and Kasson, with the addition of structures that are significantly taller than the existing 60 to 100-foot 161 kV structures. Route D would also significantly impact the aesthetics of the Kasson-Mantorville education complex located either side of 16th Street NE with the addition of structures that are significantly taller than the existing 50- to 60-foot structures used for the existing 69 kV transmission line.

Displacement

Construction of the transmission project along routes C and D would require displacement of 6 and 34 homes respectively (**Table 28**). In addition, construction of routes C and D would also require displacement of 55 and 16 non-residential buildings respectively. Based on review of 2018 satellite imagery, many of the displaced buildings along Route C appear to be businesses in downtown Dodge Center and Kasson, whereas the majority of displaced buildings along Route D are ancillary to homes (e.g. garages or sheds).

The number of residences or buildings potentially displaced is substantially larger for routes C and D than for routes A or B (**Figure 14**).

Figure 14. Displacement Comparison



Roads, Rails, and Utilities

Both routes C and D would create moderate to significant temporary impacts to the existing road, rail, and utility network in the project area.

Construction of either route C or D would require road closures, some of which would be extended due to the complexity of construction. These impacts would be expected to be temporary and moderate.

Route C has the potential to create moderate to significant long-term impacts to operation of the Canadian Pacific Railroad. Any structures within the railroad ROW would need to be substantially taller in order to meet NESC clearance requirements for rail cars. Additional induction studies would be required to ensure that the transmission project does not impact the railroad's communication and signaling systems.

Both routes C and D are within approximately one mile of the north-south runway of the Dodge Center Airport. Given the proximity to the runway, the 100 to 150 foot structures proposed for routes C or D (Table 27) are too tall for Federal Aviation Administration (FAA) approval. In order to receive FAA approval, the line in this area would either need to be placed underground or put on shorter structures, requiring a much wider ROW in order to accommodate a horizontal configuration rather than the proposed vertical configuration. Because of its proximity to the runway, it is uncertain whether even the shorter above-ground structures would meet FAA requirements for Route C.

5.3.2.2 Public Health and Safety

Routes C and D would create minimal to moderate impacts to public safety. EMF levels as well as impacts to medical devices, stray voltage, induced voltage and air quality would be minimal and similar to that described in Section 6.5.

Discussion of potential impacts to transportation systems (road, rail, and airport) are discussed above in Section 5.3.2.1.

5.3.2.3 Land-Based Economics

In general, routes C and D would have a minimal impact on land-based economics. Because these routes pass through the cities of Dodge Center and Kasson, they would impact fewer acres of agriculture land compared to routes A and B.

As with routes A and B, impacts to forestry and mining would be minimal.

5.3.2.4 Archaeology and Historic Resource

There is one identified archaeological site within the route width of Route C, there are no identified archaeological sites within the route width of Route D.

Two National Register of Historic Properties (NRHP) listed buildings are located adjacent to the anticipated alignment of Route C in downtown Kasson:[266]

- The Eureka Hotel, 301 3rd Avenue SW, is located approximately 48 feet south of the existing 161 kV transmission line and the anticipated alignment for Route C. The current building was constructed in 1894, replacing an earlier structure that had been moved from the former gold rush town of Sacramento (near Mantorville) in 1866. The structure has been an apartment building for many years. If the transmission project were built along the anticipated alignment in this area, the Eureka Hotel would be within the ROW and would be displaced. A shift in the anticipated alignment in this area to the north side of the railroad would allow the Eureka Hotel to remain, but would aesthetically impact the structure (and likely displace one or more buildings along the north side of the railroad).
- The Kasson Old City Hall, 122 West Main Street, is located approximately 150 feet north of the existing 161 kV transmission line and the anticipated alignment for Route C. This building was constructed in approximately 1916, and has housed a variety of municipal services (post office, city hall and the library). It has most recently been used as an antique store. If the transmission project were built along the anticipated alignment in this area, there would be no direct effect to the structure, but the larger transmission structures would aesthetically

[266] Kasson Alliance for Restoration, *Tour Kasson Historic Buildings* http://kassonalliance.org/wp-content/uploads/bsk-pdf-manager/276_TOUR_KASSON_HISTORIC_BLDGS.PDF

affect the context of the structure.

5.3.2.5 *Natural Environment*

Because Routes C and D pass through Dodge Center and Kasson, impacts are anticipated to be minimal. Moreover, because routes C and D parallel existing infrastructure for the majority of their length any impacts are anticipated to be incremental. Impacts to vegetation would be minimal because limited tree clearing would occur. No forested wetlands would be crossed—all emergent wetlands could be spanned. Watercourses can be spanned. Limited wildlife habitat will be impacted.

5.3.2.6 *Rare and Unique Natural Resources*

A population of rattlesnake master, a Minnesota special concern plant species.is identified along Route C. There are no identified rare or unique natural resources along Route D. As with routes A and B, although rare and unique species exist,impacts are expected to be minimal. Proper pole placement should alow either route to span these resources, thereby avoiding direct impacts

5.3.2.7 *Application of Design Options*

The existing 69 kV and 161 kV transmission lines along routes C and D could be placed on multi-circuit structures. This would entail constructing new structures to hold the new 345 kV transmission project in addition to the existing transmission lines. In some locations, distribution lines are carried on the same structures as the 69 kV or 161 kV lines; it is anticipated that the distribution lines would be buried if the 345 kV transmission project were double-circuited with these lines. If the transmission project were constructed along either Route C or Route D, the project would preclude further use of these transmission corridors for future projects.

5.3.2.8 *Use of Existing Rights-of-Way*

Routes C and D use or follow existing transmission line, road, and rail ROW for most of their lengths, about 90 percent (Table 29). In comparison, routes A and B follow existing infrastructure for between 45 and 50 percent of their lengths (Section 6.11).

Table 29. Use of Existing ROW - Routes C and D

Feature Paralleled	Route C		Route D	
	Miles	% of Route	Miles	% of Route
Road	5.3	25.6	5.3	24.7
Transmission Line	0.9	4.3	5.0	23.3
Transmission Line and Road	1.0	4.9	4.1	19.1
Transmission Line and Rail	8.7	41.2	2.3	10.9
Total Infrastructure – road, transmission line, and rail	15.9	76.5	16.7	78.0
Field or Parcel	1.0	4.9	1.0	4.8
Total Linear Features	19.9	81.4	17.7	82.7
No Linear Features	3.9	18.6	3.7	17.3
total	20.7	100.0	21.4	100.0

However, as discussed throughout this section, the advantages of paralleling existing transmission lines, road, and rail ROW are tempered by the associated impacts, including aesthetic impacts, displacement of home and businesses, and impacts to transportation by road, rail, and aviation.

5.3.2.9 Electrical System Reliability

Construction along either of the existing 69 kV or 161 kV transmission lines would require scheduled outages of these lines, although the consequences of the outage are more severe for route C.

Construction of route C would require a prolonged outage to the existing 161 kV transmission line. SMMPA provides service to the Al Corn ethanol plant in Claremont through its 161 kV transmission line. Outage of the 161 kV transmission line would disrupt service to the ethanol plant; it is unclear at this point how temporary service to the plant would be provided during the planned outage. Owatonna, a city of 26,000 located northwest of the wind farm receives electrical service through two transmission lines, one of which is the SMMPA 161 kV transmission line. An extended outage of the 161 kV line would create a radial feed to support the city, creating a situation where an unscheduled outage on the remaining line would result in a loss of electric service to the town. The reliability impacts from construction of route C could be mitigated somewhat by construction of the transmission project in segments, however the segmented construction would lengthen the duration of construction impacts for landowners, the railroad, utilities, and large commercial customer.

Construction of Route D would require shorter outages of the 69 kV line than Route C would require for the 161 kV line.

Once constructed, the double- and triple-circuit structures along routes C and D are not anticipated to pose a reliability risk for the transmission system or a risk that is relatively greater than other routing options. This said, triple-circuit structures are generally disfavored due to slightly greater reliability risks and the relative difficulty in fixing an outage on one line without taking other lines out of service. Additionally, scheduled maintenance on the multi-circuit structures would require careful coordination, as each circuit is operated and maintained by separate entities.[267]

5.3.2.10 Construction and Operation Costs

DCW estimates the cost of constructing the 345 kV line along routes C or D to be approximately $90 to $100 million, or approximately double the construction cost of routes A or B. Routes C and D would have a later in-service date, 6 to 12 months later than for routes A or B. This delay is required to allow for easement acquisition, additional permitting, and additional construction time. DCW has not monetized the cost of the schedule delays.

[267] DCW Response to Data Request 12 (Appendix M)

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6 Transmission Project - Affected Environment, Potential Impacts and Mitigation Measures

The construction and operation of the proposed transmission project will impact human and environmental resources in the project area. Some impacts will be short term and similar to those of any large construction project – e.g., noise, dust, soil disturbance. These impacts are fairly independent of the route selected for the project. However, they can mitigated by measures common to most construction projects, for example, the use of erosion control blankets and silt fencing.

Other impacts will exist for the life of the project and may include aesthetic impacts, impacts to community development, and impacts to agriculture. These long term impacts result from the design and location of the project, not the manner in which it is constructed. Long term impacts can be mitigated through prudent selection of the route and design of the project.

6.1 Chapter Summary

The project will impact human settlements in the project area.

- The proposed transmission project is compatible with zoning and land use requirements in the project area.
- The majority of impacts to human settlement from the transmission project –noise, changes to property values, electronic interference, railways, airports, and emergency services – are anticipated to be minimal and fairly independent of the route selected for the project.
- Both routes A and B are anticipated to have minor to moderate aesthetic impacts, but in general Route A is anticipated to minimize aesthetic impacts due to being generally further from home and more closely following existing infrastructure (roads and transmission lines) than Route B.
- There are no homes within the anticipated ROW of Route A. There is one home within Route B's anticipated ROW. Although DCW indicates that no displacements of residences are planned as a result of the project, it is possible that this residence would be displaced if Route B is selected.
- DCW proposes to construct portions of both routes within county road ROW. The placement of transmission lines could affect plans for future road expansions or realignments.

The primary land use in the project area is agriculture. Route A minimizes impacts to agricultural lands compared to Route B, although both routes would result in the loss of some cultivated land. No impacts to forestry or mining are anticipated from the project

Impacts to known archaeological and historic resources are anticipated to be minimal. However, there is the potential to impact unknown archaeological resources during construction of the project. These impacts can be mitigated, in part, by conducting an archaeological survey prior to construction.

Impacts to natural resources are anticipated to be minimal to moderate for both routes A and B. It is expected that impacts can be minimized through conditions in the Commission's route permit and downstream permits.

- Impact to surface waters are anticipated to be minimal to moderate for both routes. There are differences between these routes in the Salem Creek area.
- Impacts to wetlands are anticipated to be minimal, as the wetlands along both routes can be spanned by proper pole placement.
- Either route would create minimal to moderate impacts to vegetation. Route A would result in a slightly greater area of tree clearing – approximately 2.6 acres compared to 0.5 acres for Route B.
- Although rare and unique natural resources exist along both routes, proper pole placement and use of BMPs are expected to minimize the potential for impacts to these resources.
- Use of the Salem Creek Alternative Alignment creates a greater potential for impacts to wetlands, loss of wildlife habitat, and permanent vegetation changes at the stream crossing.

Neither route is anticipated to provide adverse impacts to electric system reliability.

Both routes follow existing infrastructure for a significant portion of their length – 50 percent for Route A and 45 percent for Route B.

6.2 Affected Environment

For purposes of analysis, the analysis of the affected environment studies different areas, or regions of influence (ROI), depending upon the resource evaluated. The following terms and distances are used in this analysis.

- **Right-of-Way (ROW)** is the area required for safe operation of the transmission line. The ROW must be within the designated route ad is the area for which the permittee obtains rights from landowners to construct and operate the line. DCW proposes different ROW widths along different portions of the project, however for the purpose of analysis, this document uses the typical 150 foot ROW proposed by DCW– 75 feet on each side of the transmission line.
- **Route Width** refers to the width (area) permitted by the Commission where the transmission line could be located. For the purposes of analysis, this document uses a 1,500 foot route width (750 feet either side of the anticipated alignment). As discussed in **Section 4.1.2**, DCW has requested a route width of 1500 feet for the majority of the transmission line, with a larger route width of 3,000 to 4,000 feet in some areas where easements were not secured at the time of application.
- **One thousand feet**. A distance of 1,000 feet from the anticipated alignment of the line will be used as the ROI for analyzing potential aesthetic and property value impacts and impacts to

electronic devices.

- **Anticipated Alignment** is the anticipated location of the structures and line within the ROW and route width. Can be considered – but NOT described as – the centerline of the project.
- **One mile**. A distance of one mile from all routing options will be used as the ROI for analyzing potential impacts to public utilities, tourism and recreation, roads, archaeological and historic resources, and rare and unique species.
- **Project Area** is used to refer to the counties through which the project passes and will be used as the ROI for analyzing potential impacts to socioeconomics, cultural values, zoning and land use compatibility, airports, emergency services, air quality.

Table 30. Regions of Influence

Resource Type	Element	Region of Influence
Human Settlement	Displacement, Noise	Right-of-Way
	Aesthetics, Property Values, Electronic Interference	1,000 Feet
	Public Utilities, roads	One Mile
	Socioeconomics, Cultural Values, Zoning and Land Use Compatibility, Airports, Emergency Services,	Project Area
Public Health and Safety	Electric and Magnetic Fields, Implantable Medical Devices, Stray Voltage, Induced Voltage	Route Width
	Air Quality	Project Area
Land-Based Economies	Agriculture, Forestry, Mining	Right-of-Way
	Tourism and Recreation	One Mile
Archeological and Historic Resources		One Mile
Natural Environment	Water Resources, Wetlands, Vegetation, Wildlife (except birds) Wildlife Habitat	Right-of-Way
	Wildlife (birds)	Route Width
	Rare and Unique Resources	One Mile

6.3 Discussion of Route Alternatives

In general, the analysis in this document compares potential impacts over the entire length of Route A and Route B. For many resources (e.g. public health and safety, forestry, mining) impacts do not vary by route. For resources where impacts do vary by route (e.g. right-of-way sharing), the narrative compares impacts by route.

Three areas were identified where different routing options are available to minimize certain impacts. These areas are described below, from west to east.

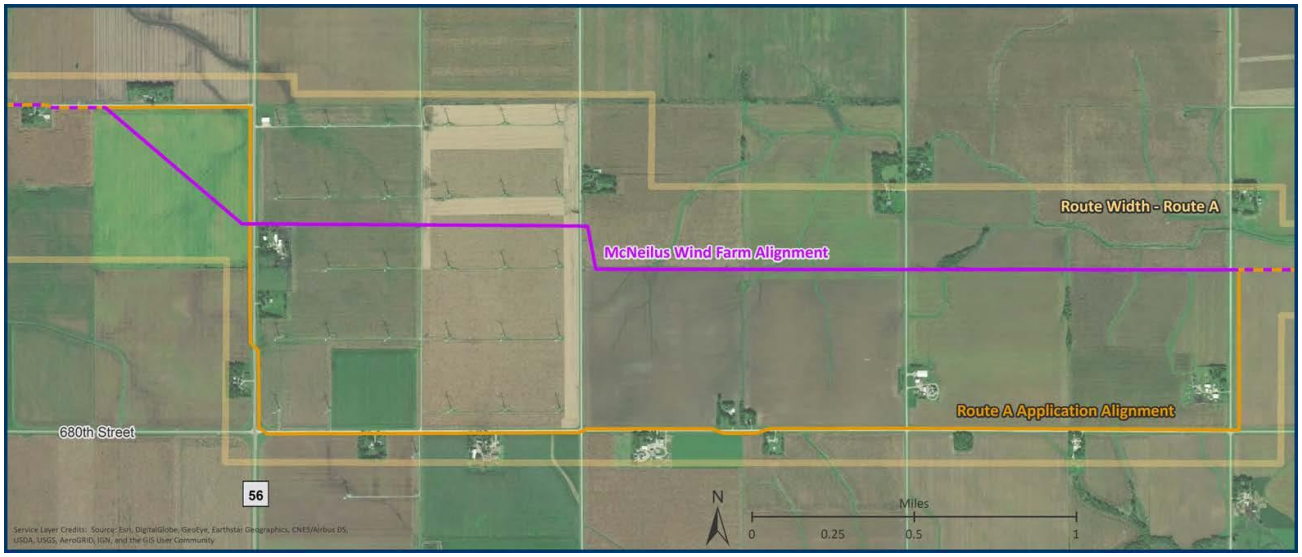
Within each resource section, differences in impacts between the routing alternatives in each area are discussed to the extent that differences are appreciable.

6.3.1 McNeilus Wind Farm

DCW has proposed the McNeilus Wind Farm alignment alternative for a portion of Route A. Because the alternative cannot be used with Route B, comparisons here are solely to Route A. The alternative crosses the McNeilus Wind Farm and proceeds along field lines, rather than along 680th Street. As shown in **Figure 15**, routing alternatives between 180th Avenue and 230th Avenue include:

- Route A alignment proposed in the application, and
- McNeilus Wind Farm Alignment Alternative.

Figure 15. McNeilus Wind FarmRouting Alternative

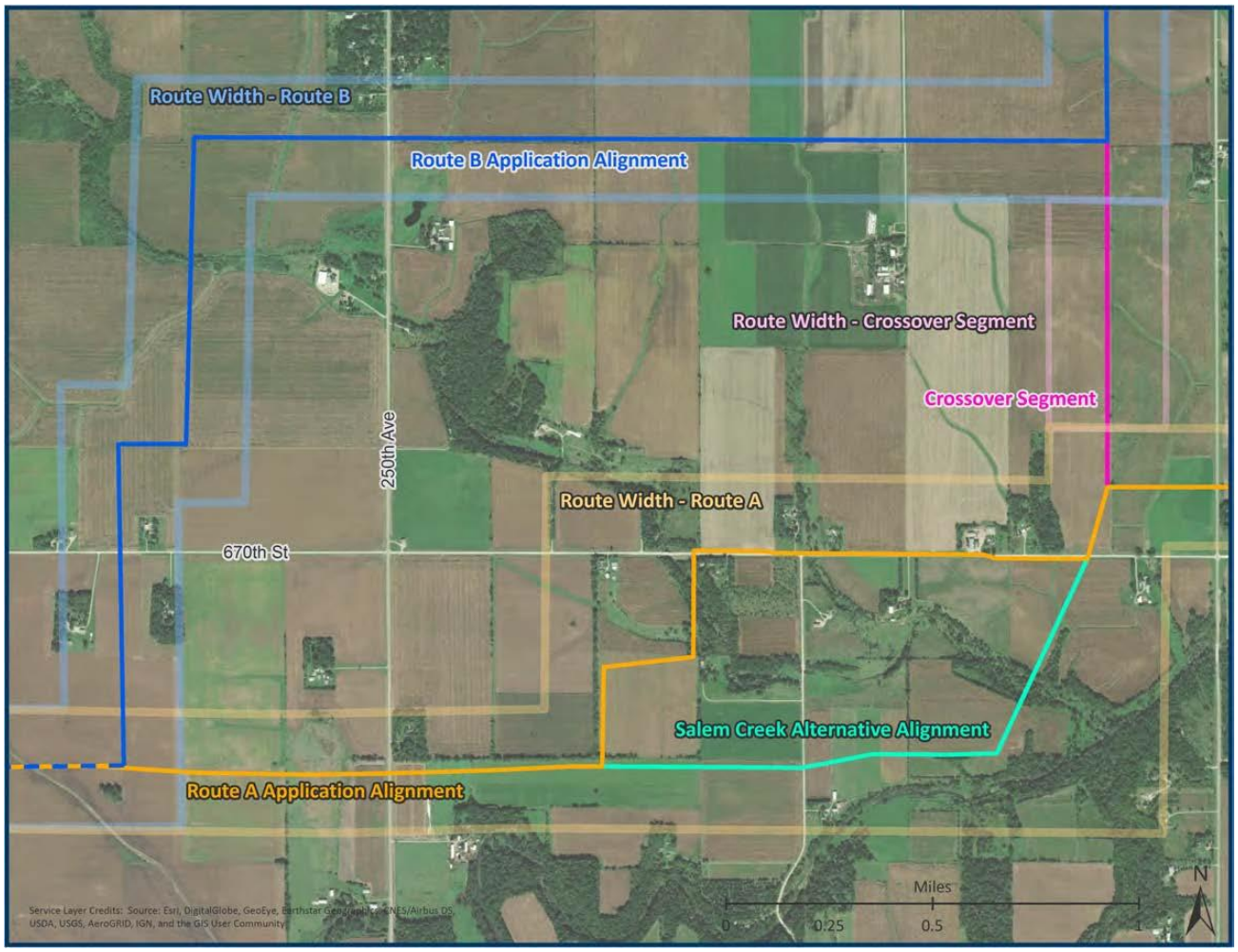


6.3.2 Salem Creek

South of the city of Kasson, there are three routing options that could minimize impacts to resources near Salem Creek. As shown in **Figure 16**, routing alternatives between 250th Avenue and 270th Avenue include:

- Route A alignment proposed in the application,
- Salem Creek Alternative Alignment, and
- Route B together with the West 270th Avenue Crossover Segment.

Figure 16. Salem Creek Routing Alternatives

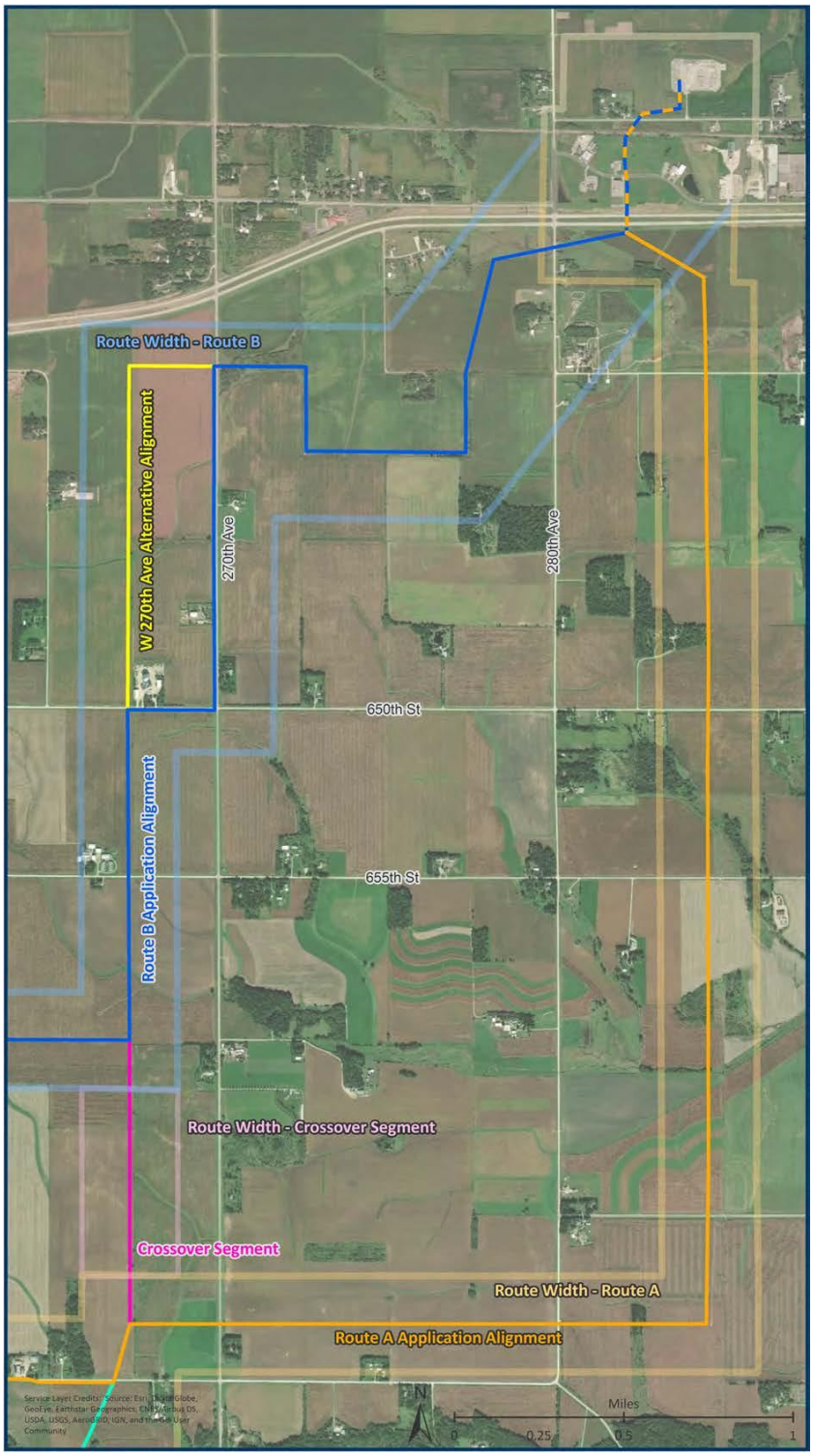


6.3.3 Byron

Southwest of the city of Byron, as the line approaches the Byron Substation, there are three routing options that could minimize impacts to resources in this area. As shown in Figure 17, routing alternatives between 670th Street and the Byron Substation include

- Route A alignment proposed in the application,
- Route B alignment proposed in the application, and
- Route B alignment modified to include the West 270th Street Alignment Alternative.

Figure 17. Byron Routing Options



6.3.4 Describing Potential Impacts and Mitigation

This EIS analyzes potential impacts of the project on various resources. The discussion of the duration, size, intensity, and location of the impacts provides context. This context is used to determine an overall resource impact level. Impact levels are described using qualitative descriptors. These descriptors are not intended as value judgments, but rather as a means to both ensure a common understanding among readers and compare resource impacts between alternatives.

- Minimal - Minimal impacts do not considerably alter an existing resource condition or function. Depending upon the resource and the location, minimal impacts may be noticeable to an average observer. These impacts generally affect common resources over the short-term.
- Moderate - Moderate impacts alter an existing resource condition or function, and are generally noticeable or predictable for the average observer. Effects may be spread out over a large area making them difficult to observe, but can be estimated by modeling or other means. Moderate impacts may be long-term or permanent to common resources, but are generally short- to long-term for rare and unique resources.
- Significant - Significant impacts alter an existing resource condition or function to the extent that the resource is severely impaired or cannot function. Significant impacts are likely noticeable or predictable for the average observer. Effects may be spread out over a large area making them difficult to observe, but can be estimated by modeling. Significant impacts can be of any duration, and may affect common and rare and unique resources.

This EIS also discusses ways to avoid, minimize, or mitigate specific impacts. These actions are collectively referred to as mitigation.

- Avoid - Avoiding an impact means the impact is eliminated altogether by moving or not undertaking parts or all of a project.
- Minimize - Minimizing an impact means to limit its intensity by reducing project size or moving a portion of the project from a given location.
- Mitigate - Impacts that cannot be avoided or minimized could be mitigated. Impacts can be mitigated by repairing, rehabilitating, or restoring the affected environment, or compensating for it by replacing or providing a substitute resource elsewhere.

6.4 Environmental Setting

The transmission project is located in Dodge and Olmsted counties, in southeastern Minnesota. The project area is dominated by cropland and scattered rural residences, with a network of agricultural ditches and intermittent and ephemeral streams, many of which support herbaceous riparian buffers.

The general topography is described as undulating, rolling relief with approximate elevations between 1,330 and 1,125 feet above mean sea level (MSL). The topography generally slopes east towards Salem Creek, a tributary of the Zumbro River that eventually flows to the Mississippi River.

As discussed in **Section 3.3.4.**1 and illustrated in **Figure 6**, the DNR and the U.S. Forest Service have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota.

The project area is located within the Eastern Broadleaf Forest Province, a transition zone between the western prairies and eastern mixed conifer/deciduous forest (**Figure 6**). This Province is further divided into Sections and Subsections. The western half of the project area is within the Minnesota and Northeast Iowa Morainal Section (222M), characterized by deciduous forest, woodland, and prairie in a hummocky morainal landscape, and the Oak Savanna Subsection (222Me), which was historically covered by bur oak savanna, patches of tallgrass prairie, and maple-basswood forest on gently rolling hills. The eastern half of the project area is within the Paleozoic Plateau Section (222L), characterized by highly eroded bluffs and valleys, and the Rochester Plateau Subsection (222Lf), an area of transition from rolling plateau to dissected landscapes (DNR 2018).[268]

Prominent features along the routes include rural residences, cropland, the McNeilus Wind Farm, several snowmobile trails, Salem Creek – North Fork, Cascade Creek, several DNR public watercourse crossings, existing powerlines, and scattered wooded areas located along water courses and adjacent to residences

6.5 Human Settlements

Transmission lines have the potential to negatively impact human settlements through a variety of means. Transmission line structures and conductors could change the aesthetics of the project area, displace homes or businesses, introduce new noise sources, lower property values, be incompatible with local zoning, and interfere with electronic communications.

Impacts to human settlements resulting from the transmission project are anticipated to be minimal. Most impacts to human settlements are relatively independent of the route selected for the project. The exception is aesthetic impacts; these impacts vary with routing options. Route A minimizes aesthetic impacts of the project relative to route B. The aesthetic impacts of route A can be further minimized by use of route B with the crossover segment and by use of the Salem Creek alignment alternative. There is one residence that could be displaced by the project; this displacement could be avoided by selecting route A or the West 270th Ave. alignment alternative south of the city of Byron.

[268] DNR *Ecological Classification System*, http://www.dnr.state.mn.us/ecs/index.html

6.5.1 Aesthetics

Aesthetic and visual resources include the physical features of a landscape such as land, water, vegetation, animals, and manmade structures. The relative value of these visual resources in a given area depends on what individuals perceive as being beautiful or aesthetically pleasing. Viewers' perceptions are based on their psychological connection to the viewing area and their physical relationship to the view, including distance to physical features, perspective, and duration of the view. Landscapes which are, for the average person, harmonious in form and use are generally perceived as having greater aesthetic value. Infrastructure which is not harmonious with a landscape or negatively impacts existing features of a landscape could negatively affect the aesthetics of an area.

The landscape in the project area is characterized by gently rolling plains of agricultural crops.[269] Viewsheds in this area are generally broad and uninterrupted, with only small scattered areas where they are defined by trees, watercourses, or topography. The landscape is also shaped by the built environment. Horizontal elements, such as highways, roads, and railroads, are consistent with the long and open viewsheds in the area. Vertical elements, such as wind turbines and transmission lines, are visible from a distance and are the tallest and often most dominant visual features of the landscape. Vertical elements along the northern edge of the project area also include buildings associated with the cities of Dodge Center, Kasson, and Byron.

6.5.1.1 Potential Impacts and Mitigation

The project's transmission line structures and conductors will result in aesthetic impacts. The extent of these impacts depends upon:

- Proximity to residences, schools, churches, etc., where relatively more persons are present to experience aesthetic impacts.
- The use of existing infrastructure rights-of-way, where the project would have an incremental impact relative to existing human modifications to the landscape (i.e., putting like with like).
- The presence of terrain and vegetation that could shield views of the transmission line and the preservation of such vegetation.

The primary strategy for minimizing aesthetic impacts is prudent routing— placing the transmission line away from residences and following existing infrastructure ROW.

Routes A and B

Aesthetic impacts can be minimized by selecting routes that are located away from residences, schools, and other buildings from which the transmission line would be visible. Route A is near fewer residences (41) than route B (54) (**Table 31**). The distance of residences from the anticipated

[269] Route Permit Application, Sections 5.1 and 6.1.

alignment of the line is similar for both routes. Route B does have one residence that is within 75 feet of the anticipated alignment.

Table 31. Proximity of Residences to Routes A and B

Distance from Anticipated Alignment	Number of Residences	
	Route A	Route B
Residences within 0 – 75 feet	0	1
Residences within 75 – 200 feet	13	16
Residences within 200 – 500 feet	15	16
Residences within 500 – 1,000 feet	13	21
Total	**41**	**54**

Aesthetic impacts can also be minimized by following existing infrastructure ROW, where elements of the built environment already define the viewshed and where the addition of the project would a have an incremental aesthetic impact. Route A follows infrastructure ROW for a greater percentage of its length than route B (50.8 percent and 45.5 percent, respectively) (**Table 32**). Only Route A follows an existing transmission line for part of its length (3.1 miles, or 14.4 percent).

Table 32. ROW Sharing and Paralleling for Routes A and B

Landscape Feature	Route A		Route B	
	Miles	% of Route	Miles	% of Route
Follows existing transmission line	3.1	14.4	0	0.0
Follows existing roads	7.8	36.3	11.9	45.4
Total infrastructure – transmission line and roads	10.9	50.0	11.9	45.4
Follows field or parcel line	1.4	6.8	5.9	22.4
Total – all	**12.3**	**57.5**	**17.8**	**67.8**

Because Route A is near fewer residences and makes relatively better use of infrastructure ROW, Route A minimizes aesthetic impacts of the project relative to Route B.

6.5.1.2 McNeilus Wind Farm Alignment Alternative

With respect to aesthetic impacts, the alternative places the line near fewer residences than the complementary section of route A, but also away from existing infrastructure (**Table 33**).

Table 33. McNeilus Wind Farm Area – Residences and Features Paralleled

Distance from Anticipated Alignment	Number of Residences		Landscape Feature	Distance Paralleled Miles (% of length)	
	Route A	McNeilus Wind Farm Alignment		Route A	McNeilus Wind Farm Alignment
0 – 75 feet	0	0	Transmission Line	0 (0)	0 (0)
75 – 200 feet	9	1	Road	5.0 (76.0)	0.5 (10.2)
200 – 500 feet	5	1	Total Existing Infrastructure	5.0 (76.0)	0.5 (10.2)
500 – 1,000 feet	1	2	Field or Parcel Line	0.9 (14.3)	2.9 (54.4)
Total Count	**15**	**4**	**Total Length of feature paralleling**	**6.0 (90.4)**	**3.5 (64.5)**

Thus, for the McNeilus Wind Farm alignment alternative, the indicators for aesthetic impacts are mixed – the alignment alternative is near fewer residences than Route A in this area, but also makes relatively poorer use of existing infrastructure ROW. On whole, and because the alignment alternative is near fewer residences, the McNeilus Wind Farm alignment minimizes aesthetic impacts of the project relative to Route A.

6.5.1.3 Salem Creek Routing Options

In this area of the transmission project, Route B with the crossover segment (B-Crossover) is near fewer residences than the complementary section of either of the Route A alternatives (Table 33). B-Crossover follow no transmission lines or roads, and therefore utilizes less infrastructure ROW than either of the Route A alignment alternatives.

The Salem Creek alignment alternative is near fewer residences than the originally proposed Route A alignment. The residences along the Salem Creek alignment are also at a greater distance, at least 500 feet, from the anticipated alignment of the line in the area where the two alignment alternatives differ (Appendix E). The Salem Creek alignment utilizes less infrastructure ROW than the original alignment of route A (Table 34).

Table 34. Salem Creek Area Route Options– Residences and Features Paralleled

Distance from Anticipated Alignment	Number of Residences			Landscape Feature	Distance Paralleled Miles (% of length)		
	Route A	Route A with Salem Creek	Route B with Crossover		Route A	Route A with Salem Creek	Route B with Crossover
0 – 75 feet	0	0	0	Transmission Line	0 (0)	0 (0)	0 (0)
75 – 200 feet	1	0	0	Road	1.0 (31.0)	0 (0)	0 (0)
200 – 500 feet	6	1	2	Total Existing Infrastructure	1.0 (31.0)	0 (0)	0 (0)
500 – 1,000 feet	7	8	4	Field or Parcel Line	0.5 (16.2)	0.5 (16.6)	3.2 (66.9)
Total Count	**14**	**9**	**6**	**Total Length of feature paralleling**	**1.5 (47.2)**	**0.5 (16.6)**	**3.2 (66.9)**

The indicators of potential aesthetic impacts of the routing alternatives in the Salem Creek area are mixed. On balance, because both Route B and the Salem Creek alternative alignment are at a greater distance from residences, either of these alternatives minimizes aesthetic impacts relative to the original alignment of Route A.

6.5.1.4 Byron Routing Options

In this area of the transmission project, Route A is near fewer homes than either of the route B options (**Table 35**). Route A follows transmission lines for more than 60 percent of its route in this area; Route B-crossover parallels roads for approximately 25 percent of its length. Both Route B alternatives follow field or parcel lines for a significant portion of their length in this area (45 percent for Route B-crossover and 70 percent for Route B-270th Avenue) (**Table 35**).

Table 35. Byron Area Route Options– Comparison of Residences and Paralleling

Distance from Anticipated Alignment	Number of Residences			Landscape Feature	Distance Paralleled Miles (% of length)		
	Route A	Crossover-Route B	Route B –West 270th Avenue		Route A	Crossover-Route B	Route B-West 270th Avenue
0 – 75 feet	0	1	0	Transmission Line	3.1 (61.1)	0 (0)	0 (0)
75 – 200 feet	0	2	0	Road	0 (0)	1.3 (25.2)	0 (0)
200 – 500 feet	2	3	3	Total Existing Infrastructure	3.1 (61.1)	1.3 (25.2)	0 (0)
500 – 1,000 feet	5	9	9	Field or Parcel Line	0 (0)	2.3 (45.2)	3.6 (70.3)
Total Count	**7**	**15**	**12**	**Total Length of feature paralleling**	**3.1 (61.1)**	**3.6 (70.4)**	**3.6 (70.3)**

The indicators of potential aesthetic impacts of the routing alternatives in the Byron area favor the use of Route A, as Route A in this area is generally at a greater distance from homes and parallels existing transmission lines for approximately 60 percent of its length.

6.5.2 Displacement

For electrical safety code and maintenance reasons, residences and other buildings are not allowed within the ROW of a transmission line. Any residences or other buildings located within a proposed ROW are generally removed or displaced. Displacements are relatively rare and are more likely to occur in more populated areas where it may not be feasible to avoid all residences and businesses.

Displacements can be avoided through several means including structure placement, the use of specialty structures, and modifications of the right-of-way width. The applicant indicates that it does not anticipate the displacement of any residences as a result of the project and notes that it will work with landowner on a case-by case basis to address potential displacements.[270] Though the general rule is that buildings are not allowed within the ROW of the transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line.

There are no residences within the anticipated ROW of Route A, the Crossover Segment, or any of the alignment alternatives. There is one residence within the anticipated ROW of Route B, where the

[270] *Route Permit Application*, Section 5.5.2 and 6.5.2.

route parallels 270th Avenue (Table 36). Although DCW indicates that no displacements of residences are planned as a result of the project,[271] it is possible that this residence would be displaced if Route B is selected.

There are five non-residential buildings (e.g., barns or equipment sheds) within the anticipated ROW of Route A and five within the anticipated ROW of Route B (Table 36). The non-residential buildings may or may not be displaced as a result of the transmission project. Though buildings are generally not allowed within the ROW of a transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., equipment storage, animal production). For each of the buildings noted here, the applicant would need to conduct a site-specific analysis to determine if the building could remain or must be displaced. There are no buildings within the anticipated ROW of the Crossover Segment or any of the alignment alternatives.

Table 36. Buildings Within 75 feet of Anticipated Alignment

Building Type	Route A	Route B	McNeilus Wind Farm Alignment	Crossover Segment	Salem Creek Alignment	West 270th Ave. Alignment
Residence	0	1	0	0	0	0
Non-Residential	5	5	0	0	0	0

6.5.3 Noise

Noise is generally defined as unwanted sound. Noise is measured in units of decibel (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more weight. The A-weighted decibel scale (dBA) scale is used to emphasize the range of sound frequencies that are most audible to the human ear. Table 19 shows dBA values for several typical noise sources. A noise level change of 3 dBA is imperceptible to average human hearing, while a 5 dBA change in noise level is noticeable.

Because sounds levels are measured on a logarithmic scale, they are not directly additive. For example, if a sound level of 50 dBA is added to another sound level of 50 dBA, the total sound level is 53 dBA, not 100 dBA. This change in sound level (3 dBA) would be imperceptible.

All noises produced by the transmission project must be within Minnesota noise standards (Table 20). These standards are promulgated by the MPCA. The standards are organized by the type of environment where the noise occurs (noise area classification, NAC) and the time of day. These noise standards are expressed as a range of permissible dBA within a 1 hour period; L50 is the dBA that may

[271] *Route Permit Application*, Section 6.5.2.

be exceeded 50 percent of the time within an hour, while L10 is the dBA that may be exceeded 10 percent of the time within 1 hour.

The MPCA noise standards are public health standards. That is, they protect receptors (persons) from noise generated by all sources at a specific time and place. The total sum of noise at a specific time and location cannot exceed the standards. The MPCA evaluates whether a specific noise source is in violation of the standards by determining if the source causes or contributes to a violation of the standards.

The primary noise receptors in the project area are residences. Residences are in noise area classification one (NAC 1). Ambient noise levels in the project are generally in the range of 20 to 60 dBA.[272] Ambient noise levels in urban areas, e.g., Dodge Center or Kasson, are likely higher and in the range of 30 to 80 dBA.

Potential noise impacts from the transmission project can be grouped into three categories: construction noise, transmission line noise, and substation noise.

6.5.3.1 Construction Noise

During the construction of the transmission project, temporary, localized noise from heavy equipment and increased vehicle traffic is expected to occur along the ROW during daytime hours. Construction activity and crews would be present at a particular location during daytime hours for a few days at a time but on multiple occasions throughout the period of approximately five to seven months between initial ROW clearing and final restoration.[273] Construction equipment produces sound levels in the range of 70 to 95 dBA.[274]

Construction noise could temporarily affect residences, schools, businesses, etc., that are close to the ROW. Residences are the closest noise receptors to the transmission line ROW. All but one residence is greater than 75 feet from the anticipated alignment of the line and most are more than 200 feet (**Table 31**). As sound pressure levels decrease with distance, no exceedances of MPCA daytime noise standards are anticipated. Commission permits do not provide for nighttime construction (**Appendix C**); thus, no exceedances of MPCA nighttime standards limits are anticipated.

DCW indicates that it will mitigate potential construction noise impacts through several means, including:[275]

- Limiting heavy equipment use to the shortest possible time period.
- Minimizing construction equipment idling.

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[272] *Site Permit Application*, Section 8.3.1.
[273] *Route Permit Application*, Section 5.5.6
[274] Ibid., Section 5.5.3.
[275] *Route Permit Application*, Section 5.5.3.

- Ensuring that proper mufflers are used on equipment.
- As practicable, locating stationary equipment (e.g., compressors, generators) away from receptors or behind barriers.

6.5.3.2 Transmission Line Noise

Noise from transmission lines is due to small electrical discharges along the conductors that ionize surrounding air molecules. This phenomenon is known as corona. The level of noise from these discharges depends on conductor conditions, voltage levels, and weather conditions. Noise emissions are greatest during heavy rains, when conductors are consistently wet. However, during heavy rains, the background noise level is usually greater than the noise from the transmission line and few people are in close proximity to the transmission line in these conditions. As a result, audible noise is not noticeable during heavy rains.

In foggy, damp, or light rain conditions, transmission lines may produce audible noise higher than background levels. During dry weather, noise from transmission lines is a perceptible hum and sporadic crackling sound. The applicant modeled and estimated noise levels for the transmission line. This modeling indicates that the highest noise levels from the line would occur during rainfall and would be approximately 48 dBA at the edge of the transmission line ROW and 52 dBA directly under the line **Table 37**). As the noise level created by the rainfall itself would be about 50 dBA (**Table 19**), the noise created by the transmission line would not be perceptible.

Estimated noise levels during fair weather are about 23 dBA at the edge of the transmission line ROW and 27 dBA directly under the line **(Table 37**). These noise levels are at the low end of ambient noise levels in the project area and would not be perceptible. Thus, under all weather conditions, noise impacts from the transmission line are anticipated to be minimal.

Table 37. Estimated Noise Levels for Transmission Line Configurations[276]

Structure Configuration	Rain – L_{50} (dBA)		Fair – L_{50} (dBA)	
	0 feet	75 feet	0 feet	75 feet
Delta	52.4	47.9	27.4	22.9
Vertical	51.5	48.2	26.5	23.2

6.5.3.3 Substation Noise

Noises associated with a substation result from the operation of transformers and switchgear. Transformers produce a consistent humming sound, resulting from magnetic forces within the

[276] *Route Permit Application*, Section 5.5.3

transformer core. This sound does not vary with transformer load. Switchgear produces short-term noises during activation of circuit breakers. These activations are infrequent.

The transmission project includes a new collector substation and additional switchgear at the exiting Byron Substation. Switchgear additions at the Byron Substation will not change or increase noise levels at the substation; thus, potential noise impacts near the substation are not anticipated.[277]

The applicant modeled and estimated noise levels associated with the new collector substation. Based on this modeling, the estimated sound level at the nearest receptor (a residence approximately 1,800 feet from the proposed substation site) is 28 dBA.[278] This noise level is at the low end of ambient noise levels in the project area and would not be perceptible.

In sum, noise impacts from the transmission project are anticipated to be minimal and within Minnesota's noise standards. However, this does not mean that noise impacts would not occur. Even if the operational noise levels for the project are within state standards, the project would introduce a new noise source that, in certain situations (e.g., a calm evening) may be heard by residents in the project area. The primary means of mitigating this noise impact is prudent routing to avoid areas where residents live, work, and congregate. Noise impacts from substation operations could be mitigated by natural or built sound barriers, e.g., berms, plantings. Route permits issued by the Commission require compliance with Minnesota's noise standards (**Appendix C, at Section 4.3**).

6.5.4 Property Values

The placement of transmission lines near human settlements has the potential to affect property values. In general, potential impacts are related to three main concerns:

- The presence of a transmission line could adversely affect the aesthetics of a property, thereby deterring certain buyers.
- The real or perceived risks associated with electric and magnetic fields (EMF) (**Section 6.6.1**) may discourage certain buyers.
- Transmission line structures, when placed in an agricultural field, take very little land out of production. However, they have the potential to interfere with farming operations. Impacts on crop yields and management could affect property values.

Proximity to transmission lines is one of many interconnected factors that influence property values; thus, the magnitude of this impact is difficult to isolate. The relationship between property values and proximity to transmission lines has been researched for decades, using a variety of methodologies.

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[277] *Route Permit Application*, Section 7.1.3.
[278] Ibid.

Some general conclusions can be drawn from this body of literature. This chapter highlights relevant outcomes of property value research with additional detail provided in Appendix K.

Research on the relationship between property values and proximity to transmission lines has not identified a clear cause-and-effect relationship, but has revealed trends which are generally applicable to properties near transmission lines:

- When negative impacts on property values occur, the potential reduction in value is in the range of 1 to 10 percent.
- Property value impacts decrease with distance from the line; thus, impacts are usually greater on smaller properties than on larger ones.
- Negative impacts diminish over time.
- Other amenities, such as proximity to schools or jobs, lot size, square footage of the home, and neighborhood characteristics, tend to have a much greater effect on sale price than the presence of a transmission line.
- The value of agricultural property decreases when transmission line structures interfere with farming operations.

Impacts to property values could be mitigated by minimizing aesthetic impacts, perceived EMF health risks, and agricultural impacts. Selecting routes and alignments that maximize the use of existing rights-of-way and that place the transmission line away from residences and out of agricultural fields could address these concerns, thus minimizing impacts to property values. Impacts can be mitigated through inclusion of specific conditions in individual easement agreements with landowners along the transmission line Impacts could also be mitigated by using the protections of Minnesota Statute 216E.12, subdivision 4 (commonly known as the "Buy the Farm" statute), where available, to move away from potential property value impacts.

6.5.5 Socioeconomics

The transmission project is located in the counties Dodge and Olmsted. These counties have a relatively greater median household income and lower poverty rate than the state of Minnesota as a whole (Table 38). These counties also have a relatively lower population of ethnic minorities. Thus, no differential socioeconomic impacts related to poverty or ethnicity are anticipated as a result of the project.

Approximately 30 to 40 workers will be required for construction of the transmission project. These workers will be in the project area from approximately 5 to 7 months.[279] The presence of these workers will likely result in a net financial gain for local economies. Workers will spend money on services and supplies in the project area, e.g., food, housing.

[279] DCW, *Response to Data Requests 7 and 10* (Appendix M).

Table 38. Population and Socioeconomic Characteristics of Project Area[280]

Location	Median Household Income ($)	Percent of Population Below Poverty Rate	Percent Ethnic Minority
Dodge County	68,718	6.6	8.7
Olmsted County	69,308	9.2	19.5
Minnesota	63,217	10.8	21.2

6.5.6 Zoning and Land Use Compatibility

Transmission lines have the potential to adversely impact existing land uses and to be incompatible with future land uses. Impacts to existing and future land uses as a result of the transmission project are anticipated to be minimal.

Land use in the project area is primarily agricultural (**Appendix E**). There are a few commercial and industrial businesses in the project area. The northern edge of the project area includes the urban centers of Claremont, Dodge Center, Kasson, and Byron. Most parcels of land in the project area are privately owned; however, parcels of land under federal, state, and county ownership or management are found in the project area, e.g., Bud Jensen WMA.

Dodge County has adopted a comprehensive plan and zoning ordinances to guide development in the county.[281] Olmsted County has adopted zoning and development plans in conjunction with the city of Rochester.[282] The project area is primarily zoned for agricultural use. Urban centers have areas zoned for residential, commercial, and industrial use.[283]

Impacts to current and future land uses due to the transmission project are anticipated to be minimal. The transmission project is generally compatible with agricultural uses and zoning in the project area and is not anticipated to frustrate planned community growth or impact otherwise protected natural resources.

Impacts to zoning and to current and future land uses due to the transmission project can be mitigated by selecting routes and alignments that are compatible, to the extent possible, with community zoning and land-use plans. Land-use impacts can be mitigated by minimizing aesthetic impacts of the project, to the extent that zoning and land-use plans address aesthetics (e.g.,

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[280] *Route Permit Application*, Section 5.5.6.
[281] *Route Permit Application*, Section 5.5.3; Dodge County Comprehensive Plan, https://www.co.dodge.mn.us/EnvironmentalServices/Complete%20Draft%2012-15.pdf; Dodge County Land Use, https://www.co.dodge.mn.us/departments/land_use2.php.
[282] *Route Permit Application*, Section 5.5.3; Olmsted County Land Use Planning, https://www.co.olmsted.mn.us/planning/lup/Pages/default.aspx.
[283] Dodge County Land Use, https://www.co.dodge.mn.us/departments/land_use2.php.

landscaping). Land-use impacts can also be mitigated by using existing rights-of-way to the maximum extent possible.

6.5.6.1 Preemption of Local Zoning

This transmission project is subject to Minnesota's Power Plant Siting Act. Under this statute, the route permit issued for a transmission line is "the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt all zoning, building or land use rules, regulations or ordinances promulgated by regional, county, local and special purpose government." [284]. Therefore, the applicant is not required to seek permits or variances from local governments to comply with applicable zoning codes. Nonetheless, impacts to local zoning are clearly impacts to human settlements, and the Commission considers impacts to human settlements as a factor in selecting transmission line routes.

6.5.7 Cultural Values

Cultural values are those community beliefs and attitudes which provide a framework for community unity and animate community actions. Cultural values are informed, in part, by history and heritage. The project area has been home to a variety of persons and cultures. In the early to mid-1800s, the area was populated primarily by Mdewakanton Sioux. In a treaty concluded in 1853, lands in the project area were relinquished by the Sioux to the territory of Minnesota. Dodge County and Olmsted County were established in 1855. European settlers in the project area were of German, Norwegian, Danish, Irish, English, and Scottish heritage.[285]

Cultural values are also informed by the work and recreation of residents and by geographical features. The project area is primarily rural and agricultural. Farming and the ability to continue to farm and support livelihoods through farming are strong values in the project area.[286] Persons in the project area have various recreational opportunities, including fishing, hunting, and snowmobiling. These opportunities are supported by a variety of natural resources, including lakes, rivers, parks, and wildlife management areas.

No impacts to cultural values are anticipated as a result of the transmission project. The project will not adversely impact the work or recreation of residents in the project area that underlie the area's cultural values, nor will it adversely impact geographical features that inform these values.

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[284] Minnesota Statutes, Section 216E.10
[285] Dodge County History, https://www.co.dodge.mn.us/government/dodge_county_history.php; History of Olmsted County, https://www.co.olmsted.mn.us/yourgovernment/Pages/HistoryofOlmstedCounty.aspx..
[286] Dodge County Comprehensive Plan, https://www.co.dodge.mn.us/EnvironmentalServices/Complete%20Draft%2012-15.pdf (see, e.g., Appendix A, noting that Dodge County citizens largely do not want more housing or commercial or industrial development in agricultural lands).

6.5.8 Electronic Interference

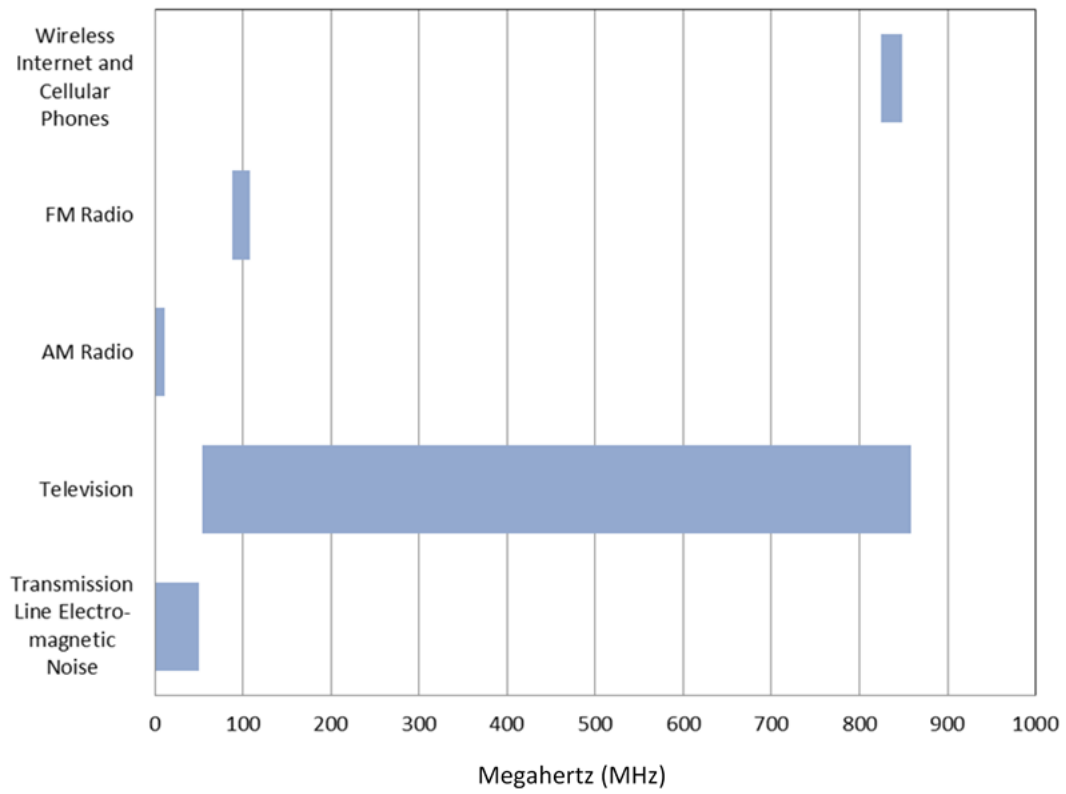
This chapter summarizes the potential impacts of the project on electronic communications and communication devices, including radios, televisions, and microwave communications. Global positioning system (GPS)-based agricultural navigation systems are discussed in Section 6.6.1, and medical electronic devices are discussed in Section 6.5.2.

Electronic interference could result from electromagnetic noise created by the ionization of air molecules surrounding transmission line conductors. This ionization is commonly known as corona. Interference could also result from transmission line structures which block line-of-sight communications.

No impacts to electronic devices are anticipated as a result of the project. Interference due to electromagnetic noise is not anticipated. Interference due to line-of-sight obstruction could occur in select areas but could be mitigated by prudent placement of transmission line poles and electronic antennas. In situations where interference with electronic devices does occur and is caused by the presence or operation of the transmission line, route permits issued by the Commission require permittees to take those actions which are feasible to restore electronic reception to pre-project quality (Appendix C).

Electromagnetic noise from transmission lines may interfere with electronic communications when it is generated at the same frequencies as communication and media signals. This noise could interfere with the reception of these signals depending on the frequency and strength of the signal and distance from the electromagnetic noise source. Corona interference from transmission lines causes the greatest disturbance in a relatively narrow frequency spectrum, in the range of about 0.1 to 50 megahertz (MHz). Because many communication and media signals are transmitted at higher frequencies, impacts to communication signals are limited. Figure 18 compares the spectrum of transmission frequencies for several communication and media signals to the frequencies associated with electromagnetic noise from transmission lines. Additional discussion is provided below for each major type of media or communication signal.

Figure 18. Frequencies of Electronic Communication and Electromagnetic Noise[287]



6.5.8.1 Radio

Electromagnetic interference could affect AM and FM radio receivers. However, electromagnetic noise created by transmission lines overlaps only with AM radio frequencies (**Figure 18**). This interference typically occurs directly under a transmission line and dissipates rapidly to either side. Otherwise, satisfactory reception could be obtained by appropriately modifying or moving the receiving AM antenna.

FM radio receivers usually do not pick up interference from transmission lines because corona-generated electromagnetic noise is quite small in the FM broadcast band (88–108 MHz) and because FM radio systems have excellent interference rejection properties that make them immune to amplitude-type disturbances.

Two-way radios used for emergency services typically operate at frequencies greater than 150 MHz. Minnesota has moved to a statewide emergency communications system that operates at 800 MHz.[288]

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[287] Marshall Brain "How the Radio Spectrum Works" 1 April 2000.HowStuffWorks.com. https://electronics.howstuffworks.com/radio-spectrum.htm

[288] Minnesota Department of Public Safety, Emergency Communication Networks https://dps.mn.gov/divisions/ecn/about/Pages/default.aspx

Corona-generated electromagnetic noise is minimal at these frequencies and no impacts to these radio systems are anticipated.

6.5.8.2 Television

Television broadcast frequencies occur in the 54–806 MHz range and are high enough that they are relatively immune to corona-generated noise (Figure 18). Digital television transmissions are not dependent on waveforms to transfer broadcast content, but rather on packets of binary information, which, in general, are less susceptible to corruption and can be corrected for errors. Satellite television is transmitted in the Ku band of radio frequencies (12,000–18,000 MHz) and is likewise immune to corona-generated noise.

Both digital and satellite television reception could be affected by multi-path reflections (shadowing) generated by nearby towers. An outdoor antenna might be necessary to resolve issues with multi-path reflections. Satellite television is susceptible to line-of-sight interference due to transmission line structures. However, reception can usually be restored by moving the affected satellite antenna to a slightly different location.

Cable television is a redistributed form of satellite broadcast and is generally not susceptible to interference due to the use of shielded coaxial cable. Cable broadcasts could suffer interference if the satellite broadcast suffers interference (e.g., line-of-sight obstruction).

6.5.8.3 Internet and Cellular Phones

Wireless internet and cellular phones use frequencies in the 900 MHz ultra-high frequency (UHF) range (Figure 18)—a range for which impacts from corona-generated noise are anticipated to be minimal. If internet service at a residence or business is provided by a satellite antenna, this service could be impacted by a line-of-sight obstruction. As with other satellite reception, any interference due to an obstruction could be resolved by moving the satellite antenna to a slightly different location.

6.5.8.4 Microwave Communication

Electromagnetic noise from transmission lines is not an issue for microwave communications. However, microwave communications can be physically blocked by taller transmission structures. Microwave beams are transmitted along aerial pathways between microwave communication towers. Microwave beam pathways can extend as close as 150 feet to the ground. Transmission line structures for this project would be 80 feet to 140 feet tall. Thus, obstruction of microwave beam pathways is unlikely. Any potential impacts could be avoided during project design by identifying the microwave beam pathways in the project area and siting the transmission line structures at locations where they would not interfere with any identified pathways.

6.5.9 Transportation

Transmission line projects have the potential to negatively impact roads and rails. These impacts are typically temporary in nature during the construction process, e.g., temporary road closures or lane

restrictions. However, impacts could be more long term if they change the project area in such a way that future options, such as road improvements, are foreclosed or limited.

Temporary impacts to the transportation system resulting from the project are anticipated to be minimal.

6.5.9.1 Roadways

Existing road infrastructure along the potential routes primarily consists of paved and unpaved county and township roads that typically follow section lines. The two highest traffic primary roadways within the project area are U.S. Highway 14 and State Highway 56.[289] U.S. Highway 14 is located near the eastern terminus of the project, approximately 0.4-mile south of the Byron Substation. State Highway 56 is located just under six miles east of the DCW Substation. Both routes A and B, and all of the possible variations on A and B involve paralleling and crossing state highway 56 in the eastern portion of the project area and both require a crossing of U.S. Highway 14 just south of the Byron substation. All routing options also have some portions that would run parallel to or cross county and township roads.

Construction of transmission lines does not generally cause permanent impacts on roadways or traffic. However, project construction would result in temporary impacts including road and lane closures and an increase in traffic congestion. Temporary road and lane closures will be necessary to install the transmission line across and along roadways. Road and lane closures may cause delays, but most crossings would be completed within 24-48 hours, so the duration of these impacts would be brief. Once the transmission line has been installed, the road and/or lanes would be re-opened and traffic flow would resume as normal. In addition to these impacts to roadways in the immediate vicinity of construction, the proposed project may also impact travel on roadways nearby because hauling of materials and equipment and travel of personnel to the construction site will increase traffic and may cause congestion at times during the 5 to 7-month construction window.

Most of the roads in the project area have minimal daily traffic, so road and/or lane closures and increases in traffic associated with hauling and travel to the construction site are expected to produce localized impacts to a relatively limited number of motorists. Because U.S. Highway 14 and State Highway 56 are higher traffic roadways, congestion and delays may be more notable and affect more motorists than road and/or lane closures on the lower traffic county and township roads.

As noted above, all of the routing options involve paralleling and crossing Highway 56, require a crossing of U.S. Highway 14 just south of the Byron Substation, and have portions that would run parallel to or cross county and township roads so similar traffic impacts would occur regardless of which route is selected.

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[289] MnDOT. Traffic Forecasting and Analysis. https://www.dot.state.mn.us/traffic/data/tma.html

Right-of-way Sharing and paralleling

DCW proposes to construction portions of both Routes A (approximately 7.8 miles, 36 percent of total length) and B (approximately 11.2 miles, 43 percent of total length) within county road ROW in Dodge County. Construction access to the transmission project ROW in these segments would be from the existing road.

Siting transmission lines along existing ROWs can minimize the proliferation of new utility ROW and the effects on private landowners. In order to share or occupy ROW, however, the applicant would have to acquire necessary approvals from the ROW owner (like the county) or the agency overseeing use of a particular ROW (like MnDOT, the county, or the township). DCW has indicated that they intend to place structures within the roadway ROW along roadways within Dodge County (and affected townships) and MnDOT's jurisdiction wherever possible. The Applicant has received guidance from Dodge County staff on potential issues and concerns with the use of road ROW, such as the need to coordinate with affected townships, identify necessary culvert replacements, assess drainage structures within the road ROW, and DCW's responsibility to update bridge load ratings, where necessary. Dodge County staff also indicated that DCW would be required to provide a Development Agreement, Road Use and Repair Agreement, and a Drainage Agreement for the Project, once detailed engineering and design is completed.

Similarly, DCW has received general guidance from MnDOT staff on the use of state highway ROW for the Project. MnDOT will require that DCW need to adhere to MnDOT's utility accommodation policy and consult further with district level staff prior to any approvals being issued. MnDOT's utility accommodation policy outlines the policies and procedures governing use of state trunk highway ROWs by utilities. The policy was developed in accordance with the requirements of state and federal law (Code of Federal Regulations, title 23, part 645, subpart B). It is designed to ensure that the placement of utilities does not interfere with the flow of traffic or the safe operation of vehicles. DCW has indicated that in its general guidance to the Applicant, MnDOT also noted that they would prefer placing existing distribution lines in an under-build configuration on the new transmission line to minimize poles within the ROW.

Transmission lines that parallel roads could affect future road expansions or realignments because poles placed along the road ROW might need to be moved to preserve a safe distance between poles and the edge of the expanded roadway. MnDOT's accommodation policy addresses MnDOT's responsibility for preserving the public investment in the transportation system and for ensuring that non-highway uses of the ROW do not interfere with the ability of the state to make long-term highway improvements, such as adding lanes, interchanges or bridges, or to safely operate and maintain the existing system. The requirements of MnDOT's accommodation policy vary based on whether the utility is crossing the highway or running parallel to it and on the type of highway. DCW has indicated that they to discuss with MnDOT and affected counties and townships the issue of financial

responsibility for future pole relocations within the road ROW resulting from the presence of existing or planned infrastructure improvements.[290]

Mitigation

The primary means of mitigating potential impacts to roadways is by coordinating with roadway authorities and by taking into account the need for roadways to be safely operated and maintained. . DCW indicates it will coordinate construction activities with MnDOT and Dodge County to develop a traffic management plan that minimizes disruption to local traffic during construction.

Construction and installation of utility lines within road ROW will require permits from the appropriate regulatory agencies. These permits are aimed at minimizing short-term impacts and ensuring that the transmission line does not have any long term impacts on the safe and efficient operation of the roadways.

6.5.9.2 Railways

The Canadian Pacific Railroad would be crossed by all of the potential routes just south of where the transmission line enters the Byron substation. While construction of the transmission project is not anticipated to have permanent impacts on the railway, temporary impacts including closure or delay for a short period of time during the actual construction of the crossing are possible.

The Applicant has indicated that they will coordinate with Canadian Pacific in order to acquire the appropriate crossing permits and to ensure the safety of all construction and railway personnel.

Mitigation

Similar to roadways, the primary means of mitigating potential impacts to railways is by coordinating with authorities and by taking into account the need for this infrastructure to be safely operated and maintained.

6.5.10 Public Utilities

Public utilities that serve residents and businesses in the project area include both electric transmission and distribution services. Xcel Energy, People's Energy Cooperative, and the City of Kasson each provide electric power to consumers various areas portions of the project area. In addition, Xcel Energy and SMMPA both have transmission lines in the project area. Other utilities such as wastewater services are primarily provided through privately- water wells and septic systems. Municipal water and sewer are likely present within the small portion of the Route B route width study area that crosses the City of Byron. There are a wide variety of other public services provided in the area by Dodge County, Olmsted County, and the City of Byron. These services include environmental services, administrative services, planning and zoning department services, economic development

[290] *Route Permit Application*, at p. 34

organizations, veteran service offices, among many others. County and city departments throughout the communities spanning the project area assist with snow removal, street maintenance, stormwater management, building maintenance, and sidewalks. Finally, DCW has indicated that during project consultations, they learned of new fiber optic and natural gas line construction that is currently planned within road ROW in Canisteo and Ashland townships in Dodge County next year.[291]

With proper coordination, project construction and operation should not directly affect any of these public utilities, regardless of the route chosen. Construction of the transmission project will temporarily increase the population and workforce present within the vicinity of the Project. This increase in population may temporarily increase in individuals requesting the use of public services. However, this minimal increase in population should not create the need for more public services than already exist. Therefore, impacts to the public services system associated with a temporary increase in population are not anticipated.

6.5.11 Emergency Services

Emergency response services in the project area are provided by local law enforcement and emergency response agencies located in nearby communities. Any necessary law enforcement would likely be provided by the Dodge County Sheriff, Olmsted County Sheriff, or the Byron Police department. Additional assistance may be provided by other local municipal police departments. Within Dodge and Olmsted counties, there are several fire departments and ambulance providers to assist in the case of emergencies. In addition, several hospitals and medical facilities are available within Dodge and Olmsted counties.

Regardless of the route chosen, project construction should not directly affect emergency services in the project area because any temporary road closures that may affect access to emergency response services would be coordinated with local jurisdictions to ensure that for safe alternative access is available for police, fire and other rescue vehicles. Any accidents that might occur during construction of the transmission project would be handled through local emergency services. Due to the relatively small number of construction workers on the project, the existing emergency services should have sufficient capacity to respond to any emergencies.

6.5.12 Airports

Dodge Center Airport (TOB) is the only public airport in the project area. The Route A anticipated alignment and all of the associated segment alternatives would pass south of Dodge Center airport TOB by approximately 2.4 nautical miles of the nearest runway end. The Route B alignment and all of the associated segment alternatives would pass south of the TOB within approximately 2.9 nautical miles of the nearest runway end.

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[291] *Route Permit Application*, at p. 33

Transmission structures and conductors can conflict with the safe operation of public airports and airstrips if they are too tall for the applicable safety zones. Different classes of airports have different safety zones depending on several characteristics, including runway dimensions, classes of aircraft they could accommodate, and navigation and communication systems. These factors determine the necessary take-off and landing glide slopes, which in turn determine the setback distance of transmission line structures.

The FAA and MnDOT have each established development guidelines on the proximity of tall structures to public use airports. Transmission lines near public airports are limited by FAA height restrictions, which prohibit transmission line structures above a certain height, depending on the distance from the specific airport. Regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory.

In the case of TOB's airspace, the Applicant has conducted own internal aeronautical evaluation to assess height restrictions to avoid impacts. Their assessment identified areas where obstruction surfaces could restrict structures to below 135 feet in height.[292]

These height restrictions have been incorporated into the project design, therefore no impacts to TOB are anticipated as a result of the transmission project along any of the routes evaluated. Following final structure design and siting, DCW has indicated that they will identify and file all structures that require notice to the FAA. Based on DCW internal review, they do not anticipate that any obstruction issues will be identified in FAA's review of these filings.

Mitigation

As noted above, potential impacts to airports typically mitigated by using shorter structures in the vicinity of an airport to ensure that structures do not impinge on airport glide slopes, safety zones or setbacks. After DCW files the necessary notices with FAA, they would work with both FAA and MnDOT to ensure compatibility between the transmission lines and air navigation stations and equipment and to identify any additional mitigation measures that may not have been identified in DCW's internal aeronautical evaluation.

6.6 Public Health and Safety

Transmission line projects have the potential to negatively impact public health and safety during both construction and operation of the project. As with any project involving heavy equipment and transmission lines, there are safety issues to consider during construction. Potential health and safety impacts include injuries due to falls, equipment use, and electrocution. Potential health impacts

[292] *Route Permit Application*, at p. 120

related to the operation of the project include health impacts from electric and magnetic fields (EMF), stray voltage, induced voltage, impaired air quality, and electrocution.

Impacts to public health and safety resulting from the project are anticipated to be minimal. No adverse health impacts due to EMF, stray voltage, induced voltage, or air emissions are anticipated. The project would have protective devices to safeguard the public from the line if an accident occurred and a structure or conductor fell to the ground. These protective devices are circuit breakers and relays located within connecting substations. The protective equipment would de-energize the transmission line, should such an event occur.

6.6.1 Electric and Magnetic Fields

Electric and magnetic fields (EMFs) are invisible regions of force resulting from the presence of electricity and are produced by all electric devices, including transmission and distribution lines. Naturally occurring EMFs are caused by the earth's weather and geomagnetic field. Man-made EMFs are caused by electrical devices and are characterized by the frequencies at which they alternate, that is, the rate at which the fields change direction each second. All electrical lines in the United States have a frequency of 60 cycles per second or 60 Hertz (Hz). EMFs at this frequency level are known as extremely low frequency (ELF) EMF.

Electric fields on a transmission line are solely dependent upon the voltage of the line, not the current. Electric field strength is measured in kilovolts per meter (kV/m), and the strength of an electric field decreases rapidly as the distance from the source increases. Electric fields are easily shielded or weakened by most objects and materials, such as trees or buildings.

Magnetic fields are created by the electrical current (measured in amps) moving through a transmission line. The strength of a magnetic field is proportional to the electrical current and is typically measured in milliGauss (mG). As with electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases. Unlike electric fields, however, magnetic fields are not easily shielded or weakened by objects or materials.

This chapter summarizes the potential health impacts of transmission line EMF, regulatory standards, and predicted EMF levels from this project. Appendix L provides detailed background on EMF health impact research.

6.6.1.1 Magnetic Field Background Levels

The wiring and appliances located in a typical home produce an average background magnetic field of between 0.5 mG and 4 mG [293]. A U.S. government study conducted by the EMF Research and Public Information Dissemination Program determined that most people in the United States are on average

[293] EPA. 1992. *EMF in Your Environment, Magnetic Field Measurements of Everyday Electrical Devices*. 1992. https://nepis.epa.gov/

exposed daily to magnetic fields of 2 mG or less.[294] Typical magnetic field strengths near common appliances are shown in **Table 39**.

Table 39. Typical Sources of Magnetic Field[295]

Source	Distance from Source (feet)			
	0.5	1	2	4
Air Cleaners	180	20	3	-
Copy Machines	90	20	7	1
Fluorescent Lights	40	6	2	-
Computer Displays	14	5	2	-
Hair Dryers	300	1	-	-
Baby Monitor	6	1	-	-
Microwave Ovens	200	4	10	2
Vacuum Cleaner	300	60	10	1

6.6.1.2 Health Studies and Potential Health Impacts

A concern related to EMFs is the potential for adverse health effects due to EMF exposure. In the 1970s, epidemiological studies indicated a possible association between childhood leukemia and EMF levels. Since then, various types of research have been conducted to examine EMF and potential health effects, including animal studies, epidemiological studies, clinical studies, and cellular studies. Scientific panels and commissions have reviewed and studied this research data (**Appendix L**). In general, these studies concur that:

- There is an association between childhood leukemia and EMF exposure. There is no consistent association between EMF exposure and other diseases in children or adults.
- Laboratory, animal, and cellular studies fail to show a cause-and-effect relationship between disease and EMF exposure at common EMF levels. A biological mechanism for how EMF might cause disease has not been established.

Because a cause-and-effect relationship cannot be established, and yet an association between

[294] National Institute of Environmental Health Sciences. 2002. EMF *Electric and Magnetic Fields Associated with the Use of Electric Power - Questions & Answers*. June 2002. https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf f.

[295] EPA. 1992. *EMF in Your Environment, Magnetic Field Measurements of Everyday Electrical Devices*. 1992. https://nepis.epa.gov/

childhood leukemia and EMF exposure has been shown, there is:

- Uncertainty as to the potential health effects of EMF.
- No methodology for estimating health effects based on EMF exposure.
- A need for further study of the potential health effects of EMF.
- A need for a prudent avoidance approach in the design and use of all electrical devices, including transmission lines.

6.6.1.3 Regulatory Standards

There are currently no federal regulations regarding allowable electric or magnetic fields produced by transmission lines in the United States. A number of states, however, have developed state-specific regulations (Table 40), and a number of international organizations have adopted EMF guidelines (Table 41).

Table 40. State Electric and Magnetic Standards[296]

State	Area where limits applies	Field	Limit
Florida	Edge of ROW	Electric	2 kV/m (lines ≤ 500 kV)
		Magnetic	150 mG (lines of ≤ 230 kV) 200 mG (>230 kV - ≤ 500) 250 mG (>500 kV)
	On ROW	Electric	8 kV/m (≤230 kV) 10 kV/m (>230 kV - ≤ 500) 15 kV/m (>500 kV)
Minnesota	On ROW	Electric	8 kV/m
Montana	Edge of ROW(1)	Electric	1 kV/m
	Road crossings	Electric	7 kV/m
New Jersey	Edge of ROW	Electric	3 kV/m
New York	Edge of ROW	Electric	1.6 kV/m
		Magnetic	200 mG
	Public road crossings	Electric	7 kV/m
	Private road crossings	Electric	11 kV/m
	On ROW	Electric	11.8 kV/m
Oregon	On ROW	Electric	9 kV/m
(1) May be waived by landowner.			

[296] National Institute of Environmental Health Sciences. 2002. EMF *Electric and Magnetic Fields Associated with the Use of Electric Power - Questions & Answers*. June 2002. https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf.

Table 41 International Electric and Magnetic Field Guidelines[297]

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	General Public	Occupational	General Public	Occupational
Institute of Electrical and Electronics Engineers	5	20	9,040	27,100
International Commission on Non-ionizing Radiation Protection	4	8	2,000	4,200
American Conference of Industrial Hygienists	-	25	-	10,000/1,000(1)
National Radiological Protection Board	4	-	830	4,200
(1) For persons with cardiac pacemakers or other medical electronic devices.				

The Commission has established a standard that limits the maximum electric field under transmission lines to 8 kV/m. All transmission lines in Minnesota must meet this standard. The Commission has not adopted a magnetic field standard for transmission lines. The Commission has, however, adopted a prudent avoidance approach in routing transmission lines and, on a case-by-case basis, considers mitigation strategies for minimizing EMF exposure levels associated with transmission lines.

Some public health scientists have questioned whether state and international EMF guidelines sufficiently protect public health. These scientists have urged state utility commissions to be more rigorous in applying a precautionary or prudent avoidance approach. Dr. David Carpenter, a public health physician at the University of Albany, and Cindy Sage, an EMF researcher, note that there is "strong scientific evidence that exposure to magnetic fields from power lines greater than 4 mG is associated with an elevated risk of childhood leukemia"[298].

They conclude that the evidence for effects on human health from ELF-EMF is strong enough to merit regulatory action to reduce EMF exposure levels. They suggest that "such a reduction could be achieved by setting EMF exposure goals that are lower than levels known to be associated with disease, understanding that these exposure goals are significantly lower than many current exposures." Dr. Carpenter and Ms. Sage, in collaboration with other public health researchers, have also authored the *BioInitiative Report*, which argues for a more proactive application of a precautionary approach to radio frequency and ELF-EMF.[299]

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[297] International Commission on Non-ionizing Radiation Protection. 2010. *Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz – 100 kHz)*. Health Physics. Vol. 99, 6, pp. 818-836. https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf

[298] Carpenter, D. O. and Sage, C. *Setting prudent public health policy for electromagnetic field exposures*. Reviews of Environmental Health. 2008, Vol. 23, 2, pp. 91-117.

[299] BioInitiative Working Group. 2012. *A Rationale for Biologically-based Exposure Standards for Low-Intensity Electromagnetic Radiation*. Prepared for BioInitiative Working Group. 2007. https://bioinitiative.org/

For the Brookings County to Hampton 345 kV transmission line project (Commission docket number TL-08-1474), Dr. Carpenter testified before the Commission on behalf of a party which argued that magnetic field levels for that project would exceed safe exposure levels. Testimony was provided in opposition to Dr. Carpenter's opinion by Dr. Peter Valberg. After examining and weighing the competing testimony of Drs. Carpenter and Valberg, the administrative law judge and, ultimately, the Commission, determined that the state's current exposure standard for ELF- EMF (an electric field standard of 8 kV/m) is adequately protective of human health and safety.

6.6.1.4 Potential Impacts

Based on the predicted EMF levels for the project, no adverse health impacts from electric or magnetic fields are anticipated for persons living or working near the project. The applicant has modeled and calculated electric and magnetic fields for the project, reflecting structure configurations that may be used for the project and two electrical loading scenarios.

Predicted Electric Fields

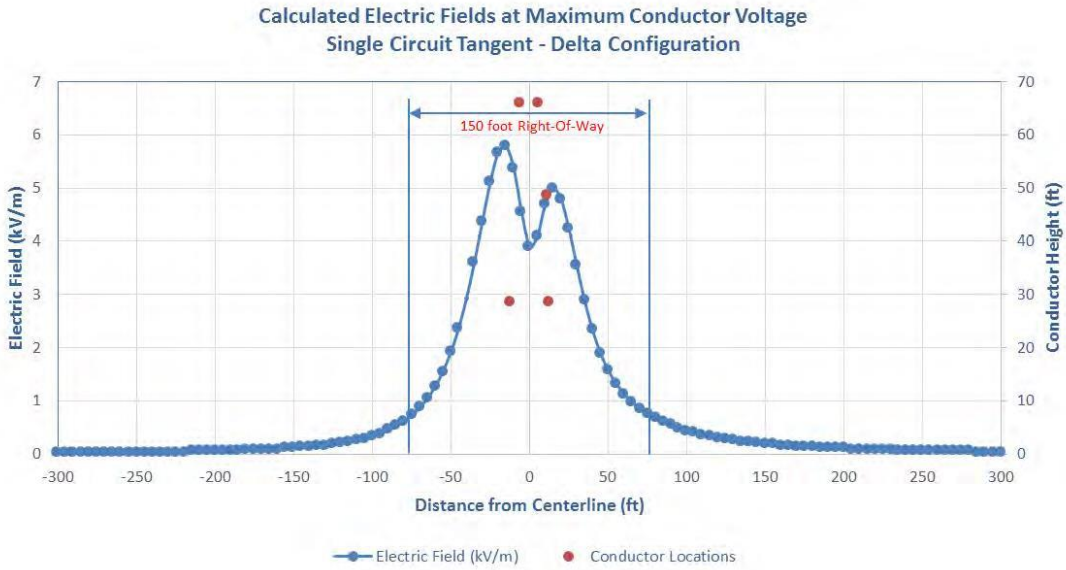
Predicted maximum electric fields for the project vary by structure type, but in all cases are anticipated to be less than the Commission's 8 kV/m standard (Table 42). The project's maximum predicted electric field, modeled at 1 meter above ground, is 5.17 kV/m and occurs at a distance of 25 feet from the centerline (Delta Configuration). The strength of the electric fields diminishes rapidly as the distance from the conductor increases.

Table 42. Predicted Electric Fields for Structure Types and Configurations (kV/m)[300]

Structure Type	Max. Conductor Voltage	Distance to Proposed Centerline (in feet)												
		-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
Single Pole Delta Tangent (0°-2°) 345 kV	379.5 kV	0.03	0.06	0.33	0.71	1.90	5.17	3.96	4.30	1.58	0.78	0.45	0.11	0.04
Single Pole Vertical Tangent (0°-2°) 345 kV	379.5 kV	0.04	0.08	0.15	0.14	0.12	1.1	4.8	4.6	1.0	0.08	0.2	0.1	0.05

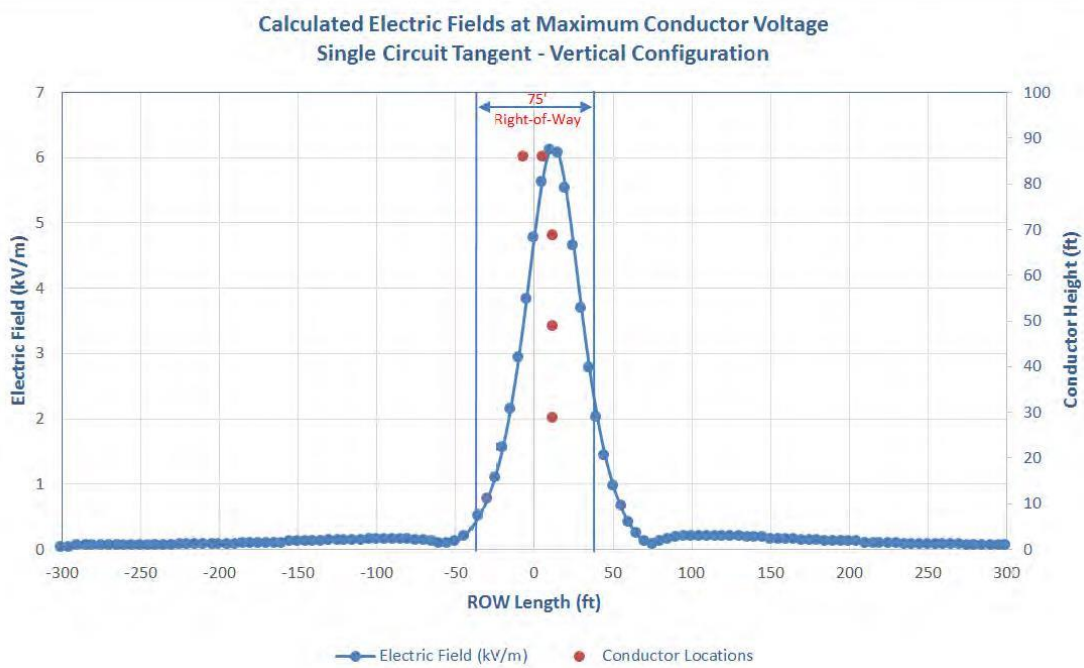
[300] *Route Permit Application*, at p. 92

Figure 19. Predicted Electric Field Delta Configuration



Maximum predicted electric fields for a Vertical configuration is 4.8 kV/m and occurs directly underneath the centerline.

Figure 20. Predicted Electric Field - Vertical Configuration



Predicted Magnetic Fields

Predicted magnetic field levels depend on anticipated currents (amps) on the transmission line, which in turn depend on the electrical load served by the line. The larger the expected current flow, the higher the predicted magnetic field.

The project's maximum predicted magnetic field, modeled at 1 meter above ground, is shown in **Table 43**.

Table 43. Predicted Magnetic Fields for Structure Types and Configurations (mG)[301]

Structure Type	System Condition	Current (Amps)	Distance to Proposed Centerline (in feet)												
			-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
Single Pole Delta Tangent	Normal	284.5	2.0	4.4	16.5	27.7	53.8	120	177	107	45	25	15.5	4.3	1.9
Single Pole Vertical Tangent	Normal	248.5	2.3	4.8	15.1	22.7	37.4	67.5	124	123	66	36.8	22.5	6.0	2.6

With a Delta Configuration, the maximum predicted magnetic field (177mG) would occur directly under the centerline (**Figure 21**) . Because magnetic field strength drops off exponentially with distance, predicted field strength levels fall below 28 mG at the edge of the transmission line ROW and below 5 mG by 200 feet from the centerline.

Maximum predicted magnetic field for a Vertical configuration is 124 mG and also occurs directly underneath the centerline (**Figure 22**). Because magnetic field strength drops off exponentially with distance, predicted field strength levels fall below 37 mG at the edge of the transmission line ROW and below 10 mG by 200 feet from the centerline.

[301] *Route Permit Application*, at pp. 93-94.

Figure 21. Predicted Magnetic Fields - Delta Configuration

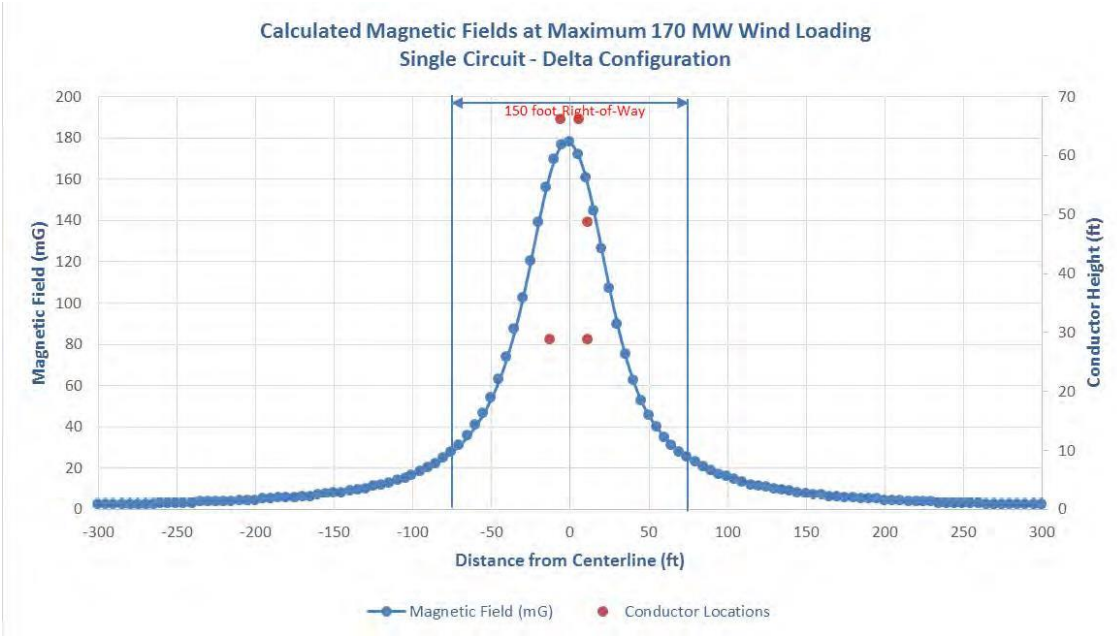
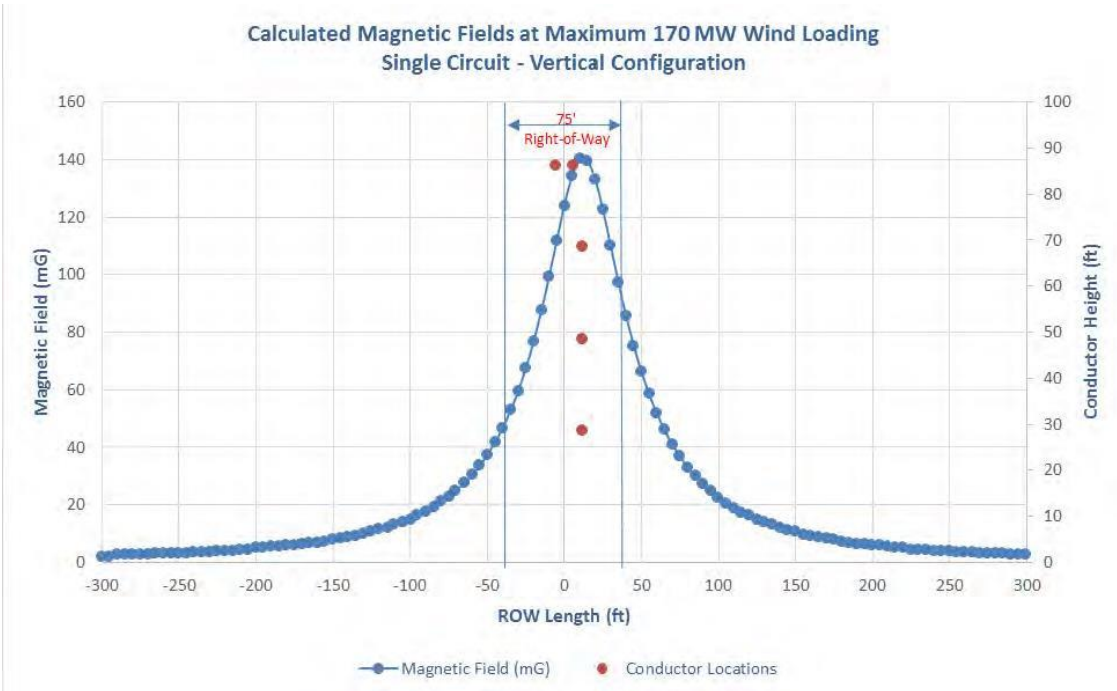


Figure 22. Predicted Magnetic Fields - Vertical Configuration



6.6.1.5 Mitigation

No adverse health effects from EMF are anticipated for the project. However, consistent with the Commission's prudent avoidance approach to EMF impacts, basic mitigation measures to minimize

EMF exposure levels warrant consideration. Such strategies are discussed below. These strategies are discussed individually, but in some instances or for specific sections of a route, they could be combined.

Distance

EMF levels decrease with distance from a conductor. Thus, EMF exposure levels could be reduced by selecting a route away from residences and from other places where people congregate. Distances and numbers of residences along the routing alternatives for the transmission project are discussed further in Section 6.5.1.

A second means of increasing distance is to use taller structures, which, by placing conductors at a greater height, reduce EMF levels at or near ground level. The 80- to 140-foot above grade, monopole structures proposed for the transmission project help reduce ground level electric and magnetic field strength.

Phase Cancellation

EMF levels could be reduced by a phenomenon known as phase cancellation. Electrical power is generally transmitted along three parallel conductors, each carrying a single phase of the power being transmitted. The closer these phases/conductors are to each other, the lower the magnetic fields produced. In other words, when the magnetic fields of the individual conductors are close together, they tend to cancel each other out. The conductors can be phased within a circuit so that the EMF emitted by each can partially cancel the others; or if more lines are present on the ROW, their conductors can be phased as well to allow for additional EMF cancelling. Often times, if a new line is constructed on an existing ROW, it can be phased to allow for a lower EMF post construction. Phasing will sometimes create a higher peak EMF near the center of the ROW with a lower EMF at the ROW edge; however, the edge is typically the location subject to regulatory requirements.

There are limits, however, on how close together conductors can be placed. The distance between conductors must meet National Electrical Safety Code (NESC) clearances, and there must be sufficient clearance to ensure the safety of utility workers. Placing conductors closer together would also require more transmission line structures per mile to better control conductor blowout and sag.

Another option is to alter the configuration of the line. The location of the conductors and shield-wires within the circuit can have a significant effect on EMF. For example, a vertical line has conductors higher than a horizontal line reducing their effective EMF at ground level; and a delta configuration will have a similar effect. A reduction in phase spacing generally correlates directly to a reduction in magnetic field, so the location and quantity of shieldwires can also affect EMF. Hardware modifications, like the addition of V-strings that may move the conductors up and closer to the center of the ROW, can have similar effects.

In certain circumstances, it may be appropriate to install a passive shield line to reduce EMF on an existing circuit. The passive shield line is a 'dummy' line that emits EMF, which directly opposes the EMF of the transmission lines. The 'dummy' line would be a short line that forms a closed loop under each side of the transmission line of concern. Using the current induced by the magnetic field of the transmission line, it emits its own magnetic field and can be designed and phased to effectively cancel out the existing EMF. However, modifications can be visually unappealing, and would increase line losses.

Undergrounding

Placing a transmission line underground could reduce EMF exposure levels. Electric fields are reduced by the underground facilities and earth covering. Magnetic fields are not reduced by covering materials, but could be attenuated by phase cancellation because underground conductors are placed closer together than overhead conductors. Though a possible EMF mitigation measure, undergrounding high-voltage transmission lines is generally not feasible for cost and reliability reasons.

Double-Circuiting

Instead of placing one circuit (three conductors) on a transmission line structure, two circuits (six conductors) could be placed on each structure. The benefit of double-circuiting is that the phases of the two circuits could be arranged such that their magnetic fields cancel each other out, thereby reducing the net magnetic field. As discussed in Section **4.2.2**, double-circuiting is not feasible for this transmission line.

6.6.2 Implantable Medical Devices

Electromechanical implantable medical devices, such as cardiac pacemakers, implantable cardioverter defibrillators (ICDs), neurostimulators, and insulin pumps may be subject to interference from electric and magnetic fields, which could mistakenly trigger a device or inhibit it from responding appropriately.

ICD manufacturers' recommended threshold for modulated magnetic fields is one gauss. Since one gauss is five to 10 times greater than the magnetic field likely to be produced by a high-voltage transmission line,[302] research has focused on electric field impacts. A 2004 Electric Power Research Institute report states that sensitivity to electric fields was reported at levels ranging upwards from 1.5 kV/m, particularly for older (unipolar) pacemakers; some modern (bipolar) units are immune at 20

[302] Public Service Commission of Wisconsin. 2013. *Environmental Impacts of Transmission Lines*. https://psc.wi.gov/Documents/Brochures/Enviromental%20Impacts%20TL.pdf

kV/m. Medtronic and Guidant, manufacturers of various implantable medical devices, have indicated that electric fields below 6.0 kV/m are unlikely to affect most of their devices.[303]

Scholten conducted a theoretical study evaluating the risk for a patient with a unipolar cardiac pacemaker under worst case and real life conditions under a high- voltage transmission line.[304] This study concluded that a life threatening situation for cardiac pacemaker patients beneath high-voltage transmission lines is very unlikely; however, an interference between the implant and the electromagnetic fields cannot be excluded. Definitive conclusions about the real risk can be drawn only by conducting additional studies with pacemaker patients.

The maximum predicted electric field strength for the project is 5.17 kV/m (Table 42). This field strength is below the 6.0 kV/m interaction level for modern, bipolar pacemakers, but abovethe 1.5 kV/m interaction levels for older, unipolar pacemakers. Electric field levels decrease with distance, however, and maximum levels at the edge of the ROW are anticipated to be less than 1 kV/m. Accordingly, impacts to implantable medical devices and their users are anticipated to be minimal.

In the event that a cardiac device is affected, the effect is typically a temporary asynchronous pacing (i.e., fixed-rate pacing), and the device returns to its normal operation when the person moves away from the source of the electric field.[305] Therefore, no adverse health impacts or permanent impacts to implantable medical devices are anticipated as a result of operation of the transmission line project.

6.6.3 Stray Voltage

Electrical systems that deliver power to end-users and electrical systems within the end-user's business, home, farm, or other buildings are grounded to the earth for safety and reliability reasons. The grounding of these electrical systems results in a small amount of current flow through the earth.

Stray voltage (also referred to as neutral-to-earth voltage) could arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, or from faulty wiring or faulty grounding of conducting objects in a facility. Thus, stray voltage could exist at any business, house, or farm which uses electricity— independent of whether there is a transmission line nearby.

6.6.3.1 Potential Impacts and Mitigation

Stray voltage is, generally, an issue associated with electrical distribution lines and electrical service at a residence or on a farm. The potential for stray voltage impacts related to the wind farm is discussed in Sections 3.3.6 and 3.3.9. Transmission lines do not create stray voltage as they do not directly

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[303] Electric Power Research Institute. 2004. *Electromagnetic Interference with Implanted Medical Devices*.
[304] Scholten, A., Joosten, S. and Silny, J. 2005. *Unipolar cardiac pacemakers in electromagnetic fields of high voltage overhead lines*. Journal of Medical Engineering & Technology, Vol. 29, 4, pp. 170-175.
[305] Public Service Commission of Wisconsin. 2013. *Environmental Impacts of Transmission Lines*. https://psc.wi.gov/Documents/Brochures/Enviromental%20Impacts%20TL.pdf

connect to businesses, residences, or farms. The project is a 345 kV transmission line that would not directly connect to businesses or residences in the area and would not change local electrical service. Accordingly, no impacts due to stray voltage are anticipated from the project.

However, for purposes of stray voltage, transmission lines may not be completely independent of locally distributed electrical service. Where transmission lines parallel distribution lines, they can, in the immediate area of the paralleling, cause current to flow on these lines (additional current, as the distribution lines already carry current). For properly wired and grounded distribution lines and electrical service, these additional currents are of no consequence. However, for distribution lines and electrical services that are not properly wired and grounded, these additional currents could create stray voltage impacts.

Depending on the route selected for the project, the 345 kV line could parallel existing distribution lines. If a distribution line is paralleled, this arrangement could create additional currents on the distribution line in the immediate area of the paralleling. These currents are not anticipated to cause any stray voltage issues in the project area. If, however, there is not proper grounding or wiring on the distribution system or at a nearby residence, business, or farm, these currents could point out this insufficiency.

In those instances where transmission lines could induce currents on inadequately grounded distribution circuits, mitigation measures for stray voltage may be required. These mitigation measures tend to be site-specific, but could include phase cancellation, transmission-to- distribution separation, isolation of the end-user neutral, and improved grounding.

6.6.4 Induced Voltage

The electric field from a transmission line could extend to a conductive (metal) object in close proximity to the line, such as a vehicle or a fence. This may induce a voltage on the object. The magnitude of this voltage depends on several factors including the object shape, size, orientation, and location along the ROW.

If the objects upon which a voltage is induced are insulated or semi-insulated from the ground and a person touches them, a small current would pass through the person's body to the ground. This might be accompanied by a spark discharge and mild shock, similar to what could occur when a person walks across a carpet and touches a grounded object or another person.

The primary concern with induced voltage is the current flow (amps) through a person to the ground. Most shocks from induced current are considered more of a nuisance than a danger, but to ensure the safety of persons in proximity to a transmission line, the NESC requires that any discharge be less than 5 milliamps. In addition, the Commission's electric field limit of 8 kV/m is designed to prevent serious hazard from shocks due to induced voltage under transmission lines. Route permits issued by the Commission require that transmission lines be constructed and operated to meet NESC standards and the Commission's electric field limit.

6.6.4.1 Mitigation

Grounding of metal objects under a transmission line is the best method of meeting the NESC's and Commission's standards and avoiding electrical shocks. Route permits issued by the Commission require permittees to ground all stationary metallic objects in or near the transmission line ROW.

Thus, for objects that the permittee can ensure are effectively grounded (i.e., stationary objects), no impacts due to inducted voltage are anticipated from the project. However, for metallic objects where effective grounding is more difficult to achieve (e.g., machinery that is movable and operated directly under a transmission line) impacts could occur, such as a mild shock. Such impacts could occur only if a person was standing on the ground and touching the machinery while directly under a transmission line. The primary means of mitigating this potential impact is to avoid exiting and entering machinery directly under a line.

6.6.5 Air Quality

The air quality in Minnesota is generally good and, for most pollutants, has been improving. Minnesota has been in compliance with all national ambient air quality standards since 2002. Air quality trends in the project area mirror those in the state overall, with air quality generally improving over the last several years.[306]

Potential air quality impacts associated with the transmission project come from two primary sources:

- ozone and nitrogen oxide (NOX) emissions from operating the facility and
- short-term emissions from construction activities.

Ionization of air molecules surrounding the conductor (corona effect) produces a small amount of ozone and NOX, both of which are reactive compounds that contribute to smog and could adversely affect human and animal respiratory systems, crops, vegetation, and buildings. Because of their detrimental effects, air concentrations of these compounds are regulated by both the EPA and the MPCA. The state of Minnesota has an ozone limit of 0.07 parts per million (ppm) (Minnesota Rules, part 7009.0080), which matches the federal ozone limit of 0.07 ppm (8-hour limit).307 Because the total emissions of ozone and NOX from operating a transmission line are very small, the transmission project is not expected to create any potential for concentrations of ozone that might exceed these standards.

Air emissions during construction would primarily consist of emissions from construction equipment and would include carbon dioxide, NOX, and particulate matter (PM); dust generated from earth

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[306] MPCA. 2013. *Minnesota Air Quality Index Trends: 2003-2013.* https://www.pca.state.mn.us/sites/default/files/aq1-46.pdf.
[307] MPCA**.** *Ozone standard in Minnesota*. https://www.pca.state.mn.us/air/ozone-standard-minnesota

disturbing activities would also give rise to PM. Emissions would be dependent upon weather conditions, the amount of equipment at any specific location, and the period of operation required for construction at that location. Any emissions from construction would be similar to those from agricultural activities common in the project area and would only occur for short periods of time in localized areas.

Emissions from operating the proposed line are anticipated to have negligible impacts on air quality. Minor short-term air quality impacts from construction could be mitigated by equipping construction equipment with appropriate mufflers, using a water truck to reduce dust, and promptly reseeding areas of disturbed vegetation. Emissions of dust and PM can also be reduced by reducing the speed of truck traffic on unpaved roads and by covering open- bodied haul trucks.

6.7 Land Based Economies

Transmission lines have the potential to impact land-based economies. Transmission line structures are a physical long-term presence on the landscape. This presence can prevent or otherwise limit use of the landscape for other purposes – e.g., agriculture, forestry, and mining. Transmission line structures have a relatively small footprint, yet they can interfere with farming and mining operations. Tall-growing trees are generally not allowed in transmission line rights-of-way. This limitation can create impacts for forestry operations.

Impacts to land-based economies due to the transmission project are anticipated to be minimal. Impacts to agriculture are anticipated to be minimal. Impacts are minimized by route A, as compared with route B, and are further minimized by use of the McNeilus wind farm alignment alternative. Impacts to forestry, mining, and recreation and tourism are anticipated to be minimal.

6.7.1 Agriculture

Agriculture is the primary land-based economic resource in the project area (see maps in **Appendix E**). Approximately 80 percent of the land in Dodge County and 62 percent of the land in Olmsted County is used for agriculture.[308] Principal crops in the project area include corn, soybeans, and wheat.[309] Farmers in the area also raise livestock, including cattle and hogs.

Potential impacts to agriculture due to the transmission project fall into two categories:

- **Temporary impacts**: Caused by construction activities and limited to the duration of construction. These activities could limit the use of fields or could affect crops and soil by compacting soil, generating dust, damaging crops or drain tile, or causing erosion. Project construction activities would typically be limited to the transmission line ROW.

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[308] *Route Permit Application*, Section 5.6.1.

[309] Ibid.

- **Permanent agricultural impacts:** Caused by the physical presence of transmission line structures in crop, pasture, and other agricultural lands. Foundations for transmission line structures will be 6 to 12 feet in diameter, resulting in a footprint of 29 to 113 square feet per structure.[310] The footprint of the transmission line structures is land that cannot be used for agricultural production. This footprint negatively impacts farm income and property values. However, more than the footprint itself, structures can impede the use of farm equipment and can significantly limit management options for agricultural operations. Each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields. Structures may require extra time and resources for the management of weeds.

Impacts to agricultural operations could be mitigated by prudent routing—i.e., by selecting routes that avoid agricultural fields by following existing rights-of-way, field lines, and property lines. Impacts to agricultural operations could also be mitigated by limiting temporary construction impacts and ensuring that any impacts (e.g soil compaction or damage to drain tile) are promptly remediated.

The applicant indicates that it will work with landowners to avoid and minimize agricultural impacts by identifying drain tile and other features that need to be avoided during construction. The applicant notes that it will work with landowners to remediate soil compaction and restore agricultural lands.[311] Commission route permits require permittees to compensate landowners for damage to crops and drain tile (**Appendix C**).

6.7.1.1 Livestock Production

Cattle and hog farms are located in the project area.[312] These livestock operations could be temporarily affected during construction (e.g., disturbances to livestock due to construction noise). These temporary impacts could be mitigated through coordination with livestock farmers such that noise, disease, and other possible impacts are properly addressed.

Though no stray voltage impacts are anticipated as a result of the transmission project, stray voltage could be of concern to livestock farmers, particularly on dairy farms, due to its potential impacts on milk production and quality (**Section 3.3.9**). Induced voltage may be of concern to livestock farmers with buildings near a transmission line. These buildings may require grounding of their metal components to avoid induced voltages. No impacts due to induced voltage are anticipated from the project if effective grounding is implemented.

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[310] Ibid.
[311] Ibid.
[312] Ibid.

6.7.1.2 Aerial Spraying

There are aerial spraying businesses that operate in the project area. These businesses apply agricultural products to fields in project area, e.g., fertilizers, pesticides. Based on scoping comments, there are approximately four aerial spraying businesses in the project area.[313]

Transmission line structures could hinder aerial applications of agricultural products. Structures could limit the ability of aerial applicators to reach specific fields or portions of fields by limiting those areas where applicators can safely fly. Structures could also affect the coverage and effectiveness of aerial spraying. The potential impacts of tall structures to aerial spraying are discussed in greater detail in Section 3.3.7.1.

Potential impacts to agriculture production from the transmission line are anticipated to be minimal. The line could impact aerial spraying of crops and fields. However, agricultural products need not be aerially applied; they can be applied on land by using a tractor and sprayer. Applications of many agricultural products need are time-sensitive. For land applications, timeliness may depend on weather and soil conditions. Impacts on agricultural production are also anticipated to be minimal because impacts on aerial spraying due to the transmission line are anticipated to be limited. That is, transmission lines do present a safety concern for aerial aviators; however, transmission lines are generally arranged in a linear, stepwise fashion on the landscape. This arrangement typically allows aerial spraying to be safely conducted in at least one direction, either north-south or east-west. There may be specific fields or parts of fields where both directions are precluded. Additionally, the direction that is not precluded may not be the most economical approach for aerially spraying the field.

Potential impacts to aerial spraying businesses as a result of the transmission project are anticipated to be minimal to moderate. The transmission line may make it uneconomical or infeasible to aerially spray select fields. This would result in a loss of income for aerial spraying businesses.

Potential impacts to agricultural production and to aerial spraying businesses could be mitigated by selecting routes that follow existing infrastructure ROW, e.g., existing transmission lines, existing roadways.

6.7.1.3 Precision Faming Systems

Precision farming involves the use of global positioning systems (GPS) to guide farming equipment. One of the most precise types of GPS systems is known as real-time kinematic GPS (RTK GPS). Precision farming minimizes the potential for waste from, for example, duplicate row seeding or overlap in fertilizer or pesticide application.

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[313] Comment Letter of Mr. Ryan Lubben, Written Public Scoping Comments E-L, eDockets Number 201812-148342-09.

Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming in two ways:

- electromagnetic noise from a transmission line could potentially interfere with the frequencies used for RTK and standard GPS signals, and
- transmission line structures could cause line-of-site obstructions or create multi-path reflections such that sending and receiving of signals would be compromised.

Interference could occur where the spectrum of transmission line electromagnetic noise overlaps the frequency spectrum used by RTK or standard GPS systems. As discussed previously (Section 6.5.8), electromagnetic noise associated with transmission line conductors occurs from about 0.1 to 50 MHz. RTK GPS and standard GPS utilize relatively higher frequency ranges (greater than 300 MHz); thus, transmission line electromagnetic noise from the project is not anticipated to affect precision farming systems.

Interference due to line-of-sight obstruction or multi-path reflection could occur in two ways:

- obstruction of, or other reflection interference with, a GPS satellite signal, and
- obstruction of radio transmissions from an RTK base station to a mobile receiving unit.

GPS uses information from multiple satellite signals to determine specific locations. Interference with one signal would not cause inaccurate navigation; however, simultaneous interference with two signals could lead to inaccurate navigation. Because simultaneous interference with two signals is relatively unlikely and any line-of-sight obstruction would be resolved with movement of the GPS receiver, line-of-sight obstruction impacts to precision farming systems are anticipated to be minimal and temporary.

A transmission line structure located very near an RTK base station could cause a line-of-sight obstruction in the signal from a base station. A transmission line structure near an RTK base station (within 100 feet) could also cause multi-path reflections that interfere in the signal from a base station. Multi-path reflections can also be caused by other structures and landscape features including homes, trees, sheds, and sudden changes in ground elevation. Prudent placement of structures and prudent location (or relocation) of the base station likely would mitigate this potential impact.

If interference with electronic devices, including precision farming systems, does occur and is caused by the presence or operation of the transmission line, route permits issued by the Commission require permittees to take actions which are feasible to restore proper operation of these devices to pre-project quality (Appendix C).

Routes A and B

The primary land use in the project area is agriculture. As a result, routes A and B each contain several hundred acres of agricultural land within their rights-of-way (Table 44). Due to its longer length, Route B crosses more agricultural land (341 acres) than Route A (276 acres).

Table 44. Agricultural Land Impacts - Routes A and B

Agricultural Resource	Routes	
	A	B
Agricultural land within right-of-way (acres)	276	341
Number of transmission line structures in agricultural land	156	170

Route B also places relatively more transmission line structures in agricultural land (170) than route A (156). Thus, Route A best minimizes agricultural impacts of the project.

McNeilus Wind Farm Alignment Alternative

The McNeilus alternative crosses more agricultural land than the complementary section of Route A (Table 45). However, the alternative places about half as many transmission line structures in agricultural land as Route A. This apparent inconsistency is explained by the fact that Route A, as it proceeds along 680th St., must use a relatively shorter span between transmission line structures in order to maintain a transmission line ROW that fits within the road ROW. In contrast, the McNeilus alternative is able to use relatively longer spans, proceeding cross country. Thus, on whole, the McNeilus Wind Farm alignment alternative best minimizes agricultural impacts in this area of the project.

Table 45. Agricultural Land Impacts – McNeilus Wind Farm Alignment Alternatives

Agricultural Resource	Routing Options	
	A	McNeilus Wind Farm Alignment
Agricultural land within right-of-way (acres)	64.2	89.5
Number of transmission line structures in agricultural land	75	36

Salem Creek Routing Options

In this area of the project, Route B with the Crossover Segment (B-Crossover) crosses substantially more agricultural land than either Route A as originally proposed or Route A with the Salem Creek alignment alternative (Table 46). Route A as originally proposed crosses the least amount of agricultural land and places the fewest number of transmission line structures in agricultural land. Thus, Route A best minimizes agricultural impacts in this area of the project.

Table 46. Agricutlural Land Impacts – Salem Creek Routing Alternatives

Agricultural Resource	Routing Options		
	Route A	Route A with Salem Creek	Route B with Crossover
Agricultural land within right-of-way (acres)	27.5	33.8	84.6
Number of transmission line structures in agricultural land	11	13	26

Byron Routing Alternatives

In this area of the project, the Crossover segment with route B (Crossover-B) crosses slightly less agricultural land than the complementary sections of Route A or Route B with the West 270th Ave. alignment alternative (Table 47). Crossover-B also places the fewest number of transmission line structures in agricultural land. Thus, Crossover-B best minimizes agricultural impacts in this area of the project.

Table 47. Agricultural Land Impacts - Byron Area Routing Alternatives

Agricultural Resource	Routing Options		
	Route A	Crossover–Route B	Route B – West 270th Ave.
Agricultural land within right-of-way (acres)	83.4	70.0	84.6
Number of transmission line structures in agricultural land	34	28	32

6.7.2 Forestry

There are few forested areas in the project area (see Appendix E). These areas mostly occur near watercourses, e.g., Salem Creek. Additionally, a few small woodlots and shelterbelts are located adjacent to farmsteads. There are no known tree farms, timber plots, or other commercial forestry operations in the project area. Accordingly, no impacts to forestry resources or operations are anticipated as a result of the project.

6.7.3 Mining

Mineral resources are resources that have a concentration or occurrence of natural, solid, inorganic, or fossilized organic material in such form, quantity, grade, and quality that it has reasonable prospects for commercial extraction.

Existing mines could be negatively impacted by transmission line structures if the structures interfere with access to minerals or the ability to remove them. To the extent there are potentially recoverable mineral resources in the project area, construction of the project could limit the ability to successfully

mine these reserves, depending on the route selected for the project and the location of these reserves.

Mining does not comprise a major industry in the project area; however, there are several aggregate mining sites in the project area (**Appendix E**). None of these sites is within the ROW of a routing option. Thus, no impacts to existing aggregate mining operations in the project area are anticipated as a result of the project. Potential impacts can be mitigated by prudent routing, including placement of the alignment and specific structures to avoid mining operations and aggregate reserves.

6.7.4 Recreation and Tourism

Recreation in the project area consists primarily of outdoor recreational opportunities, such as hiking, fishing, camping, and snowmobiling. Dodge County has four recreational parks with a campsite at Creek Park. Olmsted County has two campsites, several parks, and the Zollman Zoo. Both counties have hiking trails; Olmsted County also has cross-country skiing trails. There are two snowmobile trails in the project area – the Kasson-Mantorville trails and the Dodge County trails (**Appendix E**).[314]

There are two wildlife management areas (WMAs) in the project area – the Bud Jensen WMA and the Tri-cooperative WMA (**Appendix E**). These WMAs offer opportunities for wildlife watching.

In addition to outdoor recreation, there are a number of community events in the project area for residents and visitors alike, including the Dodge Center Harvest Fest and the Zumbro Bend Rendezvous.[315]

Impacts on recreation and tourism due to construction of the transmission project are anticipated to be minimal and temporary in nature. Short-term disturbances, such as increased noise and dust, could detract from nearby recreational activities and could, depending on the timing, affect hunting by temporarily displacing wildlife. Wildlife, however, is expected to return to the area once construction has been completed.

Once constructed, the transmission project itself could impact aesthetics in the project area or at a specific recreational feature such that recreation would be less enjoyable for the average person. These long-term impacts to recreation and tourism are anticipated to be minimal. Persons using snowmobile trails in the project area may experience aesthetic impacts due to the proximity of transmission line structures. The applicant indicates that it will coordinate with snowmobile clubs regarding the placement of structures near snowmobile trails and the timing for their construction.[316] The primary means of mitigating potential impacts is through prudent routing—i.e., selecting routes away from recreational resources.

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[314] *Route Permit Application*, Section 5.5.8
[315] Ibid., at Section 5.6.3
[316] Ibid., at Section 5.5.8

6.8 Archaeological and Historic Resources

Cultural resources, including archaeological and historic artifacts and features, contribute to the record of human occupation and alteration of the landscape. Archaeological resources include historic and prehistoric artifacts, structural ruins or earthworks and are often partially or completely below ground. Historic resources include extant structures, such as building and bridges, as well as districts and landscapes. No known Traditional Cultural Properties (TCPs), historic or cultural resources that reflect a cultural or religious importance, have been identified within the project area; therefore, TCPs are not discussed further in this EIS.

6.8.1 Potential Impacts and Mitigation

Transmission lines have the potential to impact archaeological and historic resources. Archaeological resources could be impacted by the disruption or removal of such resources during the construction of a line. Historic resources could be impacted by the placement of a line in a manner that impairs or decreases the historic value of the resource.

In Minnesota, there are three primary laws regarding the protection of archaeological and historic resources:

- **Minnesota Historic Sites Act.** This act establishes the State Historic Sites Network and the State Register of Historic Places, and requires that state agencies consult with the Minnesota Historical Society before undertaking or licensing projects that may affect properties on the network or on the State or National Registers of Historic Places (Minnesota Statutes, section 138.661-138.669).
- **Minnesota Field Archaeology Act.** This act establishes the office of the State Archaeologist; requires licenses to engage in archaeology on nonfederal public land; establishes ownership, custody and use of objects and data recovered during survey; and requires state agencies to submit development plans to the State Archaeologist, the Minnesota Historical Society and the Minnesota Indian Affairs Council for review when there are known or suspected archaeological sites in the area (Minnesota Statutes, section 138.31-138.42).
- **Minnesota Private Cemeteries Act.** A portion of this legislation protects all human burials or skeletal remains on public or private land (Minnesota Statutes, section 307.08).

At a federal level, compliance with Section 106 of the National Historic Preservation Act (NHPA) is required for all projects under federal jurisdiction. The purpose of Section 106 is to compel federal agencies to consider the effects of a project on archaeological and historic resources and applies to resources that are listed on, or eligible for listing on the National Register of Historic Places (NRHP). However, at this time, no National Environmental Policy Act (NEPA) or federal Section 106 nexus has been identified for this project.

The primary means of mitigating impacts to cultural resources is prudent routing, i.e., avoiding known archaeological and history resources. Avoidance of resources may include minor adjustments to the project design and the designation of environmentally sensitive areas that would be left undisturbed

by the project. Impacts can also be avoided by prudent pole placement within a route such that resources are spanned or avoided. If archaeological resources are anticipated or known to exist within a specific part of a route, impacts to these resources can typically be mitigated by measures developed in consultation with the Minnesota State Historic Preservation Office (SHPO) prior to construction, and by training of construction workers in the recognition and managing of archaeological resources.

DCW will prepare an unanticipated discoveries plan that will identify measures to mitigate impacts in the even that unanticipated archaeological or historic resources are discovered during. In addition, if human remains or suspected burial sites are discovered during construction, the State Archaeologist would be contacted and construction would cease at the location until DCW and the State Archaeologist have developed adequate mitigation measures as per Minnesota Statutes, section 307.08.

To determine potential impacts on cultural resources, known archaeological and historic sites in the project area were identified by the Applicant through a search of agency records. The SHPO maintains records of known archaeological and historic resources in the state. These resources are typically identified through surveys conducted for projects that require compliance with Section 106 of the NHPA, or through state sponsored research initiatives.

Because transmission lines can affect the visual character and value of cultural resources nearby, the search identified historic resources within one mile of the potential routes. Cultural resources that could be directly affected through construction-related disruption or removal were evaluated by searching records for resources located within 75 feet of the anticipated alignment.

6.8.1.1 Routes A and B

There are no NRHP listed resources located within one mile of either Route A or Route B. Both routes A and B pass within one mile of several historic resources that have not been evaluated for listing on the NRHP route including the Ashland Town Hall (DO-ASH-002), Canisteo Town Hall (DO-CAN-006), Bridges 89099, 665 and L550 (DO-CAN-11, , the George W. Gleason Farmstead DO-CAN-002, Charles Van Allen House DO-CAN-003 and Jensen Farmstead (OL-SLM-012). In addition to these resources common to both routes, Route A would pass within one mile of Bridges 665 and L550 (DO-CAN-8, DO-CAN-9) and Route B would pass within one mile of a school (DO-CAN-005). The proposed alignments for both routes A and B would cross directly over any of these sites, but would be within the Both the Route A and Route B alignment would cross over Trunk Hwy 56 (Site Number: XX-ROD-022) and U.S. Highway 14 (Site Numbers: XX-ROD-016 and OL-ROD-001). However, these highways are currently traversed by existing distribution and transmission line routes. Therefore, indirect (i.e., visual) impacts to these highways as a result of this project would not be notably different than the current impacts created by existing distribution/transmission line routes.

No known archaeological sites are located within 75 feet of the anticipated alignments of either route A or B. The proposed construction activities for the transmission project, however, have the potential

to encounter unidentified archaeological sites. DCW has indicated that if impacts to cultural resources that appear eligible for listing on NRHP are unavoidable, DCW will consult with the SHPO and/or OSA. In addition, should DCW encounter unidentified archaeological sites during Project construction, DCW will follow an unanticipated discovery plan to address the treatment of these cultural resources, including archaeological sites and possible human remains.

6.8.1.2 The McNeilus Wind Farm Alignment Alternative

With respect to cultural resource impacts, the McNeilus alternative alignment shifts the line north and further away from one of the inventoried historic structures along Route A, the Ashland Town Hall (DO-ASH-002). No known archaeological sites are located within 75 feet of the anticipated alignment of the McNeilus wind farm alignment alternative, however as noted above proposed construction activities for the transmission project have the potential to encounter unidentified archaeological sites and an unanticipated discovery plan will help to address the treatment of any cultural resources discovered during construction.

6.8.1.3 Salem Creek Routing Options

In this area of the transmission project, Route B with the crossover segment (B-Crossover) is near fewer inventoried historic resources. It avoids passing within one mile of a historic home and two historic bridges (Bridge 665 and L550)

Relative to the originally proposed Route A alignment, the Salem Creek alignment alternative does not substantively change potential impacts to cultural resources. It is within one mile of the same historic structures and does not have any known archaeological sites within 75 feet of its anticipated alignment.

6.8.1.4 Byron Routing Options

In this area of the transmission project, Route A is near two fewer inventoried historic structures than either of the route B options. None of the routing options in this area have known archaeological resources within 75 feet of their anticipated alignment.

6.9 Natural Environment

Transmission lines have the potential to impact natural resources through temporary, construction-related impacts and long-term impacts to water resources, flora, and fauna. Construction of the project would temporarily disturb vegetative cover and soils, which could affect water quality in adjacent water resources and could affect habitat for flora and fauna. Avian species could also be impacted by operation of the project through collisions with transmission line structures and conductors.

6.9.1 Surface Waters

Transmission lines have the potential to adversely impact surface waters though construction activities which move, remove, or otherwise handle vegetative cover and soils. Changes in vegetative cover and soils can change runoff and water flow patterns.

Watercourses (rivers, streams, creeks, and drain ditches) are surface water features that consist structurally of a bed and bank, which creates a channel which can have both flowing and non-flowing water or may be dry depending on the time of year and recent precipitation events. Generally, watercourses have permanent inundation, which are fed by surface and/or ground water sources.

Water bodies (lakes, ponds, and larger wetlands) are characterized by a distinct basin area comprising the extent of the feature, and there is not a noticeable flow of water or channel through the water body. Water bodies are generally permanently inundated, but may include areas of exposed substrate when the necessary hydrology to maintain inundation is lacking.

6.9.1.1 Regulation

There are several federal and state laws that regulate watercourses and water bodies. The Clean Water Act (CWA) establishes the structure for regulating the discharge of materials into waters of the United States and for developing water quality standards for surface waters (33 U.S.C. 1344 and 1311et seq). The CWA could potentially regulate several types of activities and their impacts associated with the transmission project.

Watercourses and water bodies may be regulated under both Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 et seq.) and Section 404 of the CWA (33 U.S.C. 1344). The Rivers and Harbors Act regulates activities such as excavating and dredging in, placing structures and materials on, or altering the course of Section 10-designated waterways (33 U.S.C. 403). Section 404 of the CWA prohibits discharge of dredged or fill materials without a permit. It extends to more waterbodies than the Rivers and Harbors Act, namely all waters of the United States, including navigable waters, interstate waters and wetlands (33 CFR 320.1(d); 33 CFR 328.3). The U.S. Army Corps of Engineers (USACE) holds both Section 10 and Section 404 permitting authority.

Many activities regulated under either Section 10 or Section 404 must obtain a state Section 401 water quality certification to ensure that the project would comply with state water quality standards. Section 401 of the CWA is administered by the EPA; in Minnesota, the EPA has delegated Section 401 certification to MPCA.

Section 303(d) of the CWA requires states to monitor and assess their waters to determine if they meet water quality standards and, thereby, support the beneficial uses they are intended to provide. Waters that do not meet their designated uses because of water quality standard violations are listed as impaired. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters, which are described and listed as impaired.

Some watercourses and water bodies within the project area are designated as public waters and are listed in the public waters inventory (PWI) by the State of Minnesota. The statutory definition of a public water is found in Minnesota Statute, section 103G.005, subdivision 15 and 15a. These water resources are under the jurisdiction of the DNR, and a DNR license to cross public waters is required when an activity would cross or change or diminish the course, current or cross section of public waters by any means, including filling, excavating, or placing of materials in or on the beds of public waters.

Section 303 of the CWA requires all states to identify and designate water bodies that have pollution levels that exceed established water quality standards. In Minnesota the MPCA is responsible for the designation of impaired waters. Cascade Creek and Salem Creek are impaired water identified in the project area. Cascade Creek is listed as impaired due to excess turbidity, and Salem Creek is considered impaired due to excess fecal coliform bacteria presence. Cascade Creek is crossed by both proposed Route A and Route B, and Salem Creek is crossed by Route B.

6.9.1.2 Potential Impacts and Mitigation

PWI watercourses and waterbodies could potentially be impacted directly by construction equipment entering and being operated within the watercourses or waterbodies. Transmission structures being placed within watercourses or waterbodies would result in direct, permanent impacts. Construction activities in close proximity of PWI watercourses and waterbodies could result in impacts such as, riparian vegetation disturbance, surface erosion, or petroleum based fluid leaks from construction equipment. Impaired waters are particularly vulnerable to erosion and fluid leaks.

Mitigation measures to reduce the potential for impacts to surface waters include:

- Implementation of BMPs to reduce the potential for erosion and sedimentation will minimize construction impacts from the transmission project; prevention of erosion and sedimentation is particularly important to minimize impacts to impaired waters. All of the PWI crossings will require a DNR Permit to Cross, which will be acquired by the Applicant prior to construction. The Permit to Cross conditions and requirements will provide protections which will avoid or minimize impacts to the beds and banks of the PWI watercourses crossed.
- Minimizing removal of riparian vegetation at water crossings.
- Ensuring that construction equipment is kept out of watercourse beds and banks during construction.
- Fueling vehicles away from surface waters.

Routes A and B

The anticipated alignment and ROW for both routes A and B will cross six watercourses identified on the PWI. From west to east:

- One altered, intermittent drainage ditch.

- Two natural and intermittent streams - a tributary to Henslin Creek and a tributary to Salem Creek.
- Three natural perennial streams – Cascade Creek and two tributaries to Salem Creek.

There are no PWI basins present in any of the routes or alternative route segments being considered for the proposed transmission project, so no impacts to PWI basins are anticipated.

McNeilus Wind Farm Alignment Alternative

There would not be a difference in impacts to surface water, as both alternatives in this area (the proposed alignment for Route A and the McNeilus Alternative Alignment) share the same crossing of an intermittent tributary to Salem Creek.

Salem Creek Routing Alternatives

All four routing options in this area (Route A, Route B, Route B with the crossover segment, and Route A with the Salem Creek Alignment Alternative) cross the perennial tributary to Salem Creek and could potentially impact water resources. All routing options would result in the clearing of riparian vegetation at the stream crossing location. However, because of the differences in vegetation at the crossings, the impacts from Route B or Route B with the crossover would be temporary, while Route A or Route A with the Salem Creek Alignment Alternative would result in permanent impacts. Route B or Route B with the crossover segment would minimize impacts to riparian vegetation when compared to Route A and Route A with the Salem Creek Alignment Alternative.

Route B and Route B with the crossover segment would cross the perennial stream at a point where the riparian vegetation is a mixture of grasses, shrubs, and scattered large trees. Route A and Route A with the Salem Creek Alignment Alternative cross the perennial stream at different locations, but the riparian vegetation at both locations appears to be primarily forested habitat. The stream crossings for Route A and Route A with the Salem Creek Alignment Alternative will result in greater tree clearing at the time of construction, which will also mean project operation will have a permanent impact on the riparian vegetation at these two crossing locations.

Byron Routing Options

In this portion of the transmission line project, Route A would cross two PWI watercourses, an unnamed perennial natural watercourse and Cascade Creek. The necessary tree clearing for project construction and operation would permanently impact the riparian vegetation type along the unnamed perennial watercourse. The Cascade Creek crossing looks to be primarily composed of herbaceous riparian vegetation, so the project construction and operation would likely only temporarily impact the riparian vegetation near Cascade Creek. All of the Route B options would minimize impacts to PWI watercourses because no watercourses will be crossed with the Route B options.

6.9.2 Floodplains

Floodplains are flat, or nearly flat, land adjacent to a river or stream that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which includes areas covered by the flood, but which do not experience a strong current. Floodplains prevent flood damage by detaining debris, sediment, water, and ice. The Federal Emergency Management Agency (FEMA) delineates floodplains and determines flood risks in areas susceptible to flooding. The base flood that FEMA uses, known as the 100-year flood, has a one percent chance of occurring during each year.

At the state level, the DNR oversees the administration of the state floodplain management program by promoting and ensuring sound land use development in floodplain areas in order to promote the health and safety of the public, minimize loss of life, and reduce economic losses caused by flood damages. The DNR also oversees the national flood insurance program for the state of Minnesota. Floodplains are also regulated at the local level. Within the project area, Dodge County, Olmsted County, and the cities of Dodge Center and Kasson have designated floodplain zoning districts and associated ordinances. Dodge County's Ordinance prohibits any development that results in the placement of fill within the floodplain district.[317] The routes and segments currently under consideration within Dodge County are not located within any identified flood plains or flood ways. The Olmsted County Zoning Ordinance currently considers utility transmission structures as a permitted uses for floodway and floodplain districts.[318] The City of Kasson Code of Ordinance identifies utility transmission lines as a conditional use within the flood way district.[319]

6.9.2.1 Potential Impacts and Mitigation

Route A and Route B both cross designated 100 year flood plain areas. DCW states it will not place any transmission pole structures or substation facilities within any designated 100 year flood plain areas, and will span all designated 100 year flood plains. Construction and maintenance vehicles and equipment may need to access areas designated 100 year flood plain during Project construction and operation, but no vehicles or equipment would be permanently placed within the designated 100 year flood plain.[320]

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[317] Dodge County Zoning Ordinance, Chapter 15 – Flood Plain Overlay District, https://www.co.dodge.mn.us/EnvironmentalServices/Chapter%2015%20Floodplain%2011-13-12.pdf

[318] Olmsted County Zoning Ordinance, Article IX – Flood Plain and Shoreland Districts, https://www.co.olmsted.mn.us/planning/ordinances/cozonord/Documents/ARTICLE%2009_2017.pdf

[319] City of Kasson City Code, Title XV – Land Use, Chapter 153 Floodplain Management, http://library.amlegal.com/nxt/gateway.dll/Minnesota/kasson_mn/cityofkassonminnesotacodeofordinances?f=templates$fn=default.htm$3.0$vid=amlegal:kasson_mn

[320] *Route Permit Application*, at pp. 143 and 199

No impacts to existing flood storage capacities or capabilities of the designated 100 year flood plain of Cascade Creek or Salem Creek are anticipated to occur as a result of this Project, and no mitigation measures are anticipated to be necessary.

6.9.3 Wetlands

Wetlands are areas with hydric (wetland) soils, hydrophilic (water-loving) vegetation, and wetland hydrology (inundated or saturated during much of the growing season). Wetland types include marshes, swamps, bogs, and fens. Wetlands vary widely due to differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors.[321]

Wetlands are important to the health of waterways and communities that are downstream. Wetlands can be one source of hydrology in downstream watercourses and water bodies, detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetland health also has economic impacts because of their key role in fishing, hunting, agriculture, and recreation.

Based on USFWS NWI data, most of the wetlands along the route alternatives (see **Appendix E**) are classified as emergent. Some of the mapped wetlands exist in cultivated fields and may be actively farmed.

There are no known calcareous fens, a rare and distinctive type of wetland dominated by calcium-loving plants, present within one mile of any route alternatives.

6.9.3.1 Regulation of Wetlands

Similar to watercourses and water bodies, some wetlands are protected as USACE-regulated waters of the United States under Section 404 of in the CWA. Under Section 404 of the CWA, a permit from the USACE is required for the discharge of dredged or fill materials into wetlands. As part of the permitting process, wetlands along the entire right-of-way would be identified and delineated by the qualified wetland delineators. For unavoidable impacts, compensatory mitigation is required to replace the loss of wetland, stream, or other aquatic resource functions.

Minnesota has a number of state-level mechanisms protecting wetlands and the benefits they provide. The Minnesota Wetland Conservation Act (WCA)[322] is administered by the BWSR. The WCA's goal of no-net loss of wetlands requires that proposals to drain, fill, or excavate a wetland must first avoid disturbing the wetland, next minimize wetland impacts, and finally replace lost wetland acres, functions, and values. Certain activities are exempt from the WCA, allowing projects with minimal

[321] EPA. Wetlands - Wetland Types. https://www.epa.gov/wetlands/classification-and-types-wetlands#marshes
[322] Minnesota Rules, chapter 8420

impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

A second state-level program that offers protection to the state's waters and wetlands is the PWI program administered by the DNR.[323] The DNR regulates work below the ordinary high water level of PWI wetlands and waters through the public waters work permit program. Examples of work activities addressed by this program include filling, excavation, bridges and culverts, dredging, structures, and other construction activities. There are no PWI wetlands within one mile of all route alternatives under consideration for the transmission project.

6.9.3.2 Potential Impacts and Mitigation

Temporary impacts from the transmission project would include the access of emergent wetlands with construction equipment. Permanent impacts would involve the placement of a pole structure or other project related fill material within a wetland for the life of the transmission project. Additional permanent impacts include the clearing or removal of trees within a forested wetland, or potentially the removal of shrubs within a shrub scrub wetland, along the ROW, as the removal of trees and shrubs can permanently alter the dominant vegetative community of the wetland and change the hydrologic regime of the wetland as well.

Wetland impacts can also occur if disturbed soil from construction up slope is eroded by rain or snowmelt and is transported into a wetland. The indirect filling of wetlands by up slope construction erosion and run-off could result in temporary or permanent impacts to the receiving wetland, and would depend on the timing of clean up and restoration of the area.

Because of the relatively long spans proposed for the DCW transmission project, and the relatively small number and size of the wetlands in the project area, DCW the transmission line will be able to span delineated wetland areas with proper pole placement. Some wetland areas will be accessed by equipment during construction. The majority of these impacts will be temporary in nature, and they can be minimized through BMPs such as use of construction timbers and matting to reduce soil compaction and minimizing vegetation removal within the emergent and scrub shrub wetlands. However, accessing forested wetland areas for construction purposes or to maintain the ROW will be permanent, as the trees will need to be removed. Currently, the only forested wetland basin that could be impacted by the transmission line project is located in Salem Creek area.

Indirect wetland impacts related to up slope construction activities and soil erosion and deposition can be minimized by the use of BMPs during construction. The construction contractor must also comply with a NPDES permit, which requires the appropriate installation and maintenance of erosion control materials to protect the wetland areas in close proximity of the project construction activities.

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[323] Minnesota Statutes, section 103G.005

DCW will apply for and secure all necessary federal, state, and local permits authorizing the anticipated wetland impacts. Mitigation for the those wetland impacts will be completed as specified and detailed in the federal, state, and local issued permits, and will likely include; project specific mitigation, an in-lieu fee arrangement, or the purchase of credits from a certified wetland bank location.

Routes A and B

Route A has five freshwater emergent wetlands, located within the ROW, totaling 6.5 acres. Route B has six wetlands within the ROW, five freshwater emergent wetlands (3.1 acres) and one the wetlands is a freshwater pond (0.2 acres), so the total wetland acreage within Route B ROW is 3.3 (Table 48).

Table 48. Wetland Impacts Routes A and B

Wetland Type	Acres within ROW	
	Route A	Route B
Freshwater Emergent	6.5	3.1
Freshwater Pond	0	0.2
Freshwater Forested/Shrub	0	0
Total	**6.5**	**3.3**

McNeilus Wind Farm Alignment Alternative

Utilizing the McNeilus Wind Farm Alignment Alternative rather than Route A in this area of the transmission line project, would result in the potential impact of one additional freshwater emergent wetland basin (0.03 acres) near the edge of the ROW. This wetland can likely be spanned. A portion of the McNeilus Wind Farm Alignment Alternative and Route A in this area, share a portion of the same route, and within this shared portion both route options would potentially impact the same freshwater emergent wetland basin, totally 0.05 acres. With respect to wetland impacts, the McNeilus Wind Farm Alignment Alternative and Route A in this area of the transmission line project, are relatively equal.

Salem Creek Alternative

Route A crosses one 2.2 acre freshwater emergent wetland. Route B and Route B with the crossover segment both cross two freshwater emergent wetlands, totaling 1.1 acres. Route A with the Salem Creek Alternative crosses two wetlands, one freshwater emergent, .002 acres in size, and one freshwater forested/shrub wetland, 0.6 acres in size. The forested/shrub wetland crossed by Route A with the Salem Creek Alternative will be permanently impacted by the transmission line project. Construction through the forested/shrub wetland will require clearing of trees and taller shrubs, and the taller vegetation will have to remain cut during operation and maintenance of the project. Cutting

the trees and taller shrubs within a forested/shrub wetland will change the dominant vegetation in the wetland, resulting in a change in wetland type.

Route A with the Salem Creek Alternative will have the greatest wetland impacts when compared to the other three route options. Route A, Route B, and Route B with the crossover segment all cross wetlands, but the wetlands are emergent in nature with herbaceous vegetation dominating the wetlands. Emergent wetlands can generally be spanned or crossed without significantly or permanently altering the herbaceous vegetation.

Byron Routing Options

In the area approaching the Byron Substation, Route A crosses three wetland basins classified as freshwater emergent, totaling 3.70 acres. The largest wetland area (2.76 acres) to be crossed by Route A is just north of the unnamed perennial watercourse. These wetland areas would at a minimum experience temporary impacts during vegetative clearing and project construction. Route B as proposed and Route B with the crossover segment would both cross two freshwater emergent wetlands, totaling 0.30 acres. Route B using the West 270th Alternative and Route B with the crossover segment and using the West 270th Alternative will cross three wetlands, two freshwater emergent wetlands and a one freshwater pond, totaling 0.35 acres.

All wetland basins crossed by Route A or the four Route B options would experience temporary impacts, during project construction, but it should also be possible to span all wetland basins and not place any permanent structures within them. All Route B options would minimize the temporary impacts to the wetlands associated with Route A as proposed in this area.

6.9.4 Groundwater

The transmission project spans two of Minnesota's distinct groundwater provinces. Route A and Route B both begin in Province 2 (south-central), and as extend into Province 3 (southeastern) as they head east.

Province 2 has a clay overburden with limited use surface and buried sand aquifers. Province 2 has a sedimentary bedrock, which is commonly utilized for supplying groundwater. Province 3 is characterized as having a thin or no unconsolidated sediments over bedrock, and the bedrock has characteristics that have productive aquifers.[324]

6.9.4.1 Potential Impacts and Mitigation

Impacts to groundwater quality and quantity as a result of the transmission line project are anticipated to be minimal regardless of the route selected. Groundwater use at the wind farm is discussed in Section 3.3.2.

[324] DNR. *Groundwater Provinces*. https://www.dnr.state.mn.us/groundwater/provinces/index.html

Potential impacts to groundwater from the project could occur through:

- surface water impacts,
- groundwater use, and
- impacts directly to groundwater resulting from structure foundations.

Contamination of surface waters with significant quantities of petroleum based fluids from spills or leaks related to construction could ultimately contaminate groundwater. Implementation of BMPs, such as fueling and repairing equipment away from surface waters will minimize impacts to water quality. Potential impacts to groundwater quality can be mitigated by construction crews promptly cleaning up any spilled or leaked petroleum fluids.

Impacts to surface water quantities could potentially impact groundwater quantities by reductions in surface water infiltration if surface waters are removed from the area by pumping or diversion to facilitate construction activities. Surface water removal in the form of pumping or diversion are anticipated to be limited in occurrence and duration, and when necessary the pumped or diverted waters are still likely to infiltrate within the same general groundwater catchment area.

Direct impacts to groundwater could occur as a result of the construction and placement of transmission line structures. Pole structure foundations will generally not exceed a 40 foot depth. Because wells in the Route A route width are at considerably greater depths, 75 – 400 feet, the pole structure foundations are not anticipated to penetrate the groundwater level in the project area. Impacts to the two wells identified 15 and 36 feet from the Route B ROW are not anticipated, because the depth of these two wells is below the typical maximum pole structure depth of 40 feet. Concrete may be used to secure and anchor the transmission structures. Concrete components have relatively low solubility, which greatly reduces the potential for these components to make it into the groundwater.

DCW indicates that all transmission project structures will be constructed at the appropriate setback distance from all existing wells in the area, and all well locations will be considered when placing pole structures.[325] Direct impacts to groundwater quality are not anticipated.

Routes A and B

The Minnesota Department of Health (MDH) County Well Index identifies 26 wells within the route width of Route A, but no wells are identified within the anticipated ROW within Route A. The 26 wells identified within the route width of Route A have a depth range of 75 – 400 feet below the soil surface. There are 51 wells identified on the MDH County Well Index within the route width of Route B. One well is 15 feet from the anticipated ROW, and another well is 36 feet from the ROW for Route B. The well that is 15 feet from the Route B ROW is listed as 126 feet below the soil surface, and the

[325] *Route Permit Application*, at p. 192

records for the well that is 36 feet away from the Route B anticipated ROW do not indicate a depth for this well.

McNeilus Wind Farm Alignment Alternative

Neither the McNeilus Wind Farm Alignment Alternative nor Route A in this area have any public water wells located with the anticipated ROW.

Salem Creek Routing Options

Neither Route A nor Route A with the Salem Creek Alignment Alternative both have public water wells present within the anticipated ROWs. Route B and Route B with the crossover segment both have four public water wells within their anticipated ROWs. However, during construction, pole placement can be completed in a manner than will avoid impacts to all public water wells in the ROW. No public water well impacts are anticipated, regardless of the route option selected in this area of the transmission line project.

Byron Routing Options

There are relatively few public water wells located within this section of the transmission line project routes. Route A only has one well, both options using Route B only have two wells, and both options using Route B with the West 270th Ave. Alternative have three wells within the anticipated ROWs. However, during construction, pole placement can be completed in a manner than will avoid impacts to all public water wells in the ROW. No public water well impacts are anticipated, regardless of the route option selected in this area of the transmission line project.

6.9.5 Comparison of Routes

On the whole, the potential impacts to water resources when comparing Route A and Route B will likely be similar. Route A will cross six watercourses, and five emergent wetlands totaling 6.5 acres. Route B will cross six watercourses, and six wetlands totaling 3.3 acres. Route A, as proposed, appears to cross some wetlands with shrubs dominating the vegetative community, which could result in permanent impacts to those wetland basins if the transmission line corridor vegetation has to be maintained to a low height. All wetlands to be crossed by Route B are either emergent or open water, so construction and operation of the transmission line project should be able to span these wetland crossing and conversion of wetland vegetation will not result in a change of wetland type.

When analyzing the transmission line route as a whole, utilizing Route A as proposed, Route B as proposed through the Salem Creek Area, and Route B, as proposed through the Byron Routing Area appears to provide the greatest potential to minimize impacts to water resources.

6.9.6 Flora

The transmission project area lies within the Minnesota and Northeast Iowa Morainal Section and the Paleozoic Plateau Section of the Eastern Broadleaf Forest Province, which is a transition between

western prairies and eastern mixed conifer/deciduous forest. The Minnesota and Northeast Iowa Morainal Section is characterized by a hummocky moraine landscape, and was historically dominated by deciduous forest, woodlands, and prairies. More specifically the transmission line project is located in the Oak Savanna Subsection, which was historically vegetated with patchy tall grass prairie, bur oak savanna, which transitioned into rolling hills covered with maple-basswood forest. The Paleozoic Plateau Section landscapes are characterized by highly eroded bluffs and valleys. The Rochester Plateau Subsection is made up of rolling plateaus, and the topography is primarily driven by bedrock and the amount glacial till. Historically the Rochester Plateau Subsection was dominated by tall grass prairie and oak savanna vegetative communities.

The Oak Savanna Subsection and Rochester Plateau Subsection are currently utilized primarily for row crop farming, with some areas being used for livestock forage production in the form of hayfields and pasture lands. Wetlands are found sparsely throughout the project area and include farmed wetlands, meadows, marshes, scrub-shrub wetlands, and forested wetlands (Section 6.9.3). Meadows are characterized by grasses as well as a variety of sedges and rushes. Marshes are typically dominated by cattails, bulrushes, and sedges. Shrub swamps include willows, red-osier dogwood, ferns, forbs, and grasses. Forested wetlands in the project area are primarily associated with the streams that flow through the area, and are dominated by green ash, American elm, cottonwood, and silver maple trees.[326]

6.9.6.1 Potential Impacts and Mitigation

Transmission lines have the potential to impact flora through the removal or disturbance of vegetation during construction and later during maintenance activities. Additionally, flora may be impacted by the possible introduction of invasive species, or by changes in habitat (e.g., soils, water flows) that adversely impact plant growth. Potential impacts to flora due to the project are anticipated to be minimal to moderate. Moderate impacts to plant communities will be isolated to riparian areas adjacent to the streams that flow through the project area. The majority of the transmission line project routes and alternative segments will be located over lands used for agricultural purposes, and the impacts will be minimal and temporary.

Impacts to forested areas are anticipated as a result of construction of the project and maintenance of the transmission line ROW. Depending upon the route selected, the transmission project is anticipated to impact approximately 0.5 to 2.7 acres of forested land. Impacts to other vegetation communities, for example agricultural fields and non-forested wetlands, are anticipated to be minimal, as vegetation

[326] Eggers, Steven, Reed, Donald. 2014. *Wetland and Plant Communities of Minnesota and Wisconsin, Version 3.1*, https://www.mvp.usace.army.mil/Portals/57/docs/regulatory/WetlandBook/Part%201%20-%20Introduction,%20Key%20to%20Plant%20Communities,%20Shallow%20Open%20Water%20Communities.pdf.

within these communities does not need to be cleared for ROW purposes and can, in many instances, be spanned.

Impacts to flora can also be mitigated by a number of strategies, including:

- placement of the alignment and of specific structures to avoid trees and other tall-growing species (utilization of existing utility and road ROWs)
- spanning low growing plant communities
- constructing during fall and winter months to limit plant damage
- leaving or replanting compatible plants at the edge of the transmission line ROW
- replanting on the transmission line ROW with low growing, native species
- avoiding the introduction of invasive species – on equipment or through seeds or mulches.

DCW indicates they will minimize the introduction and spread of invasive species by:[327]

- Revegetating disturbed areas using weed-free seed mixes and using weed-free straw and hay for erosion control.
- Removal of invasive species via herbicide and manual means consistent with easement conditions and landowner restrictions.
- Cleaning and inspection construction vehicles to remove dirt, mud, plant, and debris from vehicles prior to arriving at and leaving from construction sites.
- Minimizing disturbance to native plant communities
- Limiting traffic through and access to weed-infested areas

Mitigation and restoration measures for impacts to flora are standard Commission route permit conditions.

When analyzing the transmission line route as a whole, a combination of Route A, Route B (Salem Creek area), and continuing on any of the Route B options (Byron area) will minimize the acres of forest cover that will be cleared by the proposed transmission line project.

6.9.6.2 Routes A and B

In comparing proposed Route A and Route B, Route B crosses a higher acreage of land as a result of its length.

Based on the United States Geological Society's National Land Cover Database (NLCD), land cover in the project area is primarily cultivated crops, which account for approximately 71 percent of the land cover in the ROW for both routes A and B. For the most part, pasture and grassland areas are

[327] *Route Permit Application*, Pg. 149

fragmented across the project area and forested areas appear limited to stream corridors and around homesteads.[328] Land cover type within the ROWs are shown in Table 49 and Appendix E.

Route A has a somewhat higher acreage of forest clearing, 2.6 acres of deciduous forest, compared to Route B, 0.7 acres of deciduous forest.

Table 49. Land Cover Comparison - Routes A and B

Cover Type	Route A		Route B	
	Acres in ROW	% Total	Acres in ROW	% Total
Developed, Open Space	54.9	14.1	112.9	23.6
Developed, Low Intensity	16.9	4.3	14.0	2.9
Developed, Medium Intensity	6.2	1.6	2.7	0.6
Developed, High Intensity	0.0	0.0	0.0	0.0
Deciduous Forest	2.6	0.7	0.5	0.1
Grasslands/Herbaceous	20.0	5.1	6.8	1.4
Pasture/Hay	12.3	3.2	0.0	0.0
Row Crops	276.3	71.0	340.9	71.4
Total	**389.2**	**100.0**	**477.8**	**100.0**

6.9.6.3 McNeilus Wind Farm Alignment Alternative

Using the McNeilus Wind Farm Alignment Alternative rather than Route A in this area of the transmission line project, would clear 0.7 acres more of deciduous forest. Use of the original Route A alignment in this area would minimize forest clearing relative to the McNeilus Wind Farm Alignment Alternative would not minimize cleared forest cover relative to Route A in this area.

6.9.6.4 Salem Creek Routing Options

Route A, Route B with the crossover segment, and Route A with the Salem Creek Alignment Alternative all cross the same perennial tributary to Salem Creek. Crossing the stream at the furthest point upstream, Route B with the crossover segment, and with minimal riparian vegetation clearing will have the least amount of impact to forested habitat. Route A as proposed would result in the clearing of 2.5 acres of deciduous forest, Route B with the crossover segment does not cross any deciduous forest habitat, and Route A with the Salem Creek Alignment Alternative will cross 1.2 acres.

Route B with the crossover segment will minimize the potential for cleared forest habitat, when compared to Route A and Route A using the Salem Creek alignment alternative.

[328] Ibid

6.9.6.5 Byron Routing Options

In this area of the transmission project, both Route A alternatives clear 0.1 acres of deciduous forest, and all four of Route B alternatives will not clear any deciduous forest. Any of the four Route B alternatives in this area of the project will minimize the clearing of deciduous forest when compared with the Route A alternatives in this area.

6.9.7 Wildlife

The landscape across the project area is relatively homogeneous, with agriculture representing the dominant land cover type. Portions of the northern project alternatives are more heavily developed; consisting of urban residential, commercial, and industrial development. Additionally, U.S. Highway 14 and the Canadian Pacific Railroad exist in the northern portion of the project area. Forage, shelter, nesting, and stopover habitats for both resident and migratory wildlife are all available in the project area, but are mainly limited to road ditches, temporary seasonal wetland areas, riparian habitats, wildlife management areas, and conservation areas.

Resident and migratory wildlife species that typically inhabit agricultural landscapes, farmsteads, small woodlots, prairie remnants, wetlands, and riverine habitats are commonly found in the project area. These include mammals, such as squirrels, fox, and deer; birds, such as robins, killdeer, wild turkey, and wood ducks; fish, such as creek chubs, various shiner species, suckers; mussels, and reptiles and amphibians such as, snakes, turtles, frogs, and toads.

The DNR runs several wildlife management programs, including the Wildlife Management Area (WMA) program and the Shallow Lakes program, Migratory Waterfowl Feeding and Resting Areas, and State Game Refuges. The DNR established these areas to protect and enhance lands and waters that have a high potential for wildlife production, and, in the case of WMA's high potential for public hunting, trapping, fishing, and other compatible recreational uses. There are no WMAs, Shallow Wildlife Lakes, Migratory Waterfowl Feeding and Resting Areas, or State Game Refuges crossed by routing alternatives for the proposed transmission project.

The Bud Jensen WMA is locate in the center of the project area, and is approximately 1,700 feet south of the anticipated alignment proposed for Route A, approximately 2,900 feet northwest of the anticipated alignment proposed for Route B, and approximately 4,100 feet from the McNeilius Wind Farm Alternative Alignment. Because the proposed transmission project will not encircle the WMA, and neither of the route or segment alternatives are in close proximity no impacts to the WMA and minimal impacts to the wildlife that use the WMA are anticipated.

The USFWS established Waterfowl Production Areas (WPAs) as part of the National Wildlife Refuge System in an effort preserve wetlands and grasslands that are critical to waterfowl and other wildlife. There are no WPAs located within any of the proposed routes or alternative segments for the proposed transmission line project.

The National Audubon Society has established important bird areas in an effort to identify and conserve areas that are vital to birds and other biodiversity; there are no important bird areas located within ten miles of the project area.

Various conservation easements can be established on private lands, and these easement lands can provide establishment and protection of temporary and long term wildlife habitats. USFWS maintains wetland, grassland, and conservation easement programs. Farm Services Agency (FSA) manages the Conservation Reserve Program (CRP) lands program, which primarily targets the reduction of soil erosion but provides the secondary benefit of establishing temporary wildlife habitat. CRP lands are generally enrolled in the program for 10 to 15 years, depending on the landowner's contract, so the wildlife habitat benefit is temporary in nature. The RIM program is administered by the Board of Water and Soil Resources (BWSR), and establishes conservation easements on private lands utilizing state funds. RIM easements are intended to provide wildlife habitat, soil conservation, and water quality benefits by establishing permanent habitat and removing marginal crop lands from agricultural production. There are no lands currently enrolled in federal or state conservation easement programs within any of the proposed routes or alternative segments for the proposed transmission line project.

6.9.7.1 Potential Impacts and Mitigation—Non-Avian Species

Construction activities that generate noise, dust, or disturbance of habitat may result in short-term indirect impacts on fauna. During construction of the transmission project, fauna would generally be displaced within the transmission line ROW. Clearing and grading activities could also affect small mammals that may not be able to avoid equipment. Many wildlife species would likely avoid the immediate area during construction; the distance that animals would be displaced depends on the species and the tolerance level of each animal. Because other suitable habitat is available in and near the project area, potential temporary impacts to fauna are not expected to cause permanent change in local populations.

Construction of the project may result in long-term adverse impacts on wildlife due to loss, conversion, or fragmentation of habitat. DCW would permanently clear woody vegetation within the transmission line ROW. Wildlife species previously occupying forested or shrub communities in the ROW would be displaced in favor of species that prefer more open vegetation communities. Fragmentation could affect the survival of some species that depend on large areas of undisturbed habitat, and it could create barriers to daily movement. In addition, predators may pose a threat to animals that are forced out of cover to search for food, especially as the distance predators need to travel to penetrate large habitat areas decreases.

Potential long-term impacts to fauna as a result of the project are anticipated to be minimal. Potential impacts to fauna can be mitigated through several strategies. The primary strategy for mitigating impacts is to select route alternatives away from areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to fauna can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

6.9.7.2 Potential Impacts and Mitigation—Avian Species

Potential impacts to avian species (e.g., songbirds, raptors, and waterfowl) include those described above for non-avian species, but also include impacts due to electrocution and collision with transmission line conductors.

Electrocution occurs when an arc is created by contact between a bird and energized lines or an energized line and grounded structure equipment. Electrocution occurs more frequently with larger bird species, such as hawks, because they have wider wingspans that are more likely to create contact with the conductors. To avoid and minimize potential electrocution of avian species, the applicants indicate that they will construct the project in accordance with the Avian Power Line Interaction Committee's safety recommendations. These recommendations minimize electrocution risk by providing adequate clearance from energized conductors to grounded surfaces and to other conductors.

Independent of the risk of electrocution, birds may be injured by colliding with transmission line structures and conductors. The risk of collision is influenced by several factors including habitat, flyways, foraging areas, and bird size. Waterfowl, especially larger waterfowl such as swans and geese, are more likely to collide with transmission lines. The frequency of collisions increases when a transmission line is placed between agricultural fields that serve as feeding areas and wetlands or open water, which serve as resting areas. In these areas, it is likely that waterfowl and other birds would be traveling between different habitats, increasing the likelihood of a collision.

The incidence of birds colliding with transmission lines is also influenced by the number of horizontal planes in which the conductors are strung. Stringing the conductors in a single horizontal plane presents less of a barrier to birds crossing the transmission line ROW. A single horizontal plane, however, generally requires a wider structure (e.g., H-frame structure). Conversely, stringing the conductor wires in two or more planes creates a greater barrier to birds attempting to fly, not only across the lines, but over and potentially between them (e.g., monopole structure).

Beyond conductor configuration, bird collisions with transmission lines can also be mitigated by the use of bird flight diverters. Diverters enable birds to better see conductors during flight and avoid collisions with them.

6.9.7.3 Comparison of Routes

There are no designated wildlife management and conservation areas present within or adjacent to any of the proposed routes and alternative segments; comparison of potential wildlife impact between routes and alternatives is based upon NLCD data and the number of watercourse crossings. NLCDs cover types identified as forest, grassland, and pasture are generally anticipated to provide better wildlife habitat than cover types identified as residential, commercial, industrial, developed or row crop. Watercourses and the riparian areas adjacent to them provide focal points for wildlife, and serve as water sources, potential feeding locations, travel corridors, and the riparian areas can provide habitat and shelter, especially in highly developed and cultivated landscapes. Points where the

transmission line will intersect with a watercourse and the adjacent riparian habitat, are locations where wildlife species could be impacted by ground disturbance, temporary vegetative clearing, or permanent loss of habitat if when tree clearing occurs during construction and has to be maintained for the operation of the transmission line.

In comparing proposed Route A and Route B, Route A has a substantially higher percentage of habitat types identified as forest, grassland, or pasture than Route B, 8.9% (34.9 acres) and 1.5% (7.4 acres) respectively, although the actual acreage for both alternatives is relatively small. The anticipated alignments for both Route A and Route B will cross six watercourses.

When analyzing the transmission line route as a whole, a combination of Route A, the McNeilus Wind Farm Alignment Alternative, and Route B will minimize overall project impacts to wildlife within the project area.

McNeilus Wind Farm Alignment Alternative

Utilizing the McNeilus Wind Farm Alignment Alternative rather than Route A in this area of the transmission line project, would potentially impact approximately the same amount of wildlife habitat when compared with Route A in this portion of the project area. The McNeilus Wind Farm Alignment Alternative has a total of 0.84 acres of potential wildlife habitat, and the Route A segment in this area has 0.69 acres of potential wildlife habitat. Utilizing the McNeilus Wind Farm Alignment Alternative would increase the distance between the transmission line and the Bud Jensen WMA by an additional 2,400 feet.

The McNeilus Wind Farm Alignment Alternative would minimize potential impacts to wildlife relative to Route A in this area, by increasing the separation distance between the transmission line and the Bud Jensen WMA.

Salem Creek Routing Options

Route A, Route B with the crossover segment, and Route A with the Salem Creek Alignment Alternative all cross the perennial tributary to Salem Creek. Crossing the stream at the furthest point upstream, Route B with the crossover segment, and with minimal riparian vegetation clearing will likely have the least amount of impact to potential wildlife habitat. Route A as proposed crosses 27.29 acres of potential wildlife habitat, Route B with the crossover segment crosses 1.88 acres of potential wildlife habitat, and Route A with the Salem Creek Alignment Alternative will cross 17.86 acres.

Route B with the crossover segment will minimize the potential for impacts to wildlife habitat, when compared to Route A and Route A using the Salem Creek alignment alternative.

Byron Routing Options

In this area of the transmission project, both Route A alternatives cross approximately 6.1 acres of potential wildlife habitat, and all four of Route B alternatives have approximately three (3) acres of

potential wildlife habitat. Utilizing any of the Route B alternatives in this area of the project will minimize impacts to potential wildlife habitat when compared with the Route A alternatives in this area. The Route A alternatives in this section of the project cross two surface watercourses; an unnamed perennial stream and Cascade Creek are both crossed by Route A alternatives. Route B alternatives do not cross any identified watercourses.

The Route B alternatives will minimize the potential wildlife impacts, when compared to any of the Route A alternatives being considered in this section of the project.

6.9.8 Rare and Unique Resources

There are a variety of rare and unique natural resources in the project area. Without careful planning, the project could impact rare plants, animals and their habitats. These impacts could result from ecosystem changes, introduction of invasive species, habitat loss, and, for avian species, collision with transmission line conductors.

The rare and unique natural resources evaluated for potential impacts by the proposed transmission line include the following:

- Federally listed threatened and endangered species
- State Listed special concern, threatened, and endangered species
- Bald Eagles and Bald Eagle Nests
- Rare Plant Communities

6.9.8.1 Federally Listed Threatened and Endangered Species

There are five federally listed species known to be present in Dodge and/or Olmsted Counties.

Northern Long-eared Bat (Myotis septentrionalis)

The northern long-eared bat is a federally listed threatened species known to occur in Dodge and Olmsted counties.[329]The northern long-eared bat roosts in both live trees and snags. A habitat generalist, roost tree selection appears to be opportunistic; the species uses a variety of tree sizes and species, typically greater or equal to three inches diameter at breast height. Northern long-eared bats are generally associated with forested habitats, including mesic hardwood, floodplain, and fire-dependent forests, particularly those near water sources. Northern long-eared bats overwinter in

[329] USFWS Website, Endangered Species in Minnesota, County Distribution. https://www.fws.gov/midwest/endangered/lists/minnesot-cty.html

small crevices or cracks in hibernacula (e.g., caves and mines). Migration to summer habitat occurs between early April and mid-May.[330] [331][332]

Northern long-eared bats may be present in the project area. The DNR and USFWS maintain records of known hibernacula and roost tree locations. According to the DNR, there are no known maternity roost trees present within the project area, and the nearest known hibernacula is approximately 20 miles southeast of the project area.[333]

On January 14, 2016, the USFWS published the final 4(d) rule identifying prohibitions that focus on protecting the bat's sensitive life stages (i.e., hibernation and raising young) in areas affected by White Nose Syndrome (WNS)[334]. Dodge County falls within USFWS-designated WNS Zone, and Olmsted County has WNS infected hibernacula.[335]

Per USFWS guidance, incidental take from tree removal activities is not prohibited provided:

- It is not conducted within 0.25 miles of a known northern long-eared bat hibernacula; and
- It does not entail removing a known maternity roost tree (or trees within 150 feet of a known maternity roost tree) between June 1 and July 31.

As noted above, no maternity roost trees have been identified within the project area, and the closest known hibernacula is approximately 20 miles away.

Prairie Bush Clover (*Lespedeza leptostachya*)

Prairie bush clover is a federally-listed threatened species known to occur in Dodge and Olmsted counties. Prairie bush clover is a member of the *Fabaceae* (Pea) family and a Midwestern endemic – known only from the tallgrass prairie region of the upper Mississippi River Valley. In southeastern Minnesota, prairie bush clover can be found on dry-mesic prairies on north or northwest-facing slopes with well drained soils. Populations are primarily restricted to remnant prairies that have persisted

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[330] Wisconsin Department of Natural Resources. 2013. Wisconsin Northern Long-Eared Bat Species Guidance. Bureau of Natural Heritage Conservation, Wisconsin Department of Natural Resources, Madison, Wisconsin. PUB-ER-700. https://dnr.wi.gov/files/PDF/pubs/er/ER0700.pdf

[331] USFWS Website, Midwest Region Endangered Species. Northern Long-Eared Bat. https://www.fws.gov/MIDWEST/ENDANGERED/mammals/nleb/index.html

[332] DNR Website. Northern Long eared Bat, https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AMACC01150

[333] DNR. *NHIS Database*

[334] USFWS, Northern Long-eared Bat Final 4(d) Rule Map. October 1, 2018. https://www.fws.gov/Midwest/endangered/mammals/nleb/pdf/WNSZone.pdf

[335] USFWS, Northern Long-eared Bat Final 4(d) Rule Map. October 1, 2018. https://www.fws.gov/Midwest/endangered/mammals/nleb/pdf/WNSZone.pdf

despite widespread conversion to cropland; the majority of populations in the state are found on prairies that were historically or are presently used for pasture[336]

Prairie bush clover only occurs in areas of high quality prairie on north facing slopes. The project area primarily contains agricultural land cover types, and suitable habitat for the prairie bush clover is not likely to be present within the transmission line project area.

Dwarf Trout Lily (Erythronium propullans)

The Dwarf Trout Lily was listed as endangered in 1986, which was triggered by a loss of the woodland habitat where the species is found. The species is known to occur in Dodge county.[337] The Dwarf trout lily is endemic to the State of Minnesota, and is found in woodlands of southeastern Minnesota, exclusively along the Cannon River and its tributaries. Over half of the known dwarf trout lily populations are found on public lands.[338] There are no records of the dwarf trout lily within the project area, and the species is not known to occur in any of the watersheds associated with the streams that flow through the transmission line project area.

Leedy's Roseroot (Rhodiola integrifolia ssp. Leedyi)

Leedy's roseroot was discovered by John Leedy in 1936 on a cliff along the North Branch Root River near Simpson, Minnesota in Olmsted County. Before then, it was unknown to science. Leedy's roseroot is a federally-listed threatened species known to occur in Olmsted County.[339] Other than the Minnesota population of Leedy's roseroot, the species is only found in a disjunct population in the state of New York. The Minnesota population are only found growing in crevices in maderate cliffs, which are characterized by constant presence of air cooled groundwater seepages on north facing dolomite cliffs. Leedy's roseroot habitat is always associated with karst topography and geology, because the air that cools the groundwater seepage, travels through underground air passages present in the karst.[340]

There are no records of Leedy's roseroot or the species known required habitat within the transmission line project.

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[336] Prairie Bush Clover Species Profile, http://files.dnr.state.mn.us/natural_resources/ets/prairie_bush_clover.pdf.
[337] USFWS Website, Endangered Species in Minnesota, County Distribution. https://www.fws.gov/midwest/endangered/lists/minnesot-cty.html
[338] USFWS Website, Midwest Region Endangered Species. Minnesota Dwarf Trout Lily. https://www.fws.gov/midwest/endangered/plants/dwarftro.html
[339] USFWS Website, Endangered Species in Minnesota, County Distribution. https://www.fws.gov/midwest/endangered/lists/minnesot-cty.html
[340] USFWS Website, Midwest Region Endangered Species. Leedy's Roseroot. https://www.fws.gov/midwest/endangered/plants/leedys/index.html

Rusty Patch Bumble Bee (Bombus affinis)

The rusty patch bumble bee is a federally-listed endangered species known to occur in Olmsted county[341]According to mapping data developed by the USFWS, a Low Potential Zone for the rusty patch bumble bee is identified on the eastern end of the project area. Low Potential Zones surround High Potential Zones for the species presence, and are considered the Primary Dispersal Zone for an individual bee based on the maximum dispersal potential of the species from recent, 2007 – current, known records. Rusty patch bumble bees are not likely to be present within the Low Potential Zones. Consultation with the USFWS under Section 7 or Section 10 of the Endangered Species Act are not needed in Low Potential Zones. However, if rusty patch bumble bees will be surveyed for, the USFWS recommends a recovery permit be obtained and non-lethal survey techniques be used.[342]

Potential for Impact

Based on available information there are no records of any federally listed endangered or threatened species within the project area, and there is no federally designated critical habitat for any listed species within the project area.

Although there are no records of northern long-eared bats or known maternity roosting trees within the project area, the species may still use forested habitat within the project area for foraging, general roosting, and maternity roosting. Northern long-eared bats are known to fly distances of 50 miles from their hibernacula to their summer habitat locations, and the project area is within 20 miles of a known hibernacula. Mitigation measures such as avoiding tree clearing, or restricting tree clearing activities to the time period between October 1 and March 1 will significantly reduce the potential for the transmission project to impact the northern long-eared bat.

There are small native prairie patches located within the project area, but none of the small native prairie areas have the north or northwestern facing slopes favorable for the establishment of prairie bush clover.

The northeast portions of Routes A and B, and the Byron Substation location are located within an identified Low Potential Zone for the rusty patch bubble bee. The presence of rusty patch bumble bee within Low Potential Zones are unlikely, and even less likely in the case of the portions of the northeast portions of Routes A and B because there is no native prairie areas within the portion of the Project area that overlaps with the Low Potential Zone for the species. The remainder of Route A and Route B and all other route segments are located outside of the Low Potential Zone for the rusty patch bumble bee.

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[341] USFWS, GIS Shapefiles of High Potential Zone and Low Potential Zone, March 25, 2019. Downloaded from https://www.fws.gov/midwest/endangered/insects/rpbb/rpbbmap.html.
[342] USFWS Website, Rusty Patched Bumble Bee Map. https://www.fws.gov/midwest/endangered/insects/rpbb/rpbbmap.html

Outside of the Low Potential Zone for the rusty patch bumble bee, the presence of native prairie does not indicate an increase in the potential of the species occurrence, and the species is likely not present. Because there are not native prairie areas within the Low Potential Zone of the rusty patch bumble bee overlapping the route width of Route A, Route B, and the route segment alternatives the rusty patch bumble bee is not likely to be impacted by the project.

Direct impacts to federally-listed threatened and endangered species are not anticipated to occur within Route A, Route B, or any of the proposed route alternatives.

6.9.8.2 State Listed Special Concern, Threatened, and Endangered Species

There are four state-listed species present within the route width.[343]

Sullivant's Milkweed (*Asclepias sullivanti*)

Sullivant's milkweed was listed as threatened by the DNR in 1984. The reduction in the population of Sullivant's milkweed has primarily been due to the loss of the tall grass prairie habitat that supports the species. Sullivant's milkweed are typical found in undisturbed wet or mesic tall grass prairie habitats in south central Minnesota.[344] The survival and conservation of the remaining populations of Sullivant's milkweed are dependent on the avoidance of impacts to suitable native prairie habitat, protection of individual plants from drift of herbicide sprays, supporting pollinator species, and the ability to maintain a prescribed fire regime on inhabited prairie areas.

Cowbane ((Oxypolis rigidior)

Cowbane is a species of flowering carrot, which prefers moist and wet locations.[345] Cowbane can be an indicator plant species found in calcareous fens, but the species is not strictly limited to calcareous fen habitats.[346] The DNR has not listed cowbane as special concern, threatened, or endangered at this time, but the species is tracked and the presence of known populations are documented.

Loggerhead Shrike (*Lanius ludovicianus*)

The loggerhead shrike's State threatened status was changed to endangered in 2013 by the DNR, this change in status occurred after survey results showed a significant decline in the number of shrikes being observed in the State. Loggerhead shrike prefer large open prairie areas for hunting, and shrub thickets for nesting habitat. Large, open native prairie habitat in the State of Minnesota has declined significantly due to conversion to agricultural cropland. Additionally, a significant number of native

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[343] NHIS Data
[344] MN DNR Sullivant's Milkweed Species Profile Page. https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PDASC021X0.
[345] Minnesota Wildflowers. https://www.minnesotawildflowers.info/flower/cowbane
[346] MN DNR. OPp93 Prairie Extremely Rich Fen Factsheet. https://files.dnr.state.mn.us/natural_resources/npc/open_rich_peatland/opp93.pdf

prairie areas that still exist in Minnesota are no longer managed with prescribed fire regimes, which has led to significant encroachment by larger tree species. The loggerhead shrike population has been impacted by the conversion of prairie lands to both agriculture and forested habitat. Forested habitat does not provide the quality hunting opportunities needed by the shrike, and it also creates roosting locations for raptor species that will prey upon the shrike. Shrike conservation is dependent on the avoidance of prairie habitat loss, and the maintenance of existing prairie habitats with scattered shrubs and small trees for nesting. The maintenance of shrubs and brush along fence rows and the maintenance of shelterbelt tree and shrub plantings are also thought to be effective conservation measures to help the shrike population.[347]

Rattlesnake Master (*Eryngium yuccifolium*)

DNR listed rattlesnake master as a Minnesota special concern plant species in 1984. Rattlesnake master is restricted to native prairie habitat in southern Minnesota, and even more specifically favoring mesic tall grass prairie. The conversion of native prairie to agricultural row croplands has severely reduced the availability of suitable prairie habitat for rattlesnake master. Although small prairie remnants are scattered throughout southern Minnesota, these prairie areas continue to be pressured by invasive species encroachment, tree and shrub encroachment, agricultural herbicide drift, and pollinator limitations. Maintaining and potentially recovering the rattlesnake master population is dependent on efforts to protect native prairie remnants in general. Such as, controlling invasive plant species, cutting encroaching brush, avoiding or minimizing herbicide use, and supporting pollinator species. Rattlesnake master only spreads and establishes from seeds, which may make the protection and support of general pollinator species of utmost importance for the species.[348]

Aquatic Species

There are no aquatic state-listed species present within the stream segments within the identified route widths. However, some state-listed species are present in the downstream reaches, just outside of the route widths, of the streams that will be crossed by the project anticipated alignments. These species could potentially be impacted if there is additional sediment load transported downstream due to channel bed or bank disturbance, or the potential for impacts from adjacent upland erosion that is not properly managed.

State listed species present in downstream reaches (outside of route width) of streams that flow through the project area:[349]

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[347] Minnesota DNR Loggerhead Shrike Species Profile. https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABPBR01030

[348] [348] Minnesota DNR Rattlesnake Master Species Profile. https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PDAPI0Z0V0

[349] NHIS Data

- Creek heelsplitter (*Lasmigona compressa*) – Special Concern
- Ozark minnows (*Notropis nubilus*) – Special Concern
- Wood turtles (*Glyptemys insculpta*) – Threatened
- Ellipse (Venustaconcha ellipsiformis) – Threatened
- Mudpuppy (*Necturus maculosus*) – Special Concern
- Redfin shiner (*Lythrurus umbratilis*) – Special Concern

Potential for impacts to these species would likely be highly dependent on the time of year that an erosion release event or an increase in sediment load transport event occurs. Mussel and fish species would likely experience the greatest impact during reproductive activities. Wood turtles could also experience impacts during reproductive activities, but construction activities adjacent to the streams riparian vegetation or the adjacent upland vegetation will likely have the greatest impact.

Potential for Impact and Mitigation

An isolated population of Sullivant's milkweed is located within 75 feet of the anticipated alignment of Route A. If Route A is selected impacts to these individuals could easily be avoided by spanning, and completing project construction outside of the habitat area where the species is known to occur. Selecting Route A and using the McNeilus Wind Farm Alignment Alternative would also avoid impacts to the identified Sullivant's milkweed population.

The loggerhead shrike records are of nesting adults with fledglings present, and the records are within the route width of Route B. There are no alternative route segment options available along Route B that would completely avoid the identified loggerhead shrike. The anticipated alignment along Route B could avoid direct impacts to the loggerhead shrike, but is likely to result in some temporary and permanent impacts to habitat areas that the species utilizes. Selection of Route A would allow for complete avoidance of the loggerhead shrike and the species associated habitats in the area where the most recent records were confirmed.

Henslin Creek is a tributary to Dodge Center Creek, which has recent records of the state-listed creek heelsplitter. The anticipated alignment in Route A will cross a tributary to Henslin Creek once and Route B will cross the tributary to Henslin Creek in two locations. Project related erosion or sediment load impacts would have to travel a significant distance downstream through the primary receiving water, the tributary to Henslin Creek, and then down Henslin Creek into Dodge Center Creek before the creek heelsplitter population could be impacted. The crossing of the tributary to Henslin Creek will likely have minimal impact on downstream state-listed species, due to the stream length between the point of potential impacts and known records of state-listed species. Utilizing Route A in this section of the project could potentially further reduce the minimal impacts as it only crosses the tributary once, versus the two crossings of Route B.

Route A, Route B, and Route A with Salem Creek Alternative will cross a tributary to Salem Creek prior to the route turning north to extend to the Byron Substation. The perennial tributary to Salem Creek

has downstream records of the Ozark minnows, wood turtle, elipse, mudpuppy, and redfin shiner. The state-listed species identified in the Salem Creek tributary could be impacted temporarily if erosion control measures are not implemented correctly.

6.9.8.3 Bald Eagles and Bald Eagle Nests

Bald eagles and bald eagle nests are protected by the federal Bald and Golden Eagle Protection Act which is administered and regulated by the USFWS. Bald eagles and nests can be directly impacted by transmission line construction activities if they are within or adjacent to the project alignment. Once operational, transmission lines pose an electrocution hazard to bald eagles while they are in flight. Young bald eagles and bald eagles actively engaged in hunting while near the transmission line are a greatest risk of striking the lines and being electrocuted. Young bald eagles have larger flight feathers to allow for greater stability and control while in flight, due to increased flight feather length the young bald eagles have larger wing span, which puts them at greater risk of contracting multiple lines at the same time if they fly into the transmission lines. Additionally, young bald eagles generally have less control and stability while they are learning to fly, which also puts them at greater risk of strike and electrocution should the young eagles get to close to the transmission lines. Bald eagles that are actively hunting or in pursuit of prey tend to focus exclusively on their prey item, which can lead to an increased potential for strike and electrocution as the hunting eagle may be less aware of nearby transmission lines.

DCW had an aerial raptor nest survey conducted in the spring of 2017 within the project area and also in the land adjacent to the project area. The 2017 raptor nest survey did not identify any bald eagle nests within the route width of Route A and Route B. A stick nest was identified approximately 1,400 feet south of Route A ROW, and it was determined that the raptor stick nest identified is a red-tailed hawk nest. A bald eagle nest was identified 0.52 miles south of the Route A anticipated alignment. Raptor nest surveys identified one red-tailed hawk and one great horned owl nest in the Route B route width study area, and one bald eagle near the edge of the Route B route width study area. The identified bald eagle nest is approximately 1,125 feet east of the Route B ROW, and 1,200 feet east of the Route B anticipated alignment. All three of the identified raptor nests are located outside of the Route B ROW.[350]

Potential for Impact

During construction of the Project no bald eagles or bald eagle nests are anticipated to be impacted. Bald eagles will have the potential to strike the proposed transmission line during the operational phase of the Project. Alignments that cross stream corridors or that are in close proximity to livestock facilities or commonly traveled roadways may pose a greater threat than alignments that are not near these features.

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[350] *Route Permit Application*, at p.. 151

DNR has requested that bird flight diverters will be installed on sections of the proposed transmission line that will be near lakes, rivers, and other areas that may attract waterfowl. DCW indicates it will coordinate with DNR to determine how to best implement the request for bird flight diverter installation.[351] Bird flight diverters are intended to make the transmission line more noticeable and identifiable to birds that are flying near the transmission line. Bird flight diverters have been successful in reducing the strike and electrocution of a variety of bird species in a number of different habitat types.

6.9.8.4 Rare Plant Communities

Rare plant communities evaluated for potential impacts from the proposed project include native prairie, native plant communities, and Minnesota Biological Survey (MBS) Sites of Biodiversity Significance.

Native prairie is defined in MN Statute Section 84.02, Subdivision 5, as areas that have not experienced plowing and is dominated by native prairie plant species that have originated from the site. Disturbed areas and unbroken pasture lands may still be classified as native prairie as long as the predominately established with native prairie plants that have originated from the site. The DNR is directed by Minnesota Statute Section 84.961 to protect identified native prairies in the State.

The vast majority, approximately 98%, of historical native prairie in southern Minnesota has been converted to agricultural cropland.[352] Larger blocks of native prairie habitat in southern Minnesota are generally protected within the boundaries of DNR administered Scientific and Natural Area (SNA) lands. Some linear native prairie areas still exist within former or currently active railroad track ROWs, and some native prairie areas are adjacent to roads within the ROW. The majority of native prairie areas located on private property in southern Minnesota are generally small in size. Small and linear native prairie areas are both at risk from encroachment from invasive plant species, trees, and/or shrubs, which is referred to as edge effect and has a more noticeable impact on small patches of habitat. Native prairie forb species are also highly susceptible to being impacted by drift of herbicide sprays, the decline in pollinator species, and potentially genetic isolation.

Native plant communities are intact habitat areas, of various types, and are dominated by native plant species. The vast majority of native plant communities in Minnesota have been identified and surveyed by the MBS, and these areas tend to be ranked within the frame of sites of biodiversity significance.

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[351] Ibid., at p. 152

[352] DNR, *Minnesota Prairie Conservation Plan*, June 22, 2011. https://files.dnr.state.mn.us/eco/mcbs/mn_prairie_conservation_plan.pdf

Impacts and Mitigation

The preferred mitigation measure is to avoid known locations of rare and unique resources.

When analyzing the transmission line route as a whole, a combination of Route A, the McNeilus Wind Farm Alternative, Route B with the crossover segment (Salem Creek area), and back onto Route A appears to provide the greatest minimization of potential impacts to rare features.

Routes A and B

Route A, does not contain any identified native prairie areas.

Two native prairie areas were identified within Route B; a southern mesic prairie area (7.9 acres) and a southern wet prairie area (3.1 acres) (Appendix E). The two identified native prairie areas are adjacent to each other, and are part of a larger habitat complex that is an identified site of biodiversity significance that extends outside of the Route B route width. The site of biodiversity significance is classified as moderate, and is adjacent to Salem Creek.

The Route A route width crosses three sites of biodiversity significance. Only one of the three sites appears to be crossed by the anticipated alignment, and the other two sites are located outside the anticipated alignment. The site identified within the Route A anticipated alignment, is classified as MCBS 5862, with a biodiversity ranking of below. There is also another site with a biodiversity ranking of below, classified as MCBS 5862, it is located adjacent to a tributary of Salem Creek, and it is within the Route A route width but is south of the anticipated alignment. A site of moderate biodiversity is located adjacent to Salem Creek, and is located within the Route A route width but outside the anticipated alignment.

Route B has three sites of biodiversity significance within 900 feet of the center line of the anticipated alignment, but all three sites are outside the construction ROW for Route B.

McNeilus Wind Farm Alignment Alternative

There are no federal or state-listed species, identified native prairie areas or native plant communities identified along the McNeilus Wind Farm Alignment Alternative. Using the McNeilus Wind Farm Alignment Alternative rather than Route A in this area of the transmission line project, would allow for the avoidance of a population of the state-listed Sullivant's milkweed and two designated areas of biodiversity. The McNeilus Wind Farm Alignment Alternative would minimize potential impacts to rare features relative to Route A.

Salem Creek Routing Options

There are no identified native prairie areas along any of the routing alternative in this area. Route A, Route B with the crossover segment, and Route A with the Salem Creek Alignment Alternative all cross the perennial tributary to Salem Creek and could all potentially impact the state-listed species (Ozark

minnow, wood turtle, elipse, mudpuppy, and redfin shiner) in the downstream reaches. Crossing the stream at the furthest point upstream from the aquatic state-listed species records, and with minimal riparian vegetation clearing will likely have the least amount of impact on downstream state-listed species. A greater length in stream channel between the point of potential impact and the location of the state-listed species populations allows for greater potential of the erosion and sediment load to disperse and settle prior to reaching and impacting the state-listed species populations.

Route B with the crossover segment will minimize the potential for impacts to aquatic state-listed species, when compared to Route A and Route A using the Salem Creek alignment alternative.

Route A using the Salem Creek alignment alternative also crosses a small vegetated draw/swale that is identified as wood turtle habitat by NHIS. The vegetated draw appears to serve as a potential habitat connection and travel corridor between to wooded habitats for the species. Crossing the vegetated draw with the transmission line project could potentially expose the wood turtle to more direct impacts than using Route A or Route B with the crossover segment.

Using Route B will allow for the greatest separation distance from known rare features present in downstream reaches of the perennial tributary to Salem Creek and Salem Creek itself. Additionally, Route A using the Salem Creek Alignment Alternative could also result in impacts to terrestrial wood turtle habitat, which would not occur with the use of Route A or Route B.

All three route options associated with Route A that cross the perennial tributary to Salem Creek have sites of biodiversity located within them. However, by shifting to the northern most crossing of the tributary to Salem Creek, using Route B or Route B with the crossover, the anticipated alignment will have minimal impact on the sites of biodiversity within the route width, and the sites of biodiversity within the Route B route width are graded as below, versus the moderate quality sites identified in Route A

Byron Routing Options

In this area of the transmission project, both Route B, as proposed, and the 270th Ave alignment alternative segment have no impacts on rare features. However, as Route B, as proposed, progresses north from the segment with the 270th Ave alignment alternative, toward the Byron Substation, the proposed Route B could potentially impact habitat utilized by the state-listed loggerhead shrike. Route A, from the point of Route B with the crossover segment at the Salem Creek area, to the Byron Substation avoids rare features. Thus, utilizing Route A as proposed from Route B with the crossover segment at the Salem Creek area, will minimize impacts to rare features when compared with Route B beginning at the same location.

6.10 System Reliability

The North American Electric Reliability Corporation (NERC) has established mandatory reliability standards for the bulk power system in the United States. For new transmission lines, these standards

require the utility to evaluate whether the grid would continue to operate adequately under various contingencies (e.g. weather events, equipment failure). Route permits issued by the Commission require permittees to comply with NERC standards (**Appendix C**).

In developing the transmission project, DCW evaluated different voltages, different end points, and different possible routes for the project. DCW analyzed whether these routes created reliability concerns. DCW asserts that the selection of the 345 kV line and the end point of the Byron Substation will provide more integration of wind energy into MISO's transmission system and allow the proposed 345 kV line to preserve and enhance system reliability.[353]

Analysis of NERC transmission outages indicates that the 345 kV voltage is substantially more reliable than lower voltages, resulting in substantially fewer sustained and momentary outages than lower voltages.[354] DCW indicates that all routes proposed in their route permit application (and, by extension, all route alternatives fully evaluated in this EIS) provide a reliable connection between the wind farm and the electrical grid.[355] No adverse impacts to electric system reliability are anticipated.

6.11 Use and Parallel of Existing Right-of-Way

Sharing ROW with existing infrastructure or paralleling existing rights-of-way minimizes fragmentation of the landscape and can minimize human and environmental impacts (e.g., aesthetic and agricultural impacts). The use and paralleling of existing rights-of-way is considered by the Commission in determining the most appropriate route for the project.

ROW sharing opportunities in the project area are discussed below. These opportunities exist where the rights-of-way of the route alternatives would be shared with or would parallel immediately adjacent the ROW of existing infrastructure—a transmission line or road—or existing field and parcel lines not always visible on the landscape.

Though the discussion here pertains to the use or paralleling of existing rights-of-way, there is a difference in potential impacts between using ROW for double-circuiting and paralleling existing ROW. Both can minimize land-use, agricultural, and natural resource impacts, but double-circuiting with existing transmission lines best minimizes potential impacts.

6.11.1 Routes A and B

Both routes follow infrastructure for a significant portion of their length (**Figure23**). Route A follows existing road and transmission line ROW (14 and 36 percent respectively), whereas Route B follows

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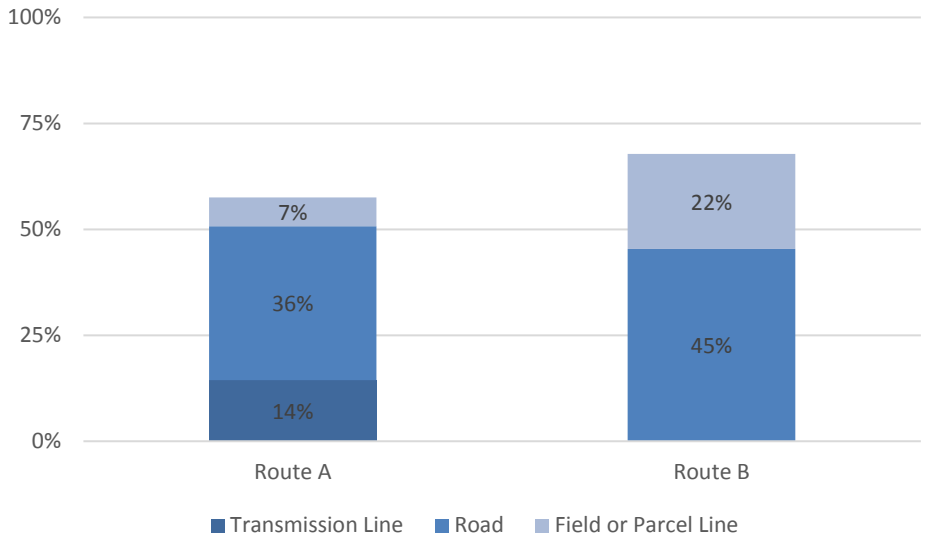
[353] *Certificate of Need Application*, at pp. 11-12

[354] Henry Chao - Direct Testimony, at Tables 1 and 2 eDocket ID: 20193-150807-17. The analysis compares transmission lines in the 300 – 399 kV range with those in the 200 – 299 kV range; voltages less than 200 kV are generally not considered part of the bulk power system subject to NERC's jurisdiction.

[355] Route Permit Application, at p. 69

road ROW for 45 percent of its length. Both follow field or parcel lines for a portion of their length (7 percent, and 22 percent).

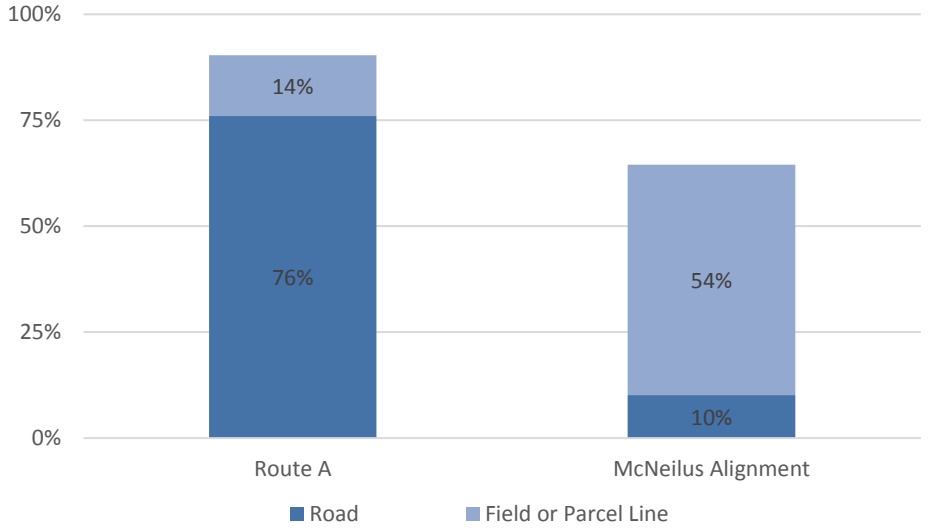
Figure 23. ROW Sharing -Routes A and B



6.11.2 McNeilus Wind Farm Alignment Alternative

Route A follows road ROW for 76 percent of its length (**Figure 24**). The McNeilus Wind Farm alignment follows road ROW for 10 percent of its length.

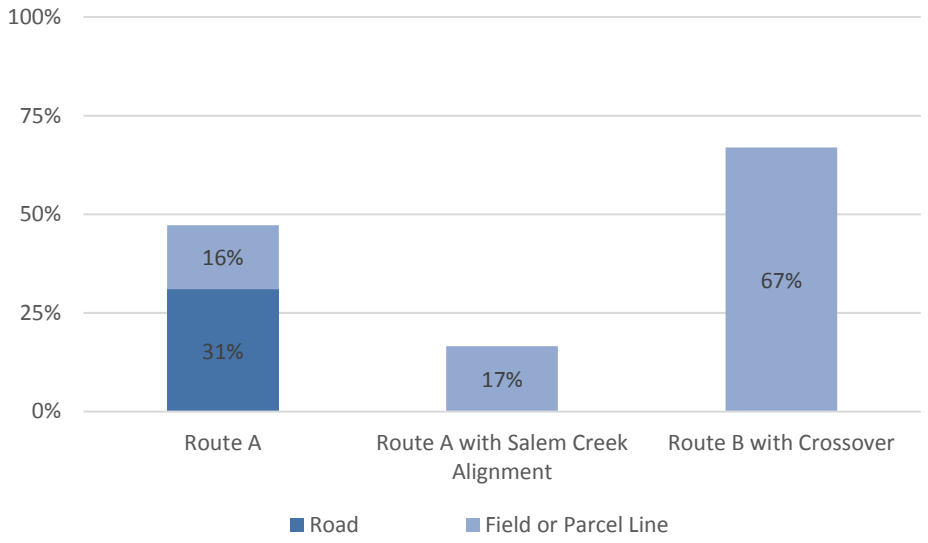
Figure 24. ROW Sharing - McNeilus Routing Options



6.11.3 Salem Creek Routing Options

Route A follows road ROW for 30 percent of its length. The Route A Salem Creek and Route B Crossover alignments do not utilize road or transmission ROW (**Figure 25**).

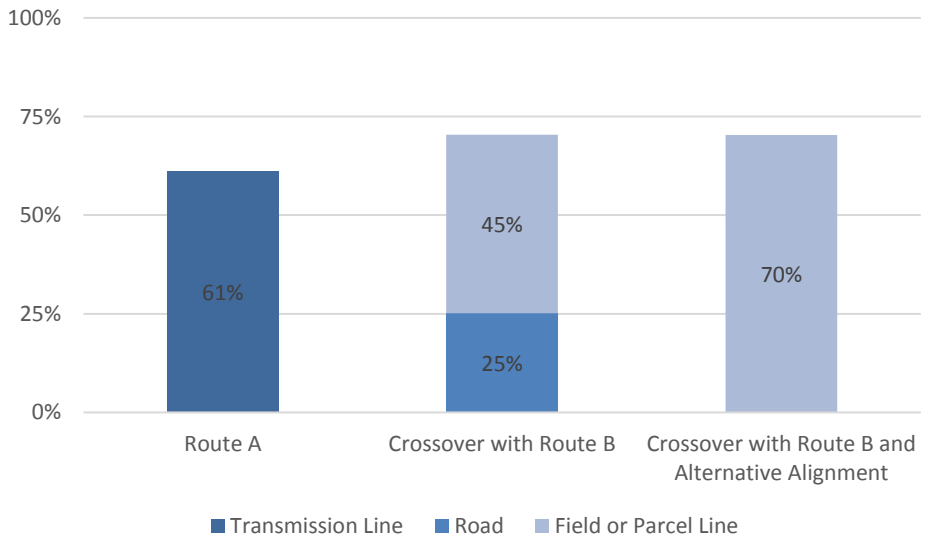
Figure 25. ROW Sharing – Salem Creek Routing Options



6.11.4 Byron Routing Options

Route A follows transmission line ROW for 61 percent of its length (**Figure 26**). Crossover with Route B follows road ROW for one-quarter of its length. The Crossover with Route B and the West 270th Avenue alignment does not follow existing infrastructure.

Figure 26. ROW Sharing - Byron Routing Options



6.12 Costs Dependent on Design and Route

The Commission considers the cost of the transmission project, and how this cost might vary with design and route in its determining the most appropriate route for the transmission line.

As discussed in **Section 4.1.8**, the cost of the transmission project is estimated be between $40.5 and $46.5 million. The cost variation between routes is due to the length of the transmission line, the substation costs are equal between route alternatives. Annual inspection and maintenance costs are anticipated to be approximately $900 per mile.

6.13 Relative Merits of Route Alternatives

The Commission is charged with locating transmission lines in a manner that is "compatible with environmental preservation and the efficient use of resources" and that minimizes "adverse human and environmental impact(s)" while ensuring electric power reliability (Minnesota Statutes, section 216E.02). Minnesota Statute, section 216E.03, subdivision 7(b) identifies considerations that the Commission must take into account when designating transmission lines routes.

Minnesota Rules, part 7850.4100 lists 14 factors for the Commission to consider in its route permitting decisions, including impacts on human settlements, impacts on land-based economies, and impacts on the natural environment:

A. Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services.
B. Effects on public health and safety.
C. Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining.
D. Effects on archaeological and historic resources.
E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna.
F. Effects on rare and unique natural resources.
G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity.
H. Use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries.
I. Use of existing large electric power generating plant sites.
J. Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way.
K. Electrical system reliability.
L. Costs of constructing, operating, and maintaining the facility which are dependent on design and route.
M. Adverse human and natural environmental effects which cannot be avoided.

N. Irreversible and irretrievable commitments of resources.

This chapter discusses the route alternatives and their merits relative to these routing factors. The discussion here uses text and a stoplight graphic to describe the relative merits of the route alternatives (**Table 50**). For routing factors where impacts are anticipated to vary with the route alternatives, the graphic represents these anticipated impacts and compares them across alternatives. For routing factors that express the state of Minnesota's interest in the efficient use of resources (e.g., the use and paralleling of existing rights-of-way), the graphic represents the consistency of the route alternatives with these interests and compares them one to the other.

Table 50. Guide to Relative Merits of Route Alternatives

Anticipated Impact or Consistency with Routing Factor	Color/Shape
Impacts anticipated to be minimal with the conditions in section 5.0 of the Commission's generic route permit – OR- route alternative is very consistent with the routing factor	
Impacts anticipated to be minimal to moderate with the conditions in section 5.0 of the Commission's generic route permit template; special conditions may be required for mitigation – OR – route alternative is very consistent with the routing factor, but less so than other route alternatives	
Impacts anticipated to be moderate to significant and likely unable to be mitigated – OR – route alternative is not consistent with the routing factor or consistent only in part.	

The discussion here focuses on the first 12 routing factors of Minnesota Rules, part 7850.4100 (factors A through L). Routing factors M and N—the unavoidable and irreversible impacts of the project—are discussed at the end of this chapter.

Routing factor I, the use of existing large electric power generating plant sites, is not relevant to this project and is not discussed further here. Routing factor G ("mitigate adverse environmental impacts") has several parts and speaks generally to environmental impacts. For purposes of discussion here, and with respect to routing factor G, it is assumed that all route alternatives are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (e.g., effects on flora and fauna, routing factor E).

Finally, routing factors H and J address similar issues, the use or paralleling of existing rights-of-way. Routing factor H relates to the use or paralleling of existing rights-of-way, but also includes items that do not have a ROW—survey lines, natural division lines, and agricultural field boundaries. Routing factor J relates to the use of existing transportation, pipeline, and electrical transmission rights-of-way. For purposes here, these factors will be considered as one—the use or paralleling of existing rights-of-way, where there is infrastructure that has a ROW. However, the discussion here includes, as appropriate, comment on the use of lines and boundaries by the route alternatives.

6.13.1 Impacts Shared by Route Alternatives

Potential impacts are anticipated to be minimal and not to vary significantly among route alternatives for the following routing factors and elements:

- Impacts on human settlements (factor A)—noise, property values, electronic interference, cultural values, zoning and land use compatibility, railways, public utilities, emergency services, or airports.
- Impacts on public health and safety (factor B)—electric and magnetic fields, implantable medical devices, stray voltage, induced voltage, and air quality.
- Impacts on land-based economies (factor C)—forestry, mining, and recreation and tourism.
- Impacts on archaeological and historic resources (factor D).
- Impacts on electric system reliability (factor K).

Impacts to fauna and water resources are anticipated to be minimal and mitigated by conditions in the Commission's generic route permit template (Appendix C) and those in downstream permits.

6.13.2 Impacts Varying between Route Alternatives

Potential impacts are anticipated to vary among route alternatives for the following routing factors and elements:

These factors and factor elements are summarized here and in Table 51.

6.13.2.1 Human Settlements

- Both routes A and B are anticipated to have minor to moderate aesthetic impacts. However, Route A is anticipated to slightly minimize aesthetic impacts due to being somewhat further from homes and more closely following existing infrastructure (roads and transmission lines) than Route B.
- There are no homes within the anticipated ROW of Route A. There is one home within Route B's anticipated ROW. Although DCW indicates that no displacements of residences are planned as a result of the project, it is possible that this residence would be displaced if Route B is selected. Both routes have five (5) non-residential buildings within the anticipated ROW.
- DCW proposes to construct portions of both routes within county road ROW. The placement of transmission lines could affect plans for future road expansions or realignments.

6.13.2.2 Land Based Economics

The primary land use in the project area is agriculture. Route A minimizes impacts to agricultural lands compared to Route B, although both routes would result in the loss of some cultivated land. No impacts to forestry or mining are anticipated from the project

6.13.2.3 Natural Resources

Although impacts to natural resources are anticipated to be minimal to moderate for both routes A and B, there are some differences between the routes. Avoidance of the Salem Creek area through use of the Route B-Crossover segment will further minimize the potential for impacts to wetlands, vegetation, and wildlife habitat.

6.13.2.4 Rare and Unique Natural Resources

Although rare and unique species exist along both routes A and B,impacts are expected to be minimal. Proper pole placement should alow either route to span these resources, thereby avoiding direct impacts. Although it is likely that Route A would be able to span occurances of rare or unique natural resources in the McNeilus Wind Farm area, use of McNeilus Wind Farm Alighment in this area would allow the complete avoidance of a population of Sullivant's milkweed and two designated "below" areas of biodiversity

6.13.2.5 Use or Paralleling of Existing Rights-of-Way

Both routes follow existing infrastructure for a significant portion of their length – 50 percent for Route A and 45 percent for Route B. Because of its overall shorter length and relatively higher proportion of its length along existing infrastructure, Route A makes relatively better use of existing infrastructure.

6.13.2.6 Costs Dependent on Design and Route

Because Route A is shorter, the lower cost is reflecitve of its length.

Table 51. Relative Merits - Route A and B

Routing Factor / Element	Route A	Route B	Summary
Human Settlements / Aesthetics	◔	◔	Although both routes are anticipated to have minor to moderate impacts on the aesthetic environment , Route A is near fewer homes and makes relatvely better use of infrastructue than Route B.
Human Settlements / Displacement	●	◔	There are no homes and 5 buildings within the anticipated ROW of Route A. There is one home and 5 buildings within the anticipated ROW of Route B.
Human Settlements / Public Roads	◔	◔	DCW proposes to construct portions of both routes, 7.8 miles of Route A and 11.2 miles of Route B, within county road ROW. The placement of transmission lines could affect plans for future road expansions or realignments.
Land-Based Economies / Agriculture	◔	◔	The overall impact on agricultural lands is anticipated to be minimal to moderate for both routes. However, due to its shorter length, Route A best minimizes agricultural impacts from the transmission line.
Natural Environment / Surface Waters	◔	◔	Impacts to surface waters are anticipated to be minimal to moderate for both routes A and B. There are differences between these routes in the Salem Creek area (see **Table 53**)
Natural Environment/ Wetlands	●	●	Impacts to wetlands are anticipated to be minimal for both routes A and B. There are differences between these routes in the Salem Creek area (see **Table 53**)
Natural Resources/ Vegetation	◔	◔	Vegetation impact for both routes would be minimal to moderate. Route B would impact a greater area due to its length, while Route A would result in the approximately 2.6 acres of tree removal,compared to 0.5 acres for Route B.
Natural Resources/ Wildlife	●	●	Impacts to wildlife are anticipated to be minimal for both routes. Route A contains a higher acreaage of higher value habitatl types such as forest, grassland, and pature, although the acreasge for both routes are relavievly small (35 acres for Route A and 7 acres for Route B). Much of the identified habitat area is near Salem Creek (see **Table 53**)
Rare and Unique Natural Resources	◔	◔	Although rare and unique species exist along both routes A and B,impacts are expected to be minimal. Proper pole placement should alow either route to span these resources, thereby avoiding direct impacts.
Use or Paralleling of Existing Rights-of-Way	●	◔	While both routes parallel existing features for the majority of their length, Route A makes relatively better use of existing infrastructure (roads and transmission lines).
Costs Dependent on Design and Route	●	◔	The only variable in costs between routes A and Bi is the route length. Because Route A is shorter, the lower cost is reflecitve of its length.

6.13.2.7 McNeilus Wind Farm Area

With respect to the routing alternatives in the McNeilus Wind Farm area, there are no differences in impacts to displacement, surface water, wetlands, wildlife, or costs between routing options. Difference in other routing factors are summarized in Table 52.

Table 52. Relative Merits - McNeilus Wind Farm Area

Routing Factor / Element	Route A- Original Alignment	Route A – McNeilus Wind Farm Alignment	Summary
Human Settlements / Aesthetics	◒	◒	Both alignment alteratives would affect the visual landscape. The McNeilus Wind Farm alignment is generally further from homes.
Land-Based Economies / Agriculture	●	●	Route A has less agricultural land within the anticipated ROW, but the McNeilus Wind Farm Alignment Alternative has fewer structures because its cross-country alighment allows for longer spans between structures compated to Route A.
Natural Environment / Flora	◒	●	Use of the McNeilus Wind Farm alignment in this area woud minimize tree clearing
Rare and Unique Natural Resources	◒	●	The McNeilus Wind Farm Alighment would allow the complete avoidance of a population of Sullivant's milkweed and two designated "below" areas of biodiversity. It is likely that Route A could also avoid these areas with proper pole placement to span these habitat areas.
Use or Paralleling of Existing Rights-of-Way	●	◒	Route A makes better use of existing road ROW in this area, following the road for 76 percent of its length.

6.13.2.8 Salem Creek Area

With respect to the Salem Creek area, there are no differences in displacement or costs between routes. Difference in other routing factors are summarized in Table 53.

Table 53. Relative Merits - Salem Creek Routing Options

Routing Factor / Element	Route A- Original Alignment	Route A – Salem Creek Alignment	Route B – Crossover	Summary
Human Settlements / Aesthetics	◓	◓	◓	On balance Route A with the Salem Creek Alternative and Route B-Crossover minimize the impact due to their greater distance from homes.
Land Based Economies / Agriculture	●	●	●	Route A as originally proposed minimizes impacts to agricultural land.
Natural Environment/ Surface Waters	◓	◓	●	Both Route A options in this area would result in permanent impacts to vegetation at the water crossing. Route B-Crossover would create temporary vegetation impacts at stream crossing.
Natural Environment/ Wetlands	●	◓	●	Route A with the Salem Creek Alternative Alignment would convert the forested/shrub wetland in this area. Wetland impacts are expected to be minimal with both the Route A original alignment and the Route B-Crossover routing options in this area.
Natural Environment / Flora	◓	◓	●	Both Route A options in this area would result in permanent impacts to vegetation at the water crossing. Route B Crossover would create only temporary vegetation impacts at stream crossing.
Natural Resources / Wildlife	◓	◓	●	Using the amount of tree clearing as a proxy for potential wildlife impact, Route-B crossover minimizes tree clearing compared to either of the Route A alternatives in this area.
Rare and Unique Resources	◓	◓	●	Using Route B-Crossover avoids the potential for impacts to MBS sites of moderate quality. Route B-Crossover crosses the Salem Creek tributary frther upstraam from known aquatic state-listed species.
Use or Paralleling of Existing Rights-of-Way	●	◓	◓	Route A makes better use of existing road ROW in this area, following the road for 31 percent of its length. Neither Route B alternative follows road or transmission ROW..

6.13.2.9 Byron Area

With respect to the Byron area, there are no substantive differences between routes with respect to displacement, agricultural land use, or costs.

Table 54. Relative Merits - Byron Area Route Options

Routing Factor/Element	Route A	Route B – Original Alignment	Route B – West 270th Avenue	Summary
Human Settlement - Aesthetics	◔	◔	◔	Route A is further from homes an d parallels existing transmission lines for most of its length in this area
Natural Resources / Surface Waters	◔	●	●	Route A would cross two PWI streams in this area, resulting in temporary impacts from clearing along Cascade Creek and permanent impacts from tree clearing along an unnamed stream. Both Route B options avoid water crossings in this area.
Natural Resources / Wetlands	●	●	●	Route A would cross three freshwater emergent basins, likely creating some temporary construction impacts. Route B options are likely to minimize temporary impacts compared to Route A in this area.
Natural Resources / Flora	●	●	●	Impacts to vegetation would be minimal for all routing options, but either of the Route B alternatives would eliminate clearing of a small area (o.1 acres) of deciduous trees along Route A.
Natural Resources / Wildlife	◔	●	●	The Route B alternatives minimize potential wildlife impacts by minimizing tree clearing and water crossings.
Rare and Unique Natural Resources	●	◔	◔	Route A avoids known rare and unique species in this area. Both Route B alternatives can likely avoid impacts to rare and unique natural resources by using proper pole placement, but the potential for impacts still exists due to the presence of species in this area.
Use or Paralleling of Existing Rights-of-Way	●	◔	◔	Route A makes better use of existing ROW in this area, following existing transmission lines for 61 percent of its length.

6.14 Unavoidable Impacts

Transmission lines are large infrastructure projects that have adverse human and environmental impacts. Even with mitigation strategies, such as prudent routing, there are adverse impact of the transmission project that cannot be avoided. These impacts are anticipated to occur for all route alternatives. To the extent that impacts vary by alternative, these variations are discussed above.

Aesthetic impacts cannot be avoided. The transmission project would introduce new transmission line structures and conductors into the project area disrupting existing viewsheds and creating an adverse aesthetic impact.

Temporary construction-related impacts, including construction-related noise and dust generation and disruption of traffic near construction sites, are also unavoidable.

The transmission project will also create unavoidable impacts to agriculture. Because the majority of the land across all routes is agricultural, primarily row crops, the installation of the DCW Substation and transmission structures will result in the loss of tillable acreage and constraints on the layout and management of field operations. The addition of the transmission structures and conductors also constrain some agricultural spraying by aircraft.

Finally, impacts to the natural environment cannot be avoided.

6.15 Irreversible Commitment of Resources

The commitment of a resource is irreversible when it is impossible or very difficult to redirect that resource for a different future use. An irretrievable commitment refers to the use or consumption of a resource such that it is not recoverable for later use by future generations. These types of commitments are anticipated to occur for all route alternatives and not to vary significantly among alternatives

The commitment of land for a transmission line ROW is likely an irreversible commitment. In general, lands in the rights-of-way for large infrastructure projects such as railroads, highways, and transmission lines remain committed to these projects for a relatively long period of time. Even in instances where a ROW is abandoned the land within the ROW is typically repurposed for a different infrastructure use, such as a rails-to-trails program, and is not returned to a previous land use. This said, transmission line rights-of-way can be returned to a previous use (e.g., row crop, pasture) by the removal of structures and structure foundations to a depth that supports this use.

There are few commitments of resources associated with the project that are irretrievable. These commitments include the steel, concrete, and hydrocarbon resources committed to the project, though it is possible that the steel could be recycled at some point in the future. Labor and fiscal resources required for the project are also irretrievable commitments.

7 Cumulative Effects

Cumulative potential effects are impacts on the environment that result from "the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation haves been laid, regardless of what person undertakes the other projects or what jurisdictions have authority over the projects."[356]

Consideration of cumulative potential effects is intended to aid decision-makers so that they do not make decisions about a specific project in a vacuum. Effects that may be minimal in the context of a single project may accumulate and become significant when all projects are considered.

Cumulative effects are discussed here for projects that are foreseeable in the next 5 to 20 years in the project area. It is assumed that the construction-related impacts of these projects are short-term. The discussion here is focused on the potential long-term impacts of these projects. A number of agencies and local governments were contacted (or websites reviewed) to identify foreseeable projects in the project area, including MnDOT; Steele, Dodge, and Olmstead counties; and the cities of Owatonna, Dodge Center, Kasson, and Byron.

[356] Minnesota Rules, part 4410.0200, subpart 11a

Table 55. Anticipated Future Projects in Project Area

Project	Location	Timeframe
US Highway 14 Expansion - Expand highway to four lanes (from its current two lanes) between Dodge Center and Owatonna. The project would also move the highway from its current location to south of Claremont. Timeframe TBD	Dodge Center - Owatonna	2020-2021
Airport Drive North Reconstruction	Dodge Center	2020
1st Street SE Reconstruction	Dodge Center	2020
1st Avenue SE Reconstruction	Dodge Center	2020
2nd Avenue SE Reconstruction	Dodge Center	2020
US Highway 14 Improvements – Planning process currently underway to improve safety and access along Highway 14, including potential changes in access from 260th Avenue, Dodge County 15 (270th Avenue), and 280th Avenue/19th Avenue (County line) https://www.us14corridoranalysis.com/	Kasson – Olmsted CR 104 (60th Avenue)	Preliminary – 2021 - 2029
Reconstruction of County State Aid Highway (CSAH) 5 from CSAH 25 to US Highway 14	Cascade Township, South of Byron	2024
Solar Farm	Kalmar Township, North of Byron	2019-2010
16th Street NE Reconstruction	Kasson	2019
Storm Sewer Project	Kasson	2019-2020
Residential Development	Kasson	2020
Highway 57 Reconstruction	Kasson	2021
Highway 57/16th Street NE Roundabout	Kasson	Unknown
Trail Connections	Kasson	2020
16th Street NW Extension	Kasson	2020
Soo Green Renewable Rail Project - A 525 kV DC transmission line connecting wind power in Iowa with the Chicago market. Preferred route is in Iowa, some maps appear to identify an alternative route along the Canadian Pacific Railroad through Dodge Center	Dodge Center?	Unknown - Very Tentative

Although the outreach done in preparation for this section identified only one community solar garden, there are likely to be several solar farm developments of various sizes in the project area in the foreseeable future as installed solar capacity continues to grow in Minnesota. The locations of new solar facilities are unknown at this time. To date, solar facilities in Minnesota tend to fall into one of two categories:

- Community solar gardens are connected to the electric distribution grid and are typically limited in size to one MW, resulting in a fenced area of 8 to 20 acres. Community solar gardens, are permitted by local jurisdictions (typically townships or counties).
- Utility-scale solar farms greater than 50 MW are typically connected to the electric transmission grid and require several hundred acres. Utility-scale solar farms are permitted by the Commission.

7.1.1 Human Settlements

Cumulative potential effects on human settlements are anticipated to be minimal. Future projects will result in aesthetic impacts. Most will occur in areas that are already well-developed, e.g., in cities, along existing roads and highways.

Although the locations of future solar facilities are unknown at this time, solar facilities would change the aesthetics of the area.

Both the wind farm and transmission elements of the DCW Project will result in aesthetic impacts (Sections 3.3.5.4 and 6.4.1). Thus, aesthetic impacts will increase in the project area as a result of foreseeable projects. Many projects would have positive effects on human settlements—e.g., improving property values in cities as result of development, developing land consistent with local zoning, and improving transportation.

7.1.2 Public Health and Safety

Cumulative potential effects on public health and safety are anticipated to be minimal to slightly positive. Impacts on public health and safety as a result of the Dodge County Wind Project are anticipated to be minimal (Chapter 6). The majority of projects foreseen in the project area are road and highway related. They are undertaken to maintain and improve local roads to ensure their safe operation and the public's health and safety

7.1.3 Land-Based Economies

Cumulative potential effects on land-based economies are anticipated to be minimal. The majority of identified projects are in urban areas in cities or along roadways. A minimal amount of land would be converted from agricultural use to other uses. Where conversion does occur, it would occur consistent with local land-use and zoning regulations.

7.1.4 Natural Environment

Cumulative potential effects on the natural environment are anticipated to be minimal. The majority of projects are in well-developed areas in cities or along roadways. Impacts are limited along roadways by the use of existing infrastructure ROW. The DCW Wind Farm would impact birds and bats. Birds and bats are susceptible to collision with wind turbine blades (Section 3.3.4.2). These impacts can be minimized by proper siting and operational controls. The DCW transmission project has the potential

to impact birds through collision with transmission line conductors. Thus, impacts to species that fly would increase in the project area as a result of foreseeable projects.

7.1.5 Rare and Unique Natural Resources

Cumulative potential effects on rare and unique natural resources are anticipated to be minimal. There are relatively few rare and unique species in the project area (Chapter 6.9.8). The majority of projects are in well-developed areas in cities or along roadways. These areas generally do not provide habitat for rare and unique species, nor do they typically support rare communities.

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