February 2019

PUBLIC SERVICE COMMISSION OF WISCONSIN
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Cardinal-Hickory Creek Transmission Line

Draft Environmental Impact Statement

PSC Docket 5-CE-146

Date Issued: February 2019

PUBLIC SERVICE COMMISSION OF WISCONSIN

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Cardinal-Hickory Creek Transmission Line Project

Public Service Commission of Wisconsin
4822 Madison Yards Way
P.O. Box 7854
Madison, Wisconsin 53707-7854
Phone 608.266.5481 • Fax 608.266.3957
Home Page: http://psc.wi.gov

Wisconsin Department of Natural Resources
101 South Webster Street
P.O. Box 7921
Madison, Wisconsin 53707-7921
Phone 608.266.0426 • Fax 608.266.5226
Home Page: http://dnr.wi.gov

This draft Environmental Impact Statement for the proposed Cardinal-Hickory Creek 345 kilovolt transmission line project is progress towards compliance with the Public Service Commission's requirement under Wis. Stat. § 1.11 and Wis. Admin. Code § PSC 4.30. It also is progress toward compliance with the Department of Natural Resources requirements under Wis. Admin. Code § NR 150.22.

By: ______________________________ Date: February 28, 2019

Adam Ingwell
WEPA Coordinator
Public Service Commission of Wisconsin

Questions about information provided in this draft Environmental Impact Statement should be directed to:

Cindy Burtley
(environmental)
Public Service Commission
(608) 267-6718
Cindy.Burtley@wisconsin.gov

or

Alexander Vedvik
(engineering)
Public Service Commission
(608) 267-9099
Alexander.Vedvik@wisconsin.gov

Lindsay Tekler
Department of Natural Resources
(608) 535-2602
Lindsay.Tekler@wisconsin.gov

Geri Radermacher
Department of Natural Resources
(262) 574-2153
Geri.Radermacher@wisconsin.gov

To the Reader

This draft environmental impact statement (EIS) fulfills part of the requirements of the Wisconsin Environmental Policy Act (WEPA), Wis. Stat. § 1.11. WEPA requires state agencies to consider environmental factors when making major decisions. The purpose of this draft EIS is to provide the decision makers, the public, and other stakeholders with an analysis of the economic, social, cultural, and environmental impacts that could result from the construction of the proposed 345 kV transmission line and its associated facilities. This document has been prepared jointly by the Public Service Commission of Wisconsin (Commission or PSC) and the Wisconsin Department of Natural Resources (DNR).

You are encouraged to comment on this draft EIS. The state agency comment period on this draft EIS ends on April 14, 2019. Please use the PSC docket number 5-CE-146 on all e-mail and correspondence. Written comments should be addressed to:

Akanksha Craft
Docket Coordinator
Public Service Commission
P.O. Box 7854
Madison, WI 53707-7854
(608) 267-9509
Akanksha.Craft@wisconsin.gov

Comments may also be submitted electronically at the Commission's web site at http://psc.wi.gov. Once at the site, click on the "E-Services" tab on the top right menu bar, toward the right of the page. On the next page select the "File a comment" link that appears on the left side of the page. Locate the Cardinal-Hickory Creek docket (5-CE-146) and file a comment. Specific questions on the draft EIS should be addressed to:

Cindy Burtley
Public Service Commission
(608) 267-6718
Cindy.Burtley@wisconsin.gov

Lindsay Tekler
Department of Natural Resources
(608) 535-2602
Lindsay.Tekler@wisconsin.gov

Geri Radermacher
Department of Natural Resources
(262) 574-2153
Geri.Radermacher@wisconsin.gov

Alexander Vedvik
(engineering)
Public Service Commission
(608) 267-9099
Alexander.Vedvik@wisconsin.gov

Comments received during the comment period will be used to prepare the final EIS, which will become part of the record used by the Commission to make its final decisions on this project. At this time, the Commission decision on the proposed project is expected in September 2019.

The Commission decision on the merits of this project will be based on the record of a public hearing that will be held about 30 days after the final EIS is issued. When the final EIS is prepared, the Commission will issue a Notice of Hearing. The hearing will satisfy the WEPA requirements of the Commission and DNR. The final EIS and testimony from the public hearing will be included in the hearing record.

If necessary, DNR will hold separate hearings on its water permits or other DNR regulatory actions discussed in this draft EIS.

Table of Contents

List of Tables

List of Figures

Contributors and Reviewers

CONTRIBUTORS

Public Service Commission

Aaron Greene
Adam Ingwell
Ajinkya Rohankar
Akanksha Craft
Alexander Vedvik
Andrew Craft
Cindy Burtley
Daniel Grant
Jim Lepinski
Paul Rahn
Stacy Schumacher
Tyler Tomaszewski

Department of Natural Resources

Geri Radermacher
Lindsay Tekler
Stacy Rowe

REVIEWERS

Public Service Commission

Adam Ingwell
Cindy Burtley
Jana Thompson
Jim Lepinski

Department of Natural Resources

Ben Callan
Geri Radermacher
Lindsay Tekler
Stacy Rowe

Executive Summary

On April 30, 2018, American Transmission Company LLC, ITC Midwest LLC, and Dairyland Power Cooperative (together, applicants) filed an application with the Public Service Commission of Wisconsin (Commission) under Wis. Stat. § 196.491 and Wis. Admin. Code § PSC 111.53 for authority to construct new transmission facilities. The applicants are seeking the Commission's approval of the project and the issuance of a Certificate of Public Convenience and Necessity (CPCN). The primary focus of the proposed Cardinal-Hickory Creek Transmission Line Project (Cardinal-Hickory Creek) is to install a new 345 kilovolt (kV) transmission line from the Hickory Creek Substation in Dubuque County, Iowa to the Cardinal Substation in Dane County, Wisconsin. Depending on approvals and possible route alternatives selected by the Commission, the new Cardinal-Hickory Creek 345 kV transmission line would be between 84 and 105 miles long. The Cardinal-Hickory Creek project also includes construction of a new intermediate Hill Valley Substation in Grant County, as well as perform a variety of modifications at substations in northeast Iowa and southwest Wisconsin.

PROPOSED CARDINAL-HICKORY CREEK PROJECT

In Wisconsin, the proposed Cardinal-Hickory Creek 345 kV transmission line would begin by crossing the Mississippi River in Cassville, travel northeast to Montfort to connect to the proposed Hill Valley Substation, and end at the Cardinal Substation in Middleton (Figure ES-1). In this EIS, the applicants' proposed route subsegments have been combined into several route alternatives that have then been grouped into four distinct routing areas to facilitate the Commission's evaluation of the proposed project. These four routing areas provide an organizational tool for presenting and analyzing information about the ecological and socioeconomic impacts of the proposed project for each proposed route alternative. The distinct geographic routing areas and their associated chapters within this EIS are the:

- Mississippi River Routing Area (Chapter 6),
- Western Routing Area (Chapter 7),
- Eastern Routing Area (Chapter 8), and
- Dane County Routing Area (Chapter 9).

The proposed project must cross the Mississippi River to get from the Hickory Creek Substation (Dubuque County, IA) to the Cardinal Substation (Dane County, WI). The applicants have proposed two different areas where it could cross the Mississippi River in Cassville, WI, either connecting to the Stoneman Substation (existing crossing) or the Nelson Dewey Substation (new crossing). Each route alternative contains common subsegments that would be shared by either route alternative, and have been included in the quantification of impacts for each route alternative throughout the tables in this EIS.

The route alternatives within each routing area that are being evaluated in this EIS include the following (Figure ES-1):

- Mississippi River Routing Area
  1. Nelson Dewey-North
  2. Nelson Dewey-South
  3. Stoneman-North
  4. Stoneman-South

- Western Routing Area
  1. Western-North
  2. Western-South

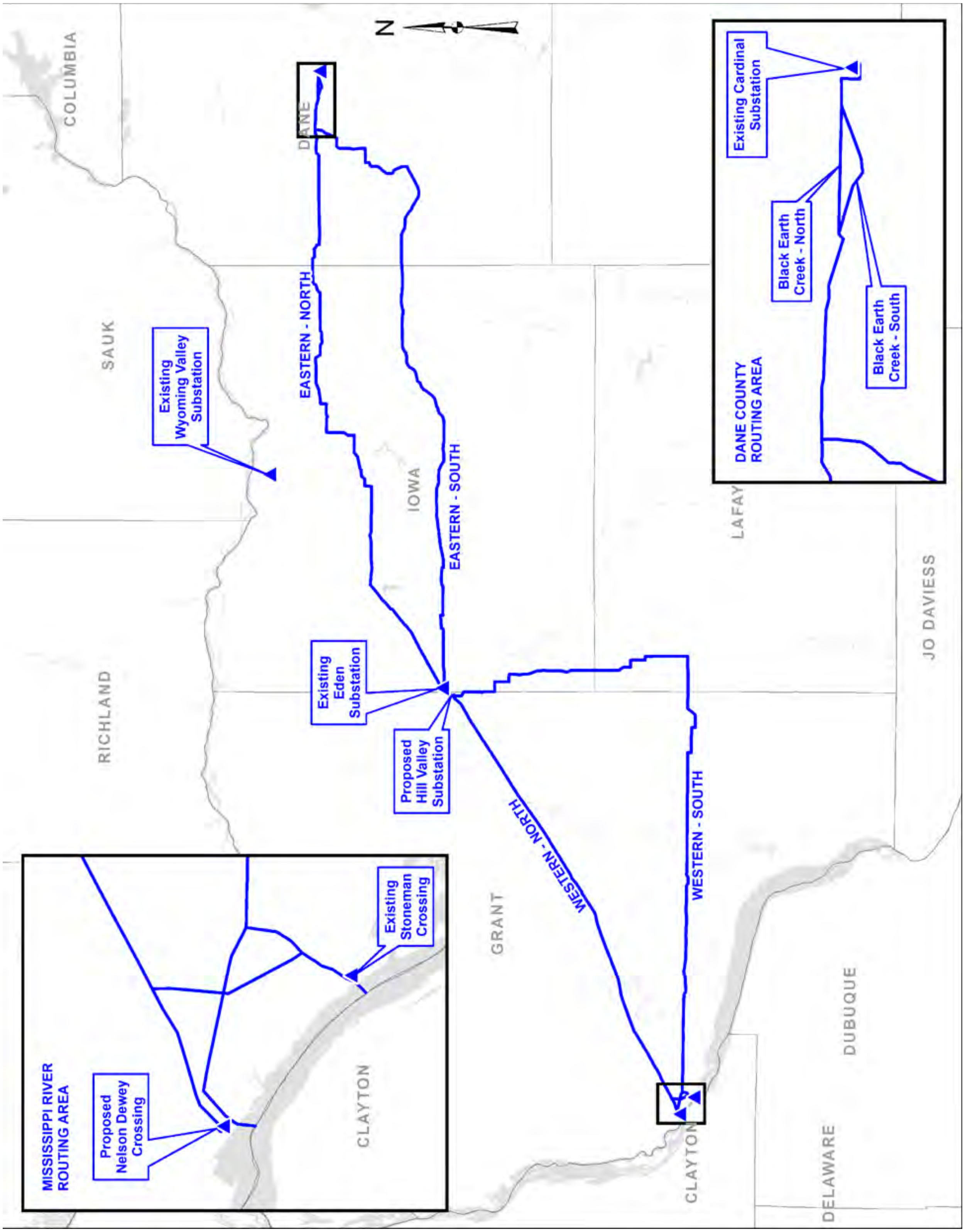
- Eastern Routing Area:
  1. Eastern-North
  2. Eastern-South

- Dane County Routing Area
  1. Black Earth Creek-North
  2. Black Earth Creek-South

The proposed route alternatives would cross the counties of LaFayette, Grant, Iowa, and Dane, and potentially involve 38 municipalities and townships. In Wisconsin, if the project is approved by the Commission a new 345kV transmission line would be constructed that is approximately 84 to 105 miles long with an average right-of-way (ROW) width of 150 feet.

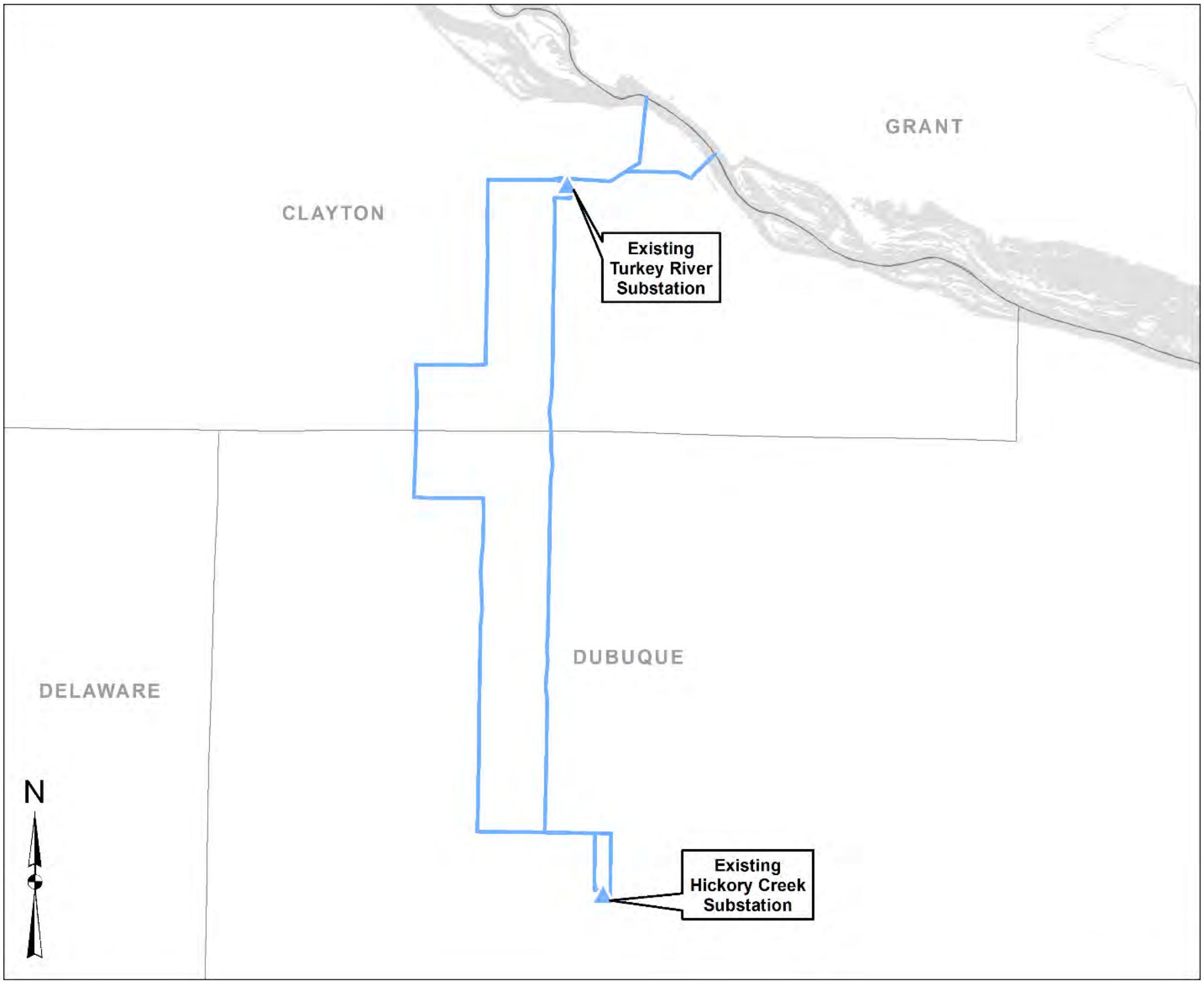
The Cardinal-Hickory Creek project would also include construction of a new intermediate substation in Grant County (i.e. Hill Valley Substation), as well as perform a variety of modifications at substations in northeast Iowa and southwest Wisconsin including the Hickory Creek, Turkey River, Stoneman, Nelson Dewey, Eden, Wyoming Valley, and the Cardinal Substations.

Figure ES-1 Route alternatives within each routing area that are being evaluated in this EIS



The proposed project would also include approximately 14 miles of 345kV transmission facilities in Iowa before it reaches Wisconsin. This portion of the applicants' project starts at the Hickory Creek Substation in Clayton County, Iowa, travels north through the Upper Mississippi River National Wildlife and Fish Refuge (Refuge), and then east across the Mississippi River into Wisconsin (Figure ES-2).

Figure ES-2 Proposed Cardinal-Hickory Creek 345 kV route in Iowa



In addition to the proposed route alternatives, the applicants have provided information on additional project options that are under consideration by the U.S. Department of Agriculture-Rural Utilities Services (RUS). RUS is the lead agency coordinating the development of the federal environmental impact statement (EIS) for the Cardinal-Hickory Creek project as a result of DPC requesting financial assistance as a partial owner of the proposed project. During its review of DPC's application for financial assistance, RUS is also responsible for reviewing the engineering purpose and need, feasibility, alternatives, and cost of the proposed project. The applicants are not proposing these additional project options as siting alternatives for the Commission in this proceeding.

The majority of the transmission line structures proposed for this project would be self-supporting tubular steel monopoles that would range from 120 to 175 feet tall with spans of 750 to 1,100 feet between structures. At the crossing of the Mississippi River, the proposed steel H-frame structures would be between 173 and 198 feet tall with a minimum wire to ground clearance between 91 and 94 feet.

The overall cost of the Cardinal-Hickory Creek Project would range between $474 million to $560 million, depending on the final route alternatives selected. These costs are estimated in 2023 dollar costs, which is the projected in-service year for the project. The estimated project cost includes substation modifications, the new Hill Valley Substation, distribution line relocations, land acquisitions, precertification, and allowance for funds used during construction (AFUDC) for ITC and DPC.

There are numerous intervenors in the Cardinal-Hickory Creek docket including utilities, individual landowners, a number of municipal government offices, and environmental advocacy groups. The primary issues of contention, based on comments received during the scoping process, include:

1) the need for the proposed project;
2) fair evaluation of non-transmission/local renewable energy resources;
3) aesthetics of the proposed project;
4) impacts to tourism and local businesses;
5) individual hardships and property impacts, and
6) impacts to the Driftless Area.

NEED FOR THE PROPOSED PROJECT

Commission staff's analysis of project need is on-going and will be covered in greater detail in the final EIS. The need for the proposed Cardinal-Hickory Creek project is and will continue to be a subject of scrutiny throughout the Commission's review process including during the public and technical hearings.

The applicants' stated purposes for the Cardinal-Hickory Creek transmission line project are to:

- Provide economic benefits to Wisconsin customers;
- Avoid the expenditure on reliability and asset renewal projects that would be needed if the proposed project were not constructed;
- Increase the transfer capability of the electric system between northeastern Iowa, and southwest and southcentral Wisconsin, ease congestion and improve generator competition;
- Allow the transfer of wind energy from the west to Wisconsin;
- Support wind energy resources that have requested interconnection in Iowa and areas west of Wisconsin;
- Eliminate the need for three MISO system operating guides in southwest and southcentral Wisconsin currently requiring load shedding and/or other operational actions under certain contingencies; and
- Create other reliability and public policy benefits stemming from a more robust and flexible electric transmission system in the state.

The analysis of need provided in the project application relied heavily on the planning process of the Midcontinent Independent System Operator (MISO). This stated need could be summarized under the following three categories of benefits that MISO's multi-value (MVP) projects are required to provide: 1) improve electric system reliability locally and regionally; 2) deliver economic savings for Wisconsin utilities and electric consumers; and 3) expand infrastructure to support the public policy of greater use of renewables. More information about the MISO process and purpose of the proposed project is included in Chapter 3.

Existing Transmission Resources

The southwest and southcentral Wisconsin area is served by a network of 161 kV and 69 kV lines along with some 138 kV lines. The Badger Coulee 345 kV project (docket 5-CE-142) connects the Briggs Road Substation in Onalaska on the west end to the North Madison Substation in Vienna and the Cardinal Substation in Middleton on the east end.

The existing Eden 138/69 kV Substation near Montfort, Wisconsin does not have any transmission facilities above the 138 kV voltage level. The existing Hickory Creek 345/161 kV Substation is connected to the Hazleton-Salem 345 kV line.

The applicants state that there is need to improve west to east power flow capability in order to relieve transmission system congestion. They believe that the proposed Cardinal-Hickory Creek project would increase the transfer capability of the electric system between northeastern Iowa, and southwest and southcentral Wisconsin by approximately 1,300 Megawatts (MW). The applicants also state that the project would provide an outlet for approximately 25 Gigawatts (GW) of wind energy resources in Iowa and areas west of Wisconsin. In addition, the applicants state that the project would eliminate the need for three transmission system operating guides in southwest and southcentral Wisconsin, which currently require load shedding and/or other operational actions under certain contingencies due to reliability concerns in the area.

SYSTEM ALTERNATIVES

The applicants considered several non-transmission and transmission alternatives to the proposed project. These non-transmission and transmission alternatives are described further in Section 3.9 of the EIS.

The non-transmission alternatives that were evaluated and considered by the applicants include:

- **Energy efficiency and load reduction**: This alternative considers reduced energy consumption and peak load, above that achieved historically by Focus on Energy.
- **Generation**: This alternative studies if additional generation resources would mitigate the need for the proposed project. These new generation sources include new natural gas, wind, and solar resources.
- **No-build alternative**: The applicants used the No-Build Alternative as a reference case for evaluating the proposed Cardinal-Hickory Creek project, other transmission, and non-transmission system alternatives considered.

In addition to the non-transmission alternatives, a number of transmission alternatives were also described in the application including:

- **Low-voltage alternative (LVA)**: This alternative would consist of construction and upgrades to multiple 138 kV transmission facilities and construction of a new 345 kV transmission line from Hickory Creek Substation in New Vienna, Iowa to an expanded Nelson Dewey Substation in Cassville, WI. The LVA has a total project cost estimate of $356 million in year-of-occurrence dollars and the present value (discounted to year 2018) of the change in net transmission charges to Wisconsin transmission network customers is estimated to be $220.6 million.
- **Other transmission alternatives**: The applicants assert that any substitute transmission alternative to the proposed project should meet the main criteria of the MVP in the MISO 2011 MVP portfolio. They state that the Wisconsin portion of any 345 kV transmission alternative

must begin in Cassville. At the northern end, the applicants point out that there are a number of potential endpoints that would meet the required criteria. These locations include:

- Existing Cardinal Substation
- Existing North Madison Substation
- Existing Rockdale Substation
- New Kitty Hawk Substation
- New Paddock Substation

The applicants state that they performed a full evaluation of each transmission system alternative by comparing all identified benefits and costs for each alternative, both quantitative and qualitative. Further discussion of the applicants' system alternatives analyses and results are detailed Section 3.9.4.

Commission staff is currently reviewing the transmission system alternatives provided by the applicants and various other transmission system alternatives that would be more limited in scope and cost as compared to the proposed project. In addition, staff is evaluating the need for the entire scope of the proposed project as described by the applicants.

Proposed Project and Route Alternatives

In Wisconsin, the proposed Cardinal-Hickory Creek 345 kV transmission line would begin by crossing the Mississippi River in Cassville, Wisconsin, travel northeast to Montfort, Wisconsin to connect to the proposed Hill Valley Substation, and end at the Cardinal Substation in Middleton, Wisconsin. If approved and depending on the route alternatives selected by the Commission, the new 345 kV transmission line would be between 84 and 105 miles long.

If approved, ATC would own 45.5 percent, ITC would own 45.5 percent, and DPC would own 9 percent of the Cardinal-Hickory Creek project. ITC would be the construction manager for the portion of the transmission line between Hickory Creek Substation (Dubuque, Iowa), across the Mississippi River, and to the new Hill Valley Substation (Grant County, Wisconsin). ATC would be the construction manager for the portion of the transmission line between the Hill Valley Substation (Grant County, Wisconsin) and Cardinal Substation (Dane County, Wisconsin). ATC would construct the new Hill Valley Substation, as well as for any modifications approved at the Cardinal, Eden, Nelson Dewey, and Wyoming Valley Substations. DPC would construct any approved modifications at the Stoneman Substation.

Mississippi River Routing Area

This routing area is located near Cassville, Wisconsin, and lies entirely within Grant County. The proposed project provides two separate locations (Nelson Dewey or Stoneman) for crossing the Mississippi River in Cassville, Wisconsin. There are existing 161kV and 69kV electric transmission lines that cross the Mississippi River connecting at the Stoneman Substation. A new Mississippi River crossing has been proposed that would connect the Wisconsin portion of the proposed project at the Nelson Dewey Substation, just north of the Stoneman Substation. Each of these crossing options includes two separate route alternatives (North and South) that connect to route alternatives in the Western Routing Area.

The route alternatives under consideration in this routing area are:

1. Nelson Dewey-North which only connects to Western-North
2. Nelson Dewey-South which only connects to Western-South
3. Stoneman-North which only connects to Western-North
4. Stoneman-South which only connects to Western-South

The only exception to the Commission having the primary siting authority for the proposed project in Wisconsin would be where it crosses property that is owned by a federal agency or encumbered with federal easement. The applicants would need a federal easement in the Upper Mississippi River National Wildlife and Fish Refuge (Iowa) prior to crossing the Mississippi River to get from the Hickory Creek Substation (Iowa) to the Cardinal Substation (Wisconsin). If the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers approve a ROW location within the Refuge that differs from the Commission's decision in the Mississippi River Routing Area, the location of the federal easement approved by the federal agencies would be the one that is constructed.

Western Routing Area

This routing area is located in Grant, Iowa, and Lafayette Counties. The Western Routing Area is comprised of two main route alternatives (North and South) that connect the Mississippi River Routing Area and the Eastern Routing Area. The Western-North route alternative travels northeast from the village of Cassville to the village of Montfort. The Western-South route alternative travels east from the village of Cassville to the city of Platteville and then north to the village of Montfort. Before entering the proposed Hill Valley Substation, both route alternatives would connect to common route subsegments before entering the substation.

The route alternatives under consideration in this routing area are:

1. Western-North
2. Western-South

Eastern Routing Area

This routing area is located within Iowa and Dane Counties. The Eastern Routing Area is comprised of two main route alternatives that connect the Western Routing Area near Montfort, Wisconsin and the Dane County Routing area near Cross Plains, Wisconsin. The Eastern-North route alternative generally travels north and east from the proposed Hill Valley Substation (Montfort) to Cross Plains. The Eastern-South route alternative generally travels east and north from Montfort to Cross Plains.

The route alternatives under consideration in this routing area are:

1. Eastern-North
2. Eastern-South

Dane County Routing Area

This routing area is located entirely within Dane County, and connects the Eastern Routing Area near Cross Plains, Wisconsin to the Cardinal Substation near Middleton, Wisconsin. The Dane County Routing Area starts near Cross Plains, Wisconsin and follows common route subsegments east until Cleveland Road where it separates into two route alternatives (North and South) near Black Earth Creek. From here it travels east along common route subsegments until it terminates at the Cardinal Substation in Middleton, Wisconsin.

The route alternatives under consideration in this routing area are:

1. Black Earth Creek-North
2. Black Earth Creek-South

POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

The proposed Cardinal-Hickory Creek project traverses southwestern Wisconsin from the Mississippi River to Middleton, Wisconsin, which is well-known and often referred to as the Driftless Area. Wisconsin's Driftless Area has not been glaciated for at least the last 2.4 million years and consists of significant topographic variation and unique ecological communities found nowhere else in the state. Southwestern Wisconsin contains areas of steep forested ridges and deeply dissected river valleys with numerous of spring-fed and cold-water trout streams.

In addition to the unique ecology of the Driftless Area, its social and economic significance is often considered unquantifiable to those who live and visit the area. Many have recognized the Driftless Area as a unique resource worthy of ecological, cultural, and economic importance; and thus, this area is the focus of several government, non-profit, and private partnerships and organizations that are solely focused on the conserving, restoring, and enjoying this unique area in the state. Concerns for the impacts the proposed Cardinal-Hickory Creek project could and would have on the Driftless Area are a common theme found throughout the hundreds of comments received on the project as well as the parties intervening in the proceeding for the proposed project.

Mississippi River Routing Area

The route alternatives in this routing area range from approximately 1.08 to 1.83 miles long starting at either the existing Mississippi River crossing (Stoneman Substation) or a new Mississippi River crossing (Nelson Dewey Substation).

The following contains a bulleted list of potential impacts of the proposed ROWs, identifying which routes would have the greatest or the least amount of impacts for a given resource. None of the route alternatives within this routing area would impact properties enrolled in the Managed Forest Law program (MFL) or are expected to cause impacts to wetlands within the proposed ROW. Refer to Chapter 6, Chapter 10, and Appendix B for additional information on these impacts by proposed route alternatives and route subsegments.

- **Nelson Dewey-North**
  - Greatest amount of grassland areas within the proposed ROW (9.80 acres).
  - Least amount of residences within 300 feet of the proposed ROW (0 houses).
  - Least amount of waterways crossed by proposed ROW (0 waterways).
  - Least amount of archaeological and historic resources potentially impacted by the proposed ROW (0 sites).
  - Greatest amount of avian risk areas identified within the proposed ROW (2.71 miles).
  - Greatest amount of endangered resources potentially impacted by the proposed ROW (62).

- **Nelson Dewey-South**
  - Greatest amount of new proposed ROW (90 percent).
  - Greatest amount of total agricultural land within the ROW (5.49 acres).
  - Greatest amount of forested lands requiring clearing within the proposed ROW (16.84 acres).

- **Stoneman-North**
  - Greatest amount of residences within 300 feet of the proposed ROW (20 houses).
  - The proposed ROW would be within 150 feet of two schools and one daycare; the same as Stoneman –South.
  - Greatest amount of waterways crossed by proposed ROW (2 waterways).

- Greatest amount of archaeological and historic resources potentially impacted by the proposed ROW (8 sites).
- Least amount of avian risk areas identified within the proposed ROW (0 miles).

- **Stoneman-South:**
  - Least amount of new proposed ROW (62 percent)
  - Least amount of total agricultural land within the ROW (2.51 acres).
  - Least amount of grassland areas within the proposed ROW (3.60 acres).
  - Least amount of forested lands requiring clearing within the proposed ROW (16.84 acres).
  - Would have the second greatest amount of residences within 300 feet of the proposed ROW (18 houses).
  - The proposed ROW would be within 150 feet of two schools and one daycare; the same as Stoneman –North.
  - Greatest amount of archaeological and historic resources potentially impacted by the proposed ROW (8 sites).
  - Least amount of avian risk areas identified within the proposed ROW (0 miles).
  - Least amount of endangered resources potentially impacted by the proposed ROW (35).

Western Routing Area

The route alternatives in this routing area range from approximately 32.54 miles (Western-North) to 50.42 miles (Western-South). Both route alternatives would have approximately the same amount of new proposed ROW (65 percent); however, the terrain along Western-North is steeper and more remote making construction potentially more difficult along this route alternative. Western-South primarily follows existing utility infrastructure and roads along its corridor through more open terrain. Although not always reflected in the impact tables, Western-North would have greater potential to impact more unique ecological resources and communities because it is sited in less disturbed, more remote locations.

The following contains a bulleted list of potential impacts of the proposed ROWs, identifying which route alternative would have the greatest amount of impacts for a given resource. There are no schools, daycares, or hospitals identified by the applicants within 300 feet of the proposed ROW in this routing area. Refer to Chapter 7, Chapter 10, and Appendix B for additional information on these impacts by proposed route alternatives and route subsegments.

- **Western-North**
  - Greatest amount of forested lands requiring clearing within the proposed ROW (95.59 acres).
  - Greatest amount of MFL properties (11 properties).
  - Greatest amount of wetland areas within the proposed ROW (16.70 acres).
  - Greatest amount of avian risk areas identified within the proposed ROW (2.55 miles).

- **Western-South**
  - Greatest amount of total agricultural land within the ROW (517.04 acres).
  - Greatest amount of grassland areas within the proposed ROW (227.26 acres).
  - Greatest amount of residences within 300 feet of the proposed ROW (37 houses).
  - Greatest amount of waterways crossed by proposed ROW (88 waterways).
  - Greatest amount of archaeological and historic resources potentially impacted by the proposed ROW (9 sites).
  - Greatest amount of endangered resources potentially impacted by the proposed ROW (37).

Eastern Routing Area

The route alternatives in this routing area range from approximately 46 miles (Eastern-North) to 48.72 miles (Eastern-South). Eastern-North would primarily travel cross-country along new ROW with steep terrain making construction potentially more difficult along this route alternative. Eastern-South primarily follows existing roads and transmission facilities along its corridor through more open and flat terrain. Although not always reflected in the impact tables, Eastern-North would have greater potential to impact more unique ecological resources and communities because it is sited in less disturbed, more remote locations.

The following contains a bulleted list of potential impacts of the proposed ROWs, identifying which route alternative would have the greatest amount of impacts for a given resource. Refer to Chapter 8, Chapter 10, and Appendix B for additional information on these impacts by proposed route alternatives and route subsegments.

- **Eastern-North**
  - Greatest amount of new proposed ROW (84 percent).
  - Greatest amount of forested lands requiring clearing within the proposed ROW (355.06 acres).
  - Greatest amount of MFL properties (97 properties).
  - Greatest amount of wetland areas within the proposed ROW (45.38 acres).
  - Greatest amount of avian risk areas identified within the proposed ROW (1.3 miles).

- **Eastern-South**
  - Greatest amount of total agricultural land within the ROW (362.34 acres).
  - Greatest amount of grassland areas within the proposed ROW (266.16 acres).
  - Greatest amount of residences within 300 feet of the proposed ROW (89 houses and 74 apartment units). Two of these homes are located within 25 feet of the proposed centerline, and one of these homes are located within 50 feet of the proposed centerline.
  - There is one school located just beyond 300 feet of the proposed ROW.
  - Greatest amount of waterways crossed by proposed ROW (63 waterways).
  - Greatest amount of archaeological and historic resources potentially impacted by the proposed ROW (8 sites).
  - Greatest amount of endangered resources potentially impacted by the proposed ROW (50).

Dane County Routing Area

The Dane County Routing Area is the only routing area that contains several common subsegments for a significant length of the route where there is no other route option. For the purposes of the executive summary, all of the impacts for the common subsegments in the Dane County Routing Area have been included in the quantification of impacts for Black Earth Creek-North and Black Earth Creek-South, as applicable.

The total length of the proposed ROW in this routing area would be between 4.47 and 4.57 miles. Both route alternatives would have the same amount of new proposed ROW (64 percent), the same number of residences within 300 feet of the proposed centerline (11 houses), and the same amount of avian risk areas identified within the proposed ROW (0.26 miles). There are no schools, daycares, or hospitals identified by the applicants within 300 feet of the proposed ROW.

The following contains a bulleted list of potential impacts of the proposed ROWs, identifying which route alternative would have the greatest amount of impacts for a given resource. Refer to Chapter 9, Chapter 10, and Appendix B for additional information on these impacts by proposed route alternatives and route subsegments.

- **Black Earth Creek-North**
  - Greatest amount of total agricultural land within the ROW (27.27 acres).
  - Greatest amount of forested lands requiring clearing within the proposed ROW (21.8 acres).
  - Greatest amount of wetland areas within the proposed ROW (5.5 acres).
  - Greatest amount of archaeological and historic resources potentially impacted by the proposed ROW (2 sites).

- **Black Earth Creek-South**
  - Greatest amount of grassland areas within the proposed ROW (15 acres).
  - Greatest amount of MFL properties (1 property).
  - Would have the same number of residences within 300 feet of the proposed centerline (11 houses) as Black Earth Creek-North; however, this route alternative has one house within 25 feet of the proposed centerline.
  - Greatest amount of waterways crossed by proposed ROW (10 waterways).
  - Greatest amount of endangered resources potentially impacted by the proposed ROW (18).

CHAPTER

1

1. Project Overview and Regulatory Responsibility

1.1. PROJECT OVERVIEW

1.1.1. Proposed Cardinal-Hickory Creek application to Commission

On April 30, 2018, American Transmission Company LLC (ATC), ITC Midwest LLC (ITC), and Dairyland Power Cooperative (DPC) (together, applicants) filed an application with the Public Service Commission of Wisconsin (Commission) under Wis. Stat. § 196.491 and Wis. Admin. Code § PSC 111.53 for authority to construct new transmission facilities in Wisconsin. The application was deemed complete on October 4, 2018.[1] The proposed Cardinal-Hickory Creek transmission line project (Cardinal-Hickory Creek) is being investigated by the Commission under docket 5-CE-146.

The applicants are seeking the Commission's approval of the project and the issuance of a Certificate of Public Convenience and Necessity (CPCN). The applicants propose to install a new 345 kilovolt (kV) transmission line from the Hickory Creek Substation (Dubuque County, Iowa) to the Cardinal Substation (Dane County, Wisconsin), construct a new substation (Grant County, Wisconsin), and make facility modifications at several substations throughout the project area. If approved, the 345 kV transmission line would be between approximately 84 and 105 miles.

The applicants' stated purposes of the proposed Cardinal-Hickory Creek project are to:

- improve electric system reliability locally and regionally,
- deliver economic savings for Wisconsin utilities and electric consumers, and
- expand infrastructure to support the public policy of greater use of renewables.

1.1.2. Midcontinent Independent System Operator, Inc.

The Midcontinent Independent System Operator, Inc. (MISO) is a not-for-profit, member-based organization that administers the wholesale electricity market in the mid-continental U.S. and Manitoba, Canada. In addition, MISO is designated as the Reliability Coordinator by the North American Electric

[1] Including an 180-day extension, final Commission action on the application is required by September 29, 2018.

Reliability Corporation (NERC) for the MISO area.[2] Each major Load Serving Entity in Wisconsin is a member of MISO.

The MISO Transmission Expansion Plan (MTEP) is the plan developed by MISO in its role as the designated Planning Coordinator for the MISO region, and the proposed Cardinal-Hickory Creek project was approved as a part of the Multi-Value Project (MVP) portfolio in the 2011 MTEP.

More information about MISO, MTEP, and the MVP portfolio can be found in Sections 3.1 and 3.2.

1.1.3. Project description

In Wisconsin, the proposed Cardinal-Hickory Creek transmission line would cross the Mississippi River in Cassville (Grant County), travel northeast through Montfort (Grant County) to connect to a new substation (Hill Valley), and end at the Cardinal Substation in Middleton (Dane County). Routes identified in the application for the new 345 kV transmission line would cross the counties of LaFayette, Grant, Iowa, and Dane, and potentially involve some 38 municipalities and townships. In Wisconsin, if the project is approved by the Commission, a new high-voltage transmission line would be constructed that is approximately 84 to 105 miles long encompassing between approximately 1,527 and 1,909 acres3. None of the proposed project facilities would be located within the Lower Wisconsin State Riverway. A general description of the applicants' siting process and the proposed routes can be found in Section 2.2 of this EIS.

The route segments under consideration occupy every type of land use and resource including rural, urban, forests, wetlands, and rivers. Many of the proposed route segments share right-of-way (ROW) with existing transmission lines, highway, and railroad corridors. Large portions of some route segments also run cross-country and would require entirely new ROW.

In addition to the new transmission line and substation, associated facility upgrades and modifications are proposed at several substations throughout the project area. These substations include:

- Hickory Creek (Dubuque County, Iowa)
- Turkey River (Clayton County, Iowa)
- Nelson Dewey (Grant County, Wisconsin)
- Stoneman (Grant County, Wisconsin)
- Wyoming Valley (Iowa County, Wisconsin)
- Hill Valley (Grant County, Wisconsin)
- Eden (Iowa County, Wisconsin), and
- Cardinal (Dane County, Wisconsin).

Additional details regarding the proposed substation modifications and construction can be found in Section 2.3 and Chapter 5 of this draft environmental impact statement (EIS).

[2] The responsibilities and authorities of a NERC Reliability Coordinator is defined by NERC Standard IRO-00101.1. The standard states that "Reliability Coordinators must have the authority, plans, and agreements in place to immediately direct reliability entities within their Reliability Coordinator Areas to re-dispatch generation, reconfigure transmission, or reduce load to mitigate critical conditions to return the system to a reliable state. If a Reliability Coordinator delegates tasks to others, the Reliability Coordinator retains its responsibilities for complying with NERC and regional standards. Standards of conduct are necessary to ensure the Reliability Coordinator does not act in a manner that favors one market participant over another."

[3] An average right-of-way width of the proposed high-voltage transmission line is 150 feet.

In this draft EIS, the applicants' proposed route subsegments (e.g. B01 and M04) have been organized into *route alternatives* (e.g. Western-North and Eastern-South) and *routing areas* (e.g. Western and Eastern) to facilitate the Commission's review of the proposed project. These *route alternatives* and *routing areas* provide an organizational tool for presenting and analyzing information about the ecological and socioeconomic impacts of the proposed project. Figure Vol. 2-4 in Appendix A illustrates these routing areas with their associated route alternatives. The four distinct routing areas and their associated chapters within this draft EIS include:

- Mississippi River Routing Area (Chapter 6),
- Western Routing Area (Chapter 7),
- Eastern Routing Area (Chapter 8), and
- Dane County Routing Area (Chapter 9).

Table 1-1 identifies all of the route alternatives that are being evaluated by the Commission in this docket. These route alternatives can be combined into several complete route options that begin by crossing the Mississippi River in Cassville, Wisconsin and end at the Cardinal Substation in Middleton, Wisconsin. These route alternatives are illustrated in the maps in Figures 5.01 through 5.04 in Appendix A.

This table does not identify common route subsegments within each routing area. Common route subsegments are subsegments that do not have a direct counterpart, or alternative choice, in that particular area.

Table 1-1 Route alternatives are under consideration by the Commission in docket 5-CE-146

Routing Area	Route Alternative
Mississippi River	Nelson Dewey-North
	Nelson Dewey-South
	Stoneman-North
	Stoneman-South
Western	Western-North
	Western-South
Eastern	Eastern-North
	Eastern-South
Dane County	Black Earth Creek-North
	Black Earth Creek-South

1.1.4. Project cost and ownership

If approved, the overall cost of the project is expected to range between $474 and $560 million, depending on the final route selected by the Commission. Costs are discussed in detail in Section 2.5 of this EIS.

The applicants proposing the Cardinal-Hickory Creek project include:

- American Transmission Company LLC (ATC),
- ITC Midwest LLC (ITC), and
- Dairyland Power Cooperative (DPC).

ATC owns and operates transmission facilities in the eastern two-thirds of Wisconsin and much of the upper peninsula of Michigan. ITC currently owns and operates transmission facilities in parts of Iowa, Minnesota, Illinois and Missouri. DPC is a not-for-profit transmission-generation cooperative based in La Crosse and serves 24 separate distribution cooperatives and 17 municipal utilities located in southern Minnesota, western Wisconsin, northern Iowa and northern Illinois.

The applicants anticipate dividing ownership of the proposed project as follows: ATC 45.5 percent, ITC 45.5 percent and DPC 9 percent (Table 1-2).

Table 1-2 Additional details regarding the ownership and construction if the project is approved by the Commission, as stated in the application[4]

Proposed Facilities	Location	Ownership Percentage and Construction Managers
345 kV transmission line	Hickory Creek Substation (Dubuque County, IA) to Hill Valley Substation (Grant County, WI)	ITC 95.5% DPC 4.5% ITC construction manager
	Hill Valley Substation (Grant County, WI) to Cardinal Substation (Dane County, WI)	ATC 95.5% DPC 4.5% ATC construction manager
161 kV transmission line	Any portion of the existing 161kV line that would be rebuilt as a part of the Mississippi River Crossing	DPC 100%[5]
Hill Valley Substation	Grant County, WI	ATC 100% ATC construction manager
Cardinal, Eden, Nelson Dewey, Wyoming Valley Substations	Various locations throughout southwestern Wisconsin	ATC currently owns and would construct all approved modifications
Stoneman Substation	Grant County, WI	DPC currently owns and would construct all approved modifications
Turkey River Substation	Clayton County, IA	DPC partial ownership

1.1.5. Proposed Construction Schedule

Provided the project is granted a CPCN by the Commission and all state and federal approvals and permits are granted, the applicants anticipate construction to start on the substations in October 2020 and on the transmission line in October 2021. Their expected in-service date for the project is December 2023.

As stated in Table 1-2, ITC would be the construction manager for the portion of the transmission line between Hickory Creek Substation (Dubuque, Iowa), across the Mississippi River, and up to the new Hill Valley Substation (Grant County, Wisconsin). ATC would be the construction manager for the portion of the transmission line between the Hill Valley Substation (Grant County, Wisconsin) and Cardinal Substation (Dane County, Wisconsin). ATC would be the construction manager for the new Hill Valley Substation, as well as for any modifications approved at the Cardinal, Eden, Nelson Dewey, and Wyoming Valley Substations. DPC would construct any approved modifications at the Stoneman Substation.

The Commission has the final authority to certify whether and how the project may be built (see Section 1.2). If approved, construction must start within one year of a Commission Order.

1.2. ROLE OF THE PUBLIC SERVICE COMMISSION OF WISCONSIN

1.2.1. Approval, denial, or modification of this proposed project

Under Wis. Stat. § 196.491 (3), the Commission has the authority to approve, deny, or modify any and all facilities proposed in the Cardinal-Hickory Creek project CPCN application. If the project is approved,

[4] PSC REF#: 352698
[5] As identified in the draft environmental impact statement prepared for RUS, accessed at: https://www.rd.usda.gov/publications/environmental-studies/impact-statements/cardinal-%E2%80%93-hickory-creek-transmission-line

the Commission would select the route and design for the proposed transmission line as well as the site and layout of the proposed substation modifications and construction.

1.2.2. Commission considerations

Compared to other state agencies, the regulatory interests of the Commission in reviewing this proposed transmission project are quite broad. These interests cover the need for the project, the project cost and electrical performance, and the project's short- and long-term environmental and socioeconomic impacts, other than those specifically regulated by the Wisconsin Department of Natural Resources.

1.2.2.1. Certificate of Public Convenience and Necessity law

Wisconsin Statute (Wis. Stat.) § 196.491(3) requires the Commission to make all of the following determinations before approving construction of a major transmission line:

- Under Wis. Stat. § 196.491(3)(d)2, the proposed facilities must satisfy the reasonable needs of the public for an adequate supply of electric energy.
- Under Wis. Stat. § 196.491(3)(d)3, the facilities must be in the public interest, considering: alternative sources of supply, alternative locations or routes, individual hardships, engineering factors, economic factors, safety, reliability, and environmental factors.
- Under Wis. Stat. § 196.491(3)(d)3r, if the high-voltage transmission line is proposed to increase the transmission import capability into this state, existing ROW must be used to the extent practicable, and the routing and design must minimize environmental impact in a manner that is consistent with achieving reasonable electric rates.
- Under Wis. Stat. § 196.491(3)(d)3t, the 345 kV line must provide usage, service, or increased regional reliability benefits to the wholesale and retail customers or members in this state, and the benefits of the line must be reasonable in relation to the cost of the line.
- Under Wis. Stat. § 196.491(3)(d)4, the facilities must not have undue adverse impact on environmental values such as, but not limited to: ecological balance, public health and welfare, historic sites, geological formations, aesthetics of land and water, and recreational use.
- Under Wis. Stat. §§ 196.491(3)(d)5. and196.49(3)(b), the facilities must not substantially impair the efficiency of the applicants' service or reasonably exceed the applicants' probable future requirements, and the value or available quantity of service the facilities provide must be proportionate to their cost.
- Under Wis. Stat. § 196.491(3)(d)6, the facilities must not unreasonably interfere with the orderly land use and development plans for the area involved.
- Under Wis. Stat. § 196.491(3)(d)7, the facilities must not have a material adverse impact on competition in the relevant wholesale electric service market.

1.2.2.2. Required priorities for meeting energy demands

In addition to the above statutory determinations, the Commission must address the priorities in Wis. Stat. §§ 1.12 and 196.025. These laws require the Commission to give priority to specific methods of meeting energy demands to the extent these methods are "cost-effective and technically feasible." The Commission must consider options based on the following priorities, in the order listed, for all energy-related decisions:

- Energy conservation and efficiency
- Noncombustible renewable energy resources
- Combustible renewable energy resources

- Advanced nuclear energy using a reactor design or amended reactor design approved after December 31, 2010, by the U.S. Nuclear Regulatory Commission
- Nonrenewable combustible energy resources, again in the order listed:
  - Natural gas
  - Oil or coal with a sulfur content of less than one percent
  - All other carbon-based fuels

If the Commission finds that any of these statutorily preferred options, or a combination of these options, constitutes a cost-effective and technically feasible alternative to the project, the Commission must reject all or a portion of the project as proposed.

1.2.2.3. Required priorities for siting electric transmission projects

Wisconsin Stat. § 1.12(6) also directs the Commission to consider corridor sharing opportunities when reviewing transmission facility projects. The statute states that, when siting new electric transmission facilities, it is the policy of the state to attempt to share existing corridors to the greatest extent feasible. When selecting existing corridors to share, the Commission must determine that corridor sharing is consistent with economic and engineering considerations, reliability of the electric system, and protection of the environment. When feasible, corridors should be utilized in the following order of priority:

- Existing utility corridors
- Highway and railroad corridors
- Recreational trails, to the extent that the facilities may be constructed below ground and that the facilities do not significantly impact environmentally sensitive areas
- New corridors

1.2.3. Intervenors in the PSC process

A number of organizations, local government offices, utilities, and community groups have requested to “intervene”, to become parties to the docket before the Commission. The intervenors in this docket are[6]:

- Amelia and Garry Williams
- Carol Beckett and Frank Sander
- Chris Klopp
- Citizens Utility Board
- Clean Grid Organizations
- Clean Wisconsin
- Dane County
- David and Nancy Giffey
- David Stanfield
- Deborah Mulligan
- Dennis and Judi Halverson
- Don and Julie Pluemer
- Driftless Area Land Conservancy
- Gene Smith
- George Schwarzmann

[6] Prehearing Conference Memorandum (PSC REF#: 357500)

- Gloria and Leroy Belkin
- Iowa County
- James Campbell
- Joe Schwarzmann
- Joel C. Kurth
- Kerry Beheler
- Lila Zastrow and Dave Hendrickson
- Linda Grice
- Marilyn and Richard Brewer
- Mark Surkowaty (Intervention remains contingent upon receipt of email address)
- Marline and Patrick Patterson
- Michael and Michelle Dubis
- Michael McDermott
- Michael Russel and Susan Ehlers
- Midcontinent Independent System Operator
- Monica Sella
- Pat and Pam Raimer
- RENEW Wisconsin
- S.O.U.L. OF WISCONSIN
- Ten Old Order Amish Intervenors (Eli S. Stoltzus, with electronic filing assistance from Susan Slotten)
- Town of Arena
- Town of Lima
- Town of Vermont
- Town of Wingville
- Town of Wyoming
- Village of Montfort
- Wisconsin Industrial Energy Group
- Wisconsin Wildlife Federation

1.2.3.1. Intervenor compensation in the PSC process

Under Wis. Stat. § 196.31 and Wis. Admin. Code ch. PSC 3, the Commission may compensate any organization or individual for the cost of participating in its proceedings if all of the following conditions are met:

- The intervening organization or individual is a customer of the utility that is the subject of the proceeding or is someone who may be materially affected by the outcome of the proceeding.
- The intervening organization or individual must have been granted full party status and will participate as such in the proceeding.
- Without compensation, the intervenor would experience "significant financial hardship."
- Without compensation for the intervenor, an interest that is material to the proceeding would not be adequately represented.
- The intervenors' interest and position must be represented to result in a fair determination in the proceeding.

1.2.4. Public Involvement

Public involvement and comments throughout the review process also contribute to the Commission's analysis of the impacts of a proposed project. Public input on the proposed project is received through:

- Written and spoken comments from public information meetings sponsored by the applicants;
- Written or public comments solicited by the Commission at environmental scoping meetings;
- Written and oral comments on the draft EIS;
- Phone calls and written comments received prior to completion of the final EIS;
- Testimony at public hearings.

1.2.4.1. Applicant-sponsored meetings

Prior to submitting its CPCN application to the Commission, the applicants sponsored a series of public information meetings throughout the project area between October 2014 and May 2016. These meetings were held to solicit input on possible routes studied and considered by the applicants. Comments received by the applicants from these meetings were provided to the PSC as part of their application. Mailing samples that the applicants sent regarding the proposed project were provided in Appendix E of the application. The applicants-sponsored project meetings were not attended by Commission staff.

1.2.4.2. Commission-sponsored meetings

After the application was declared complete on October 4, 2018, the PSC, DATCP and DNR held a series of public open-house meetings as part of the scoping process for preparation of this draft EIS. During these meetings, Commission staff worked to clarify the state review process of the application and requested comments from the public about the proposed project. These meetings were held in the project area on the following dates and locations:

- November 8, 2018, in Dodgeville, Wisconsin
- November 12, 2018, in Middleton, Wisconsin
- November 14, 2018, in Lancaster, Wisconsin

The Commission also solicited comments in a letter sent on October 24, 2018, to interested and affected persons, towns, counties, and municipalities seeking input on the environmental impact statement[7]. The scoping period for the EIS ended on January 4, 2019.

Following the release of this draft EIS, a 45-day comment period will begin. Written or verbal comments may be made to staff until the comment period on the draft EIS closes. After the 45-day comment period, Commission staff will prepare a final EIS considering comments received on the draft EIS.

The Commission's review process focuses on gathering, organizing, and analyzing information for technical and public hearings. A period of at least 30 days will occur between the issuance of the final EIS and the opening of the public hearing for this case. This period allows the public and government agencies the opportunity to review the final EIS prior to the hearings so that they can prepare appropriate, informed, and useful written or oral testimony.

Testimony received during the public hearings will become part of the case record. The Commission will approve, reject, or modify the applicants' proposal based on its reading and discussion of the case record.

---

[7] PSC REF#: 352128

At the public hearing sessions, a court reporter will record the oral and written testimony presented by Commission staff, utility staff, staff of other agencies, representatives of intervening organizations, and the public. The final EIS will be entered into the hearing record as a portion of Commission staff's testimony. At this time, the public and technical hearings for this project proposal are expected to occur in June 2019. An official notice that includes specific times for these hearings will be mailed to members of the entire project mailing list when the final EIS is issued.

1.2.4.3. Summary of comments received

The Commission received 639 solicited and unsolicited comments regarding the proposed Cardinal-Hickory Creek project under docket 5-CE-146 (Table 1-3). These comments were received during different phases of the proposed project including pre-application, EIS scoping, as well as after the EIS scoping period. In total, 544 comments were submitted during the scoping period for the EIS (Table 1-4).

Table 1-3 Summary of comments received based on the medium used to submit them

Medium Used To Submit The Comments	Number Of Comments Received
Scoping meetings – PSC comment form or left material	98
Filings on ERF[8]	431
Postal Mail	97
E-mail	13
Total comments received	639

Table 1-4 Summary of comments received based on the comment period

Comment Period During Which Comments Were Received	Number Of Comments Received
Pre-application (unsolicited comments)	86
Scoping comment period	544
Past Scoping comment period	9
Total comments received	639

Table 1-5 Summary of comments received during the Commissions scoping meetings

Scoping Meeting During Which Comments Were Received – PSC Comment Form Or Left Material	Number Of Comments Received
Dodgeville Scoping meeting on 11/8/2018	56
Middleton Scoping meeting on 11/12/2018	22
Lancaster Scoping meeting on 11/14/2018	20

Table 1-6 categorizes the comments received by the areas of concern addressed in each comment. Most of the comments received addressed several different areas of concern; therefore, the percentage of comments for each category do not add up to a total of 100 percent. For each area of concern, the number of comments that mentioned this concern were divided by the total comments received (639). These comments have been addressed throughout this EIS, more specifically:

- Chapter 3 addresses project need and potential system solutions,
- Chapter 4 addresses the typical methods and impacts associated with high-voltage transmission lines,
- Chapters 6 through 9 address specific environmental, construction, and socioeconomic concerns along proposed route alternatives, and

[8] The Electronic Records Filing (ERF) System facilitates the electronic submission of documents and online access to these documents in formal cases before the Commission.

- Section 2.5 discusses the regional natural resources in the project area, including the Driftless Area.

Table 1-6 Comments received based on the areas of concerns identified in each comment. Categories of comments are organized in descending order by the number of comments received.

Areas Of Public Concern Based On Comments Received	Number Of Comments	% Of Comments
Project need	319	50%
Fair evaluation of non-transmission/ local renewable energy resources	273	43%
Aesthetics of high-voltage transmission lines	247	39%
Tourism/ local business	241	38%
Property values	228	36%
Driftless Area	222	35%
Wildlife	193	30%
Increase in utility rates/ cost burden	186	29%
Wetlands and waterways	166	26%
Land use	156	24%
Human health	112	18%
Detriment to sensitive areas	86	13%
Recommending cost- benefit analysis	66	10%
Cultural resources	60	9%
Other specific concerns	60	9%
Vegetation management	57	9%
Stray voltage	41	6%
Easements/compensation	36	6%
Electric and magnetic fields (EMF)	36	6%

The Commission also received comments from non-governmental organizations regarding their concerns about the Cardinal-Hickory Creek project (Table 1-7).

Table 1-7 Comments received from non-government organizations

PSC REF#[9]	Organization
356071	Black Earth Creek Watershed Association
356073	Capital Region Advocacy Network for Environmental Sustainability (CRANES)
359076, 356647, 358980	Driftless Defenders
356074, 356502	Eagle Nature Foundation
356845	Environmental Law and Policy Center
356075	Folklore Village
356078	Friends of Governor Dodge State Park
356079	Friends of Military Ridge Trail
356080	Friends of Ridgeway Pine Relict State Natural Area
354825	Friends of the Military Ridge Trail
356081	Friendship Center
356121, 356194	Harry and Laura Nohr chapter of Trout Unlimited
356082, 356425	Ice Age Trail Alliance
352719	Inter-Municipal Energy Planning Committee
356193	Iowa County Recreation and Prairie Restoration Group
356153	Madison Audubon Society
359323	Madison Region Economic Partnership
358978	The Prairie Enthusiasts
356224, 356507	South Central Chapter, Wisconsin Farmers Union
356551	South West Wisconsin Area Progressives (SWWAP)

[9] The ERF System facilitates the electronic submission of documents and online access to these documents in formal cases before the Commission. Accessed at: http://apps.psc.wi.gov/vs2015/ERF/ERFhome.aspx.

PSC REF#[9]	Organization
356154	Sustain Iowa County
358010	Wisconsin Manufacturers and Commerce (WMC)

1.3. ROLE OF OTHER STATE AGENCIES

1.3.1. Inter-agency relationships in the Commission's process

Commission staff routinely consult with various regulatory agencies to better understand the potential impacts of a proposed project. In Wisconsin, some state agencies are more involved in the preparation of the EIS than others. The state agencies that have participated in the development of this EIS include:

- DNR, which by law is a co-author of the EIS,
- DATCP,
- Wisconsin Department of Transportation (WisDOT), and
- Wisconsin Historical Society (WHS).

The related responsibilities of these agencies are described briefly in this section as well as in the impact discussions found throughout this EIS. A list of permits and approvals required from various state agencies if the proposed project is approved by the Commission have been identified in Table 1-8. Copies of the applicants' correspondence with regulatory agencies[10] concerning the proposed project prior to its application submission to the Commission are included in Appendix H, Exhibits 1-11 of the application.

Table 1-8 Permits and approvals required for the proposed project in Wisconsin

Agency	Regulated Activity	Approval Or Permit Type	Status
PSC	Construction of a new 345 kV high-voltage electric transmission line and new electric substation	Certificate of Public Convenience and Necessity (CPCN); Wis. Stat. § 196.491	Complete application 10/5/2018. Commission decision required by 9/29/2019.[11]
DATCP	Use of eminent domain authority on greater than 5.0 acres of any farm	Agricultural Impact Statement (AIS); Wis. Stat. § 32.035	The AIS is expected to be complete early 2019.
WisDOT	Alter or disturb any highway or bridge	Utility Permit DT 1553; Wis. Stat. § 86.07(2)(a)	Applicants provided a draft Constructability Report in Appendix H, Exhibit 4 of the application and will apply for necessary permits after obtaining a CPCN from the PSC.
	Construct and operate electric poles and lines within the limits of highways	Written consent from WisDOT; Wis. Stat. § 86.16	
	Oversize loads or excessive weights on highways	Vehicle weight and load permits; Wis. Stat. § 348	
WHS	Evaluation of adverse effects to historic properties and human burial sites	Wis. Stat. § 44.40	Applicants have reviewed the project area for known historic properties and PSC is evaluating the results with SHPO (WHS).

[10] Entities represented in this correspondence include Dane County Parks Department, DNR, WisDOT, DATCP, U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), Federal Aviation Administration (FAA), U.S. Department of Agriculture Rural Utilities Service (RUS), and the Federal Permitting Improvement Steering Committee (FPISC).

[11] Under Wis. Stat. § 196.491(3)(g), the Commission must take final action on the application within 180 days after the application is determined to be complete unless the Chairperson grants a one-time 180-day extension period. Without the extension and if the Commission fails to take action within 180 days, the Commission is considered to have granted and issued a CPCN with respect to the application.

Agency	Regulated Activity	Approval Or Permit Type	Status
		Section 106 of the National Historic Preservation Act (NHPA)	Under review through the NEPA process, led by Rural Utilities Services (RUS).
		Request to Disturb a Human Burial Site permits (if necessary); Wis. Stat. § 157.70	Applicants have reviewed the project area for known burial sites and would apply for the necessary permits after obtaining a CPCN from the Commission.
DNR	Place temporary bridges over navigable waters	Chapter 30 Permit; Wis. Stat. § 30.123 and Wis. Admin. Code chs. NR 102 and 320	Application under review.
	Wetland fill	Wetland Individual Permit; Wis. Stat. § 281.36 and Wis. Admin. Code chs. NR 103 and 299	Application under review.
	Storm water discharges from construction sites	Wisconsin Pollutant Discharge Elimination System (WPDES) Storm Water Discharge Permit; Wis. Stat. ch. 283 and Wis. Admin. Code ch. NR 216	Applicants would apply for the necessary permits after obtaining a CPCN from the Commission.
	Impacts to state listed endangered and threatened species	Incidental Take Authorization; Wis. Stat. ch. 29.604. (However, utilities are exempted from the taking prohibitions of the listed plant species.)	Applicants would apply for the necessary permits after obtaining a CPCN from the Commission.

1.3.2. Department of Natural Resources

During the review of this project, Commission staff have consulted with DNR to assess the potential impact the proposed project may have on Wisconsin's natural resources. The Commission and DNR are required under Wis. Stat. § 196.025(2m)(b)(1)1. and 3. to prepare an EIS cooperatively and include all of the information needed by both agencies to carry out their respective duties under Wis. Stat. § 1.11 (Wisconsin Environmental Policy Act, or WEPA, the governmental consideration of environmental impact). DNR and the Commission are co-authors of this draft EIS, with the Commission acting as the lead agency.

DNR is the permitting authority of Wis. Stat. ch. 30 related to navigable waterways and , temporary clear span bridges (TCSB) over streams. DNR is also the permitting authority of Wis. Stat. § 281.36 related the discharge of dredged or fill material in wetlands.

DNR is also the permitting authority for construction site erosion control. Stormwater permits must be obtained from DNR under Wis. Stat. ch. 283 and Wis. Admin. Code chs. NR 216 and NR 151.

DNR also reviews and permits potential impacts to endangered resources and would process any Incidental Take Permits or Authorizations under Wis. Stat. § 29.604.

DNR may consult with the U.S. Army Corps of Engineers (USACE) and the U.S. Fish and Wildlife Service (USFWS) to evaluate the applicants' proposed construction activities. However, these federal agencies may require separate permitting beyond what would be provided by DNR or ordered by the Commission. Additional information about the federal agencies reviewing the proposed project have been included in Section 1.5 of this draft EIS.

1.3.3. Department of Agriculture, Trade, and Consumer Protection

DATCP has the responsibility, under Wis. Stat. § 32.035, to prepare an Agricultural Impact Statement (AIS) whenever a project involves the potential use of the power of eminent domain and proposes to acquire an interest of more than 5.0 acres from at least one agricultural property, as is the case for the proposed Cardinal-Hickory Creek project.

The objectives of the AIS program, administered by DATCP, include:

- Making sure farmers are well-informed of their rights and the range of potential impacts from a project, prior to acquisition negotiations.
- Providing input to applicants, landowners, and the PSC how the proposed project can avoid, minimize, or mitigate impacts to agricultural resources and farm operators.
- Documenting for the public record the agricultural impacts of public projects, especially when unwilling sellers are involved.

An AIS is being prepared for the Cardinal-Hickory Creek project. For this project, DATCP sent questionnaires to agricultural landowners who may have 3.0 or more acres of easement acquired. This included agricultural property owners who would be potentially affected by the routes under consideration by Rural Utilities Services (RUS) and temporary construction easements such as off-ROW roads. In total, 379 agricultural landowners were surveyed. The AIS will discuss farmer impacts and concerns, soil types, crops, and identify land enrolled in preservation or conservation programs.

The published AIS will be made available to the public and sent to concerned individuals, government entities, libraries, and regional newspapers for public review. **The applicants are not allowed to negotiate with an agricultural owner or make a jurisdictional offer until 30 days after the AIS is published (Wis. Stat. § 32.035(4)(d)).**

DATCP and Commission staff have consulted throughout the review of the proposed project. DATCP representatives attended all of the EIS scoping meetings hosted by the Commission and they will be involved in the Commission's proceedings of this project. The AIS will be presented as part of DATCP testimony in the Commission proceedings. When complete, the full AIS will be available on DATCP's website.[12]

1.3.4. Wisconsin Department of Transportation

The Wisconsin Department of Transportation (WisDOT) is responsible for planning, building, and maintaining Wisconsin's network of state highways and Interstate highway system. A Cooperative Agreement between WisDOT and the Commission describes project pre-application and review processes between the two agencies. This agreement ensures that, whenever practical, existing transportation corridors are used for new electric transmission facilities instead of new corridors.

If the proposed project is approved by the Commission, the applicants must submit a DT 1553 form for permits to make any excavation or fill, install any culvert, make any other alteration in any highway, or to otherwise disturb any highway or bridge (Wis. Stat. § 86.07(2)(a)). Additionally, Wis. Stat. § 86.16 requires that the applicants obtain written consent of WisDOT and its regional offices for the state truck highway system[13] to construct and operate electric poles and lines within the limits of highways. Under Wis. Stat.

[12] https://datcp.wi.gov/Pages/Programs_Services/AISCardinalHickoryCrkProject.aspx
[13] The state trunk highway system includes state highways, federal highways, and the Interstate System.

§ 348, the applicants also must obtain permits from WisDOT for oversize loads or excessive weights on highways.

WisDOT also has federal obligations under 23 USC 111 and 23 CFR 645. These include maintaining a Utility Accommodation Policy, approved by the U.S. Federal Highway Administration, and the protection of scenic easements from above-ground construction of any type.

1.3.4.1. Project constructability report

The applicants have submitted a preliminary constructability report[14] to WisDOT to identify many related issues such as siting constraints, proposed construction access, and traffic impacts for the proposed project. The applicants propose to construct transmission structures and transmission ROWs on many miles of WisDOT-controlled ROWs. In agreement with WisDOT, the applicants have prepared the report to document issues associated specifically with the Cardinal-Hickory Creek project and to help WisDOT prepare a letter of understanding that addresses this project. A preliminary constructability report that is kept current and updated with evolving issues can help expedite the WisDOT permitting process, if the Commission authorizes the project and selects a route.

In addition to reviewing constructability issues associated with existing highway facilities, the applicants should factor in WisDOT's future highway expansion plans into their route selection and alignments. This process, in past transmission construction projects, has helped to make the applicants aware of WisDOT highway projects near proposed segments and helped to develop more appropriate alignments along WisDOT corridors.

A preliminary constructability report was submitted to WisDOT, prior to the submittal of the application for WisDOT review and comment. WisDOT's final response has not yet been received by the applicants. The applicants have indicated that, if the project is approved by the Commission, they will meet with WisDOT to discuss any remaining concerns and incorporate the resolutions to these concerns in the detailed project engineering. Once detailed engineering is completed, the applicants will submit a final constructability report to WisDOT.

WisDOT issues identified in the project constructability report are discussed in Chapters 6 through 9, if applicable and as appropriate.

1.3.5. Wisconsin Historical Society

Wisconsin Admin. Code § PSC 4.30(3)(f) directs the EIS to include an evaluation of the archaeological, architectural, and historic significance of any affected resources, and that the evaluation include consultation with the state historical society of Wisconsin. The role of the WHS, through the State Historic Preservation Office (SHPO), is to work with PSC to evaluate any adverse effects to historic properties. According to Wis. Stat. § 44.31(3), historic properties include any building, structure, object, district, area or site, whether on or beneath the surface of land or water, that is significant in the history, prehistory, architecture, archaeology, or culture of this state, its rural and urban communities, or the nation.

The relationship between the Commission and WHS is further described in Wis. Stat. § 44.40 and the PSC-SHPO Interagency Programmatic Agreement. These direct the Commission to assess possible adverse effects to known historic properties within the area of potential effect (APE), and as necessary coordinate a review with SHPO. If the review determines that an adverse effect may occur, SHPO may propose a mechanism to avoid, minimize, or mitigate the adverse effect. For the proposed project, the

[14] PSC REF#: 341415, 341416, 341416

applicants have reviewed the project area for known historic properties and the Commission is evaluating the results with SHPO.[15]

The SHPO also works with federal agencies, such as the U.S. Army Corps of Engineers and USDA-Rural Utilities Service, on the Section 106 process of the National Historic Preservation Act (NHPA) using the guidelines from 36 CFR 800. This process requires that federal projects, activities, or programs either funded, permitted, licensed, or approved by a federal agency consider the effects of their undertakings on historic properties. The SHPO coordinates with these federal agencies to evaluate any adverse effects to historic properties. As part of this process, federal agencies often must survey project areas for unrecorded historic properties. For the proposed project, some Section 106 reviews have been completed.[16]

In addition, the WHS is responsible for preserving human burials under the state burial sites preservation program as described in Admin. Code § HS 2 and Wis. Stat. § 157.70. Burial sites are defined as any place where human remains are buried, which may be any part of the body of a deceased person in any stage of decomposition in a context indicating substantial evidence for burial. Burial sites are often indicated by stone monuments, spirit houses, wooden crosses, or prehistoric Native American mounds. No person may intentionally cause or permit the disturbance of a burial site; therefore, any proposed activities that may disturb burial sites must receive a permit from WHS. For the proposed project, the applicants have reviewed the project area for known burial sites and would obtain permits if the project is approved as appropriate.

The permits and approvals regulating impacts to archaeological and historical resources that may be required if the proposed project is approved by the Commission are identified in Table 1-8. Information regarding the impacts the proposed project could have on archaeological and historic resources can be found in Sections 6.2.8, 7.2.8, 8.2.8, and 9.2.8 of this draft EIS.

1.4. COUNTY AND LOCAL GOVERNMENTS' INTERESTS AND PERMITS

County and local governments have numerous interests and responsibilities that can be addressed during the Commission's review of the proposed project. In terms of local impacts, potential effects on a local government jurisdiction should and would be considered by the Commission as an impact on the existing local social environment. Before a CPCN can be issued, the Commission under Wis. Stat. § 196.491(3)(d)6. must determine that:

> "The proposed facility will not unreasonably interfere with the orderly land use and development plans of the area involved."

In addition, when a project is authorized by the Commission, under Wis. Stat. § 196.491(3)(i):

> "If installation or utilization of a facility for which a certificate of convenience and necessity has been granted is precluded or inhibited by a local ordinance, the installation and utilization of the facility may nevertheless proceed."

This statute restricts the ability of local governments to block a project through a local ordinance if the project has received a CPCN. The first statutory reference indicates that the Commission must be aware of potential conflicts with existing local ordinances, zoning, or land use plans when making its final

[15] PSC REF#: 341911, PSC REF#: 341878, PSC REF#: 345377, PSC REF#: 348067, PSC REF#: 352698 pp. 133-135
[16] PSC REF#: 341426

decisions about a project. Local land use or development plans that may be affected by the proposed project are discussed in Chapters 6 through 9 of this EIS.

The applicants have shown in their application that they are fully cognizant of these sections of the statutes, and they have stated that they would apply for permits under local ordinances where they involve matters of public safety. Depending on the municipality, applicable local safety ordinances may include road crossing permits, road weight limits, noise abatement ordinances (such as hours or times of construction), building permits, driveway, and culvert permits. The applicants have stated that they would not apply for local permits that address the siting of proposed utility facilities, land use, recreational use, or aesthetics. A compilation of local permits and ordinances that could apply to the proposed project, absent the provisions of Wis. Stat. § 196.491(3)(i), were identified in in the application[17]

The applicants have stated that they would work with local units of government to assure that the representatives of those units of government affected by the proposed project would be informed of construction activities. The applicants have also requested that local units of government provide the Commission and the applicants with its comments and concerns regarding the siting and location of the proposed project.

1.4.1. Local governments in the project area

Several county and local jurisdictions would be affected by the potential transmission construction for this project. These areas are listed in Table 1-9 along with the proposed facilities that would be constructed in those areas.

Table 1-9 Local governments and communities potentially impacted by the proposed project

County	Municipality	Town	Village	City	Routing Alternative	Route Subsegments	Additional Project Infrastructure
Dane	Blue Mounds	X			Eastern-South	S13	
Dane	Blue Mounds		X		Eastern-South	S13	1 Laydown Yard
Dane	Cross Plains	X			Eastern-North, Eastern-South, Black Earth Creek-North, Black Earth Creek-South	P09, T03, T04, T05, U02, V02, V01, V02, V03, V04, V05, V06, W01, W02, W03, W04, X01, X02, Y01A, Y01B, Y01C, Y05, Y06A, Y06B, Z01A, Z02	
Dane	Middleton	X			Black Earth Creek-North, Black Earth Creek-South	Y06B, Y07, Y08, Z01A, Z01B, Z02	1 Laydown Yard
Dane	Mount Horeb		X		Eastern-South	S13	
Dane	Springdale	X			Eastern-South	S13, T01, T02, T03, U01	
Dane	Vermont	X			Eastern-North	P09	
Grant	Beetown	X			Western-North	D04	
Grant	Cassville	X			Nelson Dewey-North and South, Stoneman-North and South, Western-North, Western-South	A01A, A02, A03, B01, B02, B03, B04, C01, C02B, C03, C04, D01, D03, D04, E01, E03, E04	2 Laydown Yards
Grant	Cassville		X		Nelson Dewey-North and South,	A01A, A01B, A01C, A02, B01, B02, C01, C02A, C02B	2 Laydown Yards

[17] Tables 1.7.3-1 and 1.7.3-2 on pp. 23-24 of the CPCN application (PSC REF#: 352698)

County	Municipality	Town	Village	City	Routing Alternative	Route Subsegments	Additional Project Infrastructure
					Stoneman-North and South		
Grant	Clifton	X			Western-South,	D08, J01, J02, J03, J04, K01	
Grant	Ellensboro	X			Western-North	D08	
Grant	Harrison	X			Western-South	E16, E18, E19	
Grant	Liberty	X			Western-North	D08	
Grant	Livingston		X		Western-South,	J02, J03	
Grant	Montfort		X		Eastern-North, Eastern-South	N01	1 Laydown Yard
Grant	Platteville	X			Western-South	E19, F01, F02, F03, F04, F06, G01, G04, G06A, G06B, G08	4 Laydown Yards
Grant	Potosi	X			Western-South	E10, E12, E13, E14, E16	
Grant	South Lancaster	X			Western-North	D04, D05, D08	
Grant	Waterloo	X			Western-North, Western-South	D04, E04, E06, E07, E09, E10	1 Laydown Yard
Grant	Wingville	X			Western-North, Western-South	D08, D09A, D09B, D10A, D10B, D10C, L02, L03, L04, L05, M03, N01, R01	Hill Valley Substation, 1 Laydown Yard
Iowa	Arena	X			Eastern-North	P09	
Iowa	Barneveld		X		Eastern-South	S10D, S11D, S12, S13	
Iowa	Brigham	X			Eastern-South	S09, S10A, S10B, S10C, S11A, S11B, S11C, S11D, S13	
Iowa	Cobb		X		Eastern-South	Q02	
Iowa	Dodgeville	X			Eastern-North, Eastern-South,	P03, P04, P05, P06, P07, P08, P09, Q02, Q03, Q05, Q06, R09, R10, R11, R13, R14, R15, S01, S02, S03, S04,	2 Laydown Yards
Iowa	Dodgeville			X	Eastern-North, Eastern-South	Q03, Q04, Q05, R09	
Iowa	Eden	X			Eastern-North, Eastern-South	L01, L02, M01, M02, M03, M04, M05, N03, N04, N06, N07, O02, O03, P01, P02, Q01, Q02, R01, R02, R03, R04	1 Laydown Yard
Iowa	Highland	X			Eastern-North	P02, P03	
Iowa	Linden	X			Eastern-South	Q02, R04, R05, R06, R07, R08, R09	1 Laydown Yard
Iowa	Mifflin	X			Western-South	H06, H07, H09, I01, I02, I05, I06, I07, I08, I09, J01, J04, K01, L01, M01	
Iowa	Rewey		X		Western-South	H06, H07	
Iowa	Ridgeway	X			Eastern-South	S04, S05, S08, S09	
Iowa	Ridgeway		X		Eastern-South	S09	
Iowa	Wyoming	X			Eastern-North	P09	
Lafayette	Belmont	X			Western-South	G09, H01, H02, H03, H06	1 Laydown Yard
Lafayette	Elk Grove	X			Western-South	G08, G09	

1.4.2. Local government interests

Local governments have written seeking to minimize adverse impacts from the proposed project on the communities that they are charged to manage and protect (Table 1-10). In addition, the Commission also received the comments from Legislators (Table 1-11). In general, these comments and resolutions seek to ensure that the routes and design of the proposed transmission facilities meet local standards, permitting requirements, and conform to local ordinances and zoning regulations. They also provided information regarding project need, alternatives, land use plans, county forest plans, watershed management plans, recreational plans, and agricultural extension programs.

Table 1-10 Comments and resolutions received from local government entities

PSC REF#[18]	Government Organization Commenting
341023	Barneveld Board of Education
328524, 338697, 358978	Dane County Board of Supervisors
341280	Grant County Board of Supervisors
303831	Iowa County Planning and Zoning Committee
352719	Mount Horeb Area School district
352719	Platteville City Council
229501	Town of Arena
292900	Town of Belmont
297137, 342185, 352719	Town of Brigham
328507	Town of Clyde
352719, 356258, 356259, 356260	Town of Cross Plains
303706	Town of Dodgeville
210169, 285866	Town of Eden
295366	Town of Ellenboro
344148	Town of Liberty
290186, 339468	Town of Lima
294253	Town of Mifflin
342796	Town of Mount Ida
293075	Town of Platteville
344616	Town of Potosi
296840, 296841, 296842, 352719	Town of Ridgeway
333789	Town of Springdale
287631, 296071, 352719	Town of Vermont
297500, 352719	Town of Wingville
294792, 302040, 356617, 358979	Town of Wyoming
328911	Village of Arena
340766	Village of Barneveld
334254, 356291	Village of Montfort
340325	Village of Mt. Horeb
229678	Village of Ridgeway
352719	Village of Montfort

Table 1-11 Comments received from Legislators

PSC REF#[19]	Legislator Commenting	
303394	Jennifer K. Shilling	State Senator, 32nd Senate District
328802	Sondy Pope	State Representative, 80th Assembly District
342718	Howard Marklein	State Senator, 17th Senate District
355172	Howard Marklein	State Senator, 17th Senate District
356344	Jonathan Erpenbach	State Senator, 27th District
	Dave Considine	State Representative, 81st District
	Dianne Hesselbein	State Representative, 79th District
	Sondy Pope	State Representative, 80th District
356354	Sondy Pope	State Representative, 80th Assembly District

[18] The ERF System facilitates the electronic submission of documents and online access to these documents in formal cases before the Commission. Accessed at: http://apps.psc.wi.gov/vs2015/ERF/ERFhome.aspx.
[19] The Electronic Records Filing (ERF) System facilitates the electronic submission of documents and online access to these documents in formal cases before the Commission. Accessed at: http://apps.psc.wi.gov/vs2015/ERF/ERFhome.aspx.

1.5. REGIONAL PLANNING COMMISSIONS' INTEREST

Related to the Commission's requirement to consider local land use and development plans is a requirement to keep the regional planning commissions (RPC) apprised of its cases and project reviews. Regional planning commissions are listed as one of the categories of organizations and government offices that receive copies of Commission notices and environmental impact statements.

The regional planning commissions and their represented counties in the proposed project area include:

- Capital Area RPC: Dane County, and
- Southwestern RPC: Iowa, Lafayette, Green, Richland, and Grant Counties.

No comments have been received at the Commission from either RPC during the pre-application or EIS scoping phases.

1.6. IOWA

The proposed project includes approximately 14-miles of high-voltage transmission line in Iowa. This portion of the applicants' project starts at the Hickory Creek Substation in Clayton County, Iowa, travels north through the Refuge, and then east across the Mississippi River into Wisconsin (Figure 8, Appendix A). In addition to the new high-voltage transmission ROW proposed in Iowa, the applicants are also proposing several modifications at the Hickory Creek and Turkey River substations in Iowa. These substation modifications are described in Sections 2.3.1 and 2.3.2.

To construct the proposed facilities in Iowa, the applicants must obtain an Electric Transmission Franchise. The Iowa Utilities Board (IUB) is the state agency responsible for reviewing and processing the applicants' petition (submitted May 18, 2018) for the electric transmission franchise. To grant a franchise, the IUB must find that the project is necessary to serve a public use. Additional information about the electric transmission franchise process in Iowa described in Section 1.6.3 of the federal draft EIS and on IUB's website.[20]

If the proposed project is granted an electric transmission franchise by the State of Iowa, then ITC and DPC would construct the facilities from the Hickory Creek Substation (Dubuque County, Iowa) and across the Mississippi River to the Hill Valley Substation (Green County, Wisconsin). The state permits and approvals that would be required for the proposed facilities in Iowa, as identified by the applicants, can be found in Table 1-12 below.

Table 1-12 Permits and approvals required for the proposed project in Iowa, as identified by the applicants

Agency	Regulated Activity	Approval or Permit Type	Status
IUB and Iowa municipalities (if crossed)	Construction of a new transmission line	Electric Transmission Line Franchise	The application for an electric transmission franchise was filed 05/18/2018. A decision is expected by September 2020.
Iowa Department of Natural Resources (IDNR)	Impacts to regulated resources	CWA Section 401 Water Quality Certification, NPDES Permit, Floodplain Development Permit, Sovereign Land Construction Permit	Would apply, if necessary, after an electric transmission franchise would be granted.

[20] Accessed at: https://iub.iowa.gov/regulated-industries/electric-franchises-transmission-projects/electric-transmission-line-franchise.

Agency	Regulated Activity	Approval or Permit Type	Status
Iowa Department of Transportation (IDOT)	Construction within IDOT ROW	Utility Accommodation Permit; work within ROW permit	Would apply after an electric transmission franchise would be granted.
Iowa State Historic Preservation Office	Impacts to regulated resources	NHPA Section 106 Consultation	To be initiated by USDA RUS

1.7. FEDERAL INTERESTS AND PERMITS

The applicants are required to obtain approvals from multiple federal agencies prior to constructing the proposed project. Table 1-13 summarizes the different federal interests and their status in regards to the proposed project.

The federal decisions required by the proposed project are subject to the National Environmental Policy Act (NEPA) which requires federal agencies to consider environmental and socioeconomic impacts in their decisions. To comply with NEPA, the federal agencies issue a draft environmental impact statement (DEIS) and final environmental impact statement (FEIS) that are used to inform federal agencies in their decisions about funding, authorizing, and/or permitting various components of the proposed Cardinal-Hickory Creek project.

The agencies contributing to the federal DEIS and FEIS include:

- U.S. Department of Agriculture-Rural Utilities Services (RUS), the lead federal agency,
- U.S. Fish and Wildlife Service (USFWS),
- U.S. Army Corps of Engineers (USACE), and
- U.S. Environmental Protection Agency (USEPA).

The federal DEIS was issued December 7, 2018.[21] The public review period for the federal draft EIS ends on April 1, 2019.

Table 1-13 Federal interests in the construction of the Cardinal-Hickory Creek, as identified in the application and the federal DEIS

Agency	Regulated Activity	Approval or Permit Type	Status[22]
RUS, USACE, USFWS, and USEPA	NEPA compliance, including National Historic Preservation Act (NHPA) Section 106 consultation and Endangered Species Act Section 7 consultation	Federal EIS	Certification of Control and Responsibility submitted 7/27/2015 (Appendix H, Exhibit 1 of application) Ongoing A Draft EIS was complete 12/7/2018.
RUS	Federal loan to DPC	Record of Decision	To be completed within 35 business days after the final EIS (FEIS) comment period closes
USACE	Wetland impacts	Sections 401 and 404 of Clean Water Act (CWA)	The applicants would apply after a route would be ordered by PSC.
	Archaeological review	Section 106 of NHPA	Occurring as part of the NEPA review

[21] The draft federal EIS can be accessed at: https://www.rd.usda.gov/publications/environmental-studies/impact-statements/cardinal-–-hickory-creek-transmission-line.
[22] The federal permitting timeline can be accessed at: https://www.permits.performance.gov/permitting-projects/cardinal-hickory-creek-345-kv-transmission-line-project.

Agency	Regulated Activity	Approval or Permit Type	Status[22]
	Navigable Waterways	Section 10 of the Rivers and Harbors Act	The applicants would apply after a route would be ordered by PSC.
	"Real Estate Land Use" Utility ROW through federal land	Easement for high-voltage transmission ROW on ACOE-owned lands	Initial Outgrant Application submitted 1/31/2017 and included in Appendix H, Exhibit 2. A revised Outgrant application would need to be submitted once a Mississippi River crossing location (Stoneman or Nelson Dewey) is selected.
FAA	Construction of transmission lines near airports	FAA Notice Criteria Tool and Form 7460-1	FAA Correspondence and associated forms are provided in ATC's application for this project as Appendix H, Exhibit 3. If approved, final notifications would be submitted once a route is ordered and final design is complete.
National Park Service (NPS)	Cross Land and Water Conservation Fund (LWCF) properties, if necessary	Approval from LWCF	Refer to federal DEIS.
Natural Resources Conservation Service (NRCS)	Cross NRCS property or easement, if necessary	Easement	Refer to federal DEIS.
Federal Highway Administration	Cross Federal and interstate highways, usually coordinated through state DOTs.	Permit	Under review.
U.S. Coast Guard	Construction activities affecting navigable waters of the United States	Authorization	Refer to federal DEIS.
USFWS	Impacts to federally protected and listed rare species	Section 7 Consultation (under the Endangered Species Act), compliance with the Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act	Draft Biological Statement submitted November 2018.
	ROW authorization within Upper Mississippi River National Wildlife and Fish Refuge (Refuge)	Special Use Permit for crossing the Refuge. Easement for crossing federally (USFWS) owned land.	The applicants would apply for the permit after a PSC order and the Mississippi River crossing (Stoneman or Nelson Dewey) is determined compatible by USFWS for the ROW in the Refuge.

The U.S. Department of Agriculture-Rural Utilities Services (RUS) is involved in the proposed project as a result of DPC requesting financial assistance as a partial owner of the Cardinal-Hickory Creek project. RUS is the lead agency coordinating the development of the federal DEIS and FEIS. During its review of DPC's application for financial assistance, RUS is also responsible for reviewing the engineering purpose and need, feasibility, alternatives and cost of the proposed project. Additional information regarding RUS and its responsibilities are identified in Section 1.5.1 of the federal DEIS.

In addition to the proposed facilities in Wisconsin identified in this EIS, RUS is considering an alternative Hill Valley Substation site in Montfort as well as additional route options near Platteville, Livingston, Montfort, Dodgeville, Mount Horeb, Cross Plains, and Black Earth Creek. These additional project options came up during the federal EIS scoping process, and have been identified in Appendix M of the CPCN Application (PSC REF#: 350875). At this time, the applicants are not proposing these additional project options in docket 5-CE-146. Additional details regarding these project options can be found in Appendix C of this EIS.

Table 1-14 Comments from federal agencies received during the scoping period

PSC REF#[23]	Agency Commenting
352719	U.S. Department of Agriculture (RUS)
352719	SWCA for RUS

1.8. STATE AND FEDERAL SITING CONSIDERATIONS

The Commission is the regulatory agency that would decide, if approved, where the project would be constructed in Wisconsin. For the proposed project, the additional project options (in Wisconsin) under consideration by RUS would only be constructed if they are approved and selected by the Commission.

The only exception to the Commission having the primary siting authority for the proposed project in Wisconsin would be where it crosses property that is owned by a federal agency or encumbered with federal easement. As identified in Table 1-13, the applicants would require a federal easement in the Upper Mississippi Wildlife and Fish Refuge (Iowa) prior to crossing the Mississippi River to get from the Hickory Creek Substation to the Cardinal Substation. As it is currently proposed, the project would either cross the Mississippi River at the existing high-voltage transmission line crossing to the Stoneman Substation or at a new high-voltage transmission crossing to the Nelson Dewey Substation (Figure 6-1). If USFWS and USACE approve a ROW location within the refuge that differs from the Commission's decision in the Mississippi River Routing Area, the location of the federal easement approved by the federal agencies would be the one that is constructed. Additional information regarding the Mississippi River route alternatives are discussed in Chapter 6.

1.9. STATE AND FEDERAL PERMITTING CONSIDERATIONS IN THE COMMISSION'S PROCESS

The Commission must make a number of determinations regarding the proposed construction project in a short timeframe, without knowing whether other state and federal regulatory permits would be granted. The Commission typically includes language in an order authorizing a project that states an applicant is required to obtain all necessary federal, state, and local permits prior to starting construction on either the entire project, or project "construction spread", as a practical way of mitigating that uncertainty. In previous projects, the Commission has identified "construction spreads" as the following:[24]

> "Construction spread means any subpart or segment of the proposed project established by the applicant for the purposes of managing construction of the project."

The reason for this requirement is to ensure that the Commission does not approve, and the applicants begin constructing, a section of a project for which the applicants would not be able to obtain the required permits from other regulatory agencies.

[23] The ERF System facilitates the electronic submission of documents and online access to these documents in formal cases before the Commission. Accessed at: http://apps.psc.wi.gov/vs2015/ERF/ERFhome.aspx.
[24] From docket numbers 137-CE-167, 137-CE-186, and 137-CE-188.

CHAPTER

2

2. General Description of Proposed Project

2.1. ROUTING AND SITING OF THE PROPOSED PROJECT

The applicants have proposed to locate a new 345 kV transmission line in southwestern Wisconsin. It would cross the Mississippi River near Cassville (Grant County), travel northeast to a new substation in Montfort (Grant County), and continue northeast to end at the Cardinal Substation in Middleton (Dane County). The proposed 345 kV transmission line would be approximately 84 to 105 miles long with an average ROW width of 150 feet, with few exceptions.

As introduced in Section 1.1.3, each proposed route alterative is evaluated within the context of its designated routing area in this EIS. Routing areas are introduced in Sections 2.1.3 through 2.1.6 below, and they are discussed in much greater detail in Chapters 6 through 9. These routing areas provide an organizational tool for analyzing information about the ecological and socioeconomic impacts of the proposed project.

Overall, the different route alternatives within each routing area can be combined into several complete route alternatives that add up to between 84 and 105 miles between the Cassville, Wisconsin and Middleton, Wisconsin. These are the route alternatives under consideration in docket 5-CE-146 (Table 2-1).

Table 2-1 Route alternatives are under consideration by the Commission in docket 5-CE-146

Routing Area	Route Alternative
Mississippi River	Nelson Dewey-North
	Nelson Dewey-South
	Stoneman-North
	Stoneman-South
Western	Western-North
	Western-South
Eastern	Eastern-North
	Eastern-South
Dane County	Black Earth Creek-North
	Black Earth Creek-South

2.1.1. Applicants' original route references

To facilitate continuity and understanding of the original route references in the application and how these routes have been identified in this EIS, Table 2-2 identifies the names the applicants' used to identify the routes in the application, the names the Commission is using to describe the proposed route alternatives in this EIS, as well as their associated routing areas used as an organizational tool in this EIS.

Table 2-2 Application and EIS references of proposed facilities

Application Route References	EIS Proposed Route References	EIS Routing Area
Preferred Mississippi to Hill Valley	Nelson Dewey-North Western-North	Mississippi River and Western
Preferred Hill Valley to Cardinal	Eastern-South Black Earth Creek-North	Eastern and Dane County
Alternate Mississippi to Hill Valley	Nelson Dewey-South Western-South	Mississippi River and Western
Alternate Hill Valley to Cardinal	Eastern-North Black Earth Creek-Hwy 14	Eastern and Dane County
Stoneman Crossing to Preferred Route	Stoneman-North	Mississippi River
Stoneman Crossing to Alternate Route	Stoneman-South	Mississippi River
Proposed Substation (S1)	Hill Valley-South	Not applicable

In addition to the proposed route alternatives found in the main body of the application, the applicants have provided additional information on route subsegments and an additional substation site that are under consideration by RUS.[25] For additional information regarding RUS's process, refer to Section 1.7 of this EIS. The applicants are not proposing these route subsegments or the additional substation site as siting options in docket 5-CE-146. Additional details regarding these project options have been noted, where appropriate, and can be found in Appendix C of this EIS.

2.1.2. Applicants' siting process

During the initial siting process, the applicants' identified a study area that encompassed southwestern and southcentral Wisconsin. Early on the applicants decided that a new intermediate substation (Hill Valley Substation) should be located in Montfort, Wisconsin. Subsequently, the initial study area encompassed greater than 1,100 square miles between southwestern Grant County and northern Dane County in Wisconsin.[26]

The location of the new Hill Valley Substation significantly impacted the siting of the proposed 345 kV transmission line in southwestern Wisconsin. The applicants stated that they considered and dismissed the location of the new substation in Spring Green because it would require crossing the Wisconsin River as well as several areas of cultural significance including House on the Rock, the American Players Theatre, and the Taliesen (Frank Lloyd Wright property). In addition, the applicants stated that they considered siting the new substation in Darlington and Dodgeville, but dismissed these locations because of additional project cost and scope.[27] The applicants have not yet identified why they did not consider siting the new substation at the Hillman Substation in Platteville, and Commission staff are waiting on responses from the applicants regarding additional locations that were considered for the proposed Hill Valley Substation.

The applicants siting process included a multi-stage process to narrow the initial project corridor down to the proposed route alternatives presented in docket 5-CE-146. As stated by the applicants, the preliminary route corridors were based off of the siting priorities listed in Wis. Stat. § 1.12(6).

To narrow the project study area, the applicants reviewed:

- maps and aerial imagery,
- engineering,

[25] Appendix M of the application (PSC REF#: 350875)
[26] Appendix A, Figure 2 (PSC REF#: 341654)
[27] Data Request 4.73 (PSC REF#: 354949), Data Request 4.74 (PSC REF#: 353712)

- constructability,
- environmental constraints,
- cost,
- input from local landowners, public officials, and other stakeholders, and
- consultations with various state and federal agencies.

The applicants considered several criteria prior to identifying a preferred and alternate route presented to the Commission. As stated by the applicants, these criteria included:

- Wisconsin siting priorities (Wis. Stat. § 1.12(6)),
- existing linear infrastructure,
- locations of cemeteries, schools, daycare facilities, and hospitals,
- county and state road expansion plans,
- proximity to residences,
- impacts to landowners and communities,
- impacts to wetlands, waterways, and forests,
- impacts to archaeological and cultural resources,
- avoidance of airports, airstrips, and high-density residential areas,
- existing land-use patterns and practices,
- known conservation easements, and
- design modifications and/or construction practices to overcome terrain challenges.

2.1.2.1. Siting transmission facilities across the Mississippi River

To connect the applicants designated end points of the proposed project (Hickory Creek Substation in Iowa and Cardinal Substation in Wisconsin) the route would have to cross the Mississippi River. Prior to its application to the Commission, the applicants evaluated over 46 miles of potential river crossings between Dubuque and Guttenberg, Iowa[28]. After consultation and feedback from the permitting authorities the applicants determined that the river crossing should be in Cassville, Wisconsin.

As identified in Section 1.7, the proposed project requires a federal easement through the Refuge prior to crossing the Mississippi River. USACE and USFWS's decision regarding the location of the easement within the Refuge could impact the siting of the proposed project in Wisconsin. Additional information regarding the State and Federal Siting Considerations can be found in Section 1.8.

2.1.3. Mississippi River Routing Area

The Mississippi River Routing Area is located near Cassville, Wisconsin, and lies entirely within Grant County. The Mississippi River Routing Area is comprised of four separate route alternatives, and is discussed in detail in Chapter 6 of this EIS.

The proposed project provides two separate locations (Nelson Dewey or Stoneman) for crossing the Mississippi River in Cassville, Wisconsin. There are existing 161kV and 69kV electric transmission lines that cross the Mississippi River connecting at the Stoneman Substation. A new Mississippi River crossing has been proposed that would connect the Wisconsin portion of the proposed project at the Nelson

[28] The Alternative Crossing Analysis and Macro Corridor Study can be found on the U.S. Department of Agriculture, Rural Development website at: https://www.rd.usda.gov/publications/environmental-studies/impact-statements/cardinal-%E2%80%93-hickory-creek-transmission-line.

Dewey Substation, just north of the Stoneman Substation. Each of these crossing options includes two separate route alternatives (North and South) that connect to route alternatives in the Western Routing Area. The Mississippi River route alternatives are identified in Table 2-3 and displayed in Figure 6-1.

Table 2-3 Mississippi River routing area route alternatives

Route Alternative	Route Subsegments
Nelson Dewey-North*	A01A, A01B, A02, A03
Nelson Dewey-South	A01A, C02A, C02B, C04
Stoneman-North	B01, B02, C01, C03
Stoneman-South	B01, B02, B03, B04

*See Appendix C for an additional route options under consideration by RUS.

2.1.4. Western Routing Area

The Western Routing Area is located in Grant, Iowa, and Lafayette Counties. The Western Routing Area is comprised of two main route alternatives (North and South) that connect the Mississippi River Routing Area and the Eastern Routing Area, and is discussed in detail in Chapter 7 of the draft EIS.

The Western-North route alternative travels northeast from the village of Cassville to the village of Montfort. The Western-South route alternative travels east from the village of Cassville to the city of Platteville and then north to the village of Montfort. Before entering the proposed substation (Hill Valley-South), both route alternatives would connect to common route subsegments before entering the substation. The Western Routing Area alternatives are identified in Table 2-4 and displayed in Figure 7-1

Table 2-4 Western Routing Area route alternatives

Route Alternative	Route Subsegments
Western-North	D01, D03, D04, D05, D08, D09A
Western-South*	E01, E03, E04, E06, E07, E09, E10, E12, E13, E14, E16, E18, E19, G01, F01, F02, F03, G06A, G06B, G08, G09, H01, H02, H03, H06, H07, H09, I01, I02, I05, I06, 107, I08, I09, K01, L01, L02, L03, L04, D10C
Common Route Subsegments	D10A, D10B, L05

*See Appendix C for an additional route options under consideration by RUS.

2.1.5. Eastern Routing Area

The Eastern Routing Area is located within Iowa and Dane Counties. The Eastern Routing Area is comprised of two main route alternatives that connect the Western Routing Area near Montfort, Wisconsin and the Dane County Routing area near Cross Plains, Wisconsin, and is discussed in detail in Chapter 8 of the EIS.

The Eastern-North route option generally travels north and east from the Hill Valley-South substation site (Montfort) to Cross Plains. The Eastern-South route option generally travels east and north from Montfort to Cross Plains. The Eastern Routing Area alternatives are identified in Table 2-5 and displayed in Figure 8-1.

Table 2-5 Eastern Routing Area route alternatives

Route Alternative	Route Subsegments
Common Route Subsegments	N07 (138kV only), N01, N03, N04, N05, N06
Eastern-North	P01, P02, P03, P04, P05, P06, P07, P08, P09, W01, W02
Eastern-South*	Q01, Q02, Q03, Q04, Q05, Q06, S01, S04, S05, S08, S09, S10A, S10B, S10C, S10D, S12, S13, T01, T02, T03, T04, T05, V01, V02, V03, V04, V05, V06

*See Appendix C for an additional route options under consideration by RUS.

2.1.6. Dane County Routing Area

The Dane County Routing Area is located entirely within Dane County. This routing area connects the Eastern Routing Area near Cross Plains, Wisconsin to the Cardinal Substation near Middleton, Wisconsin. This routing area is discussed in detail in Chapter 9 of the EIS.

The Dane County Routing Area starts near Cross Plains, Wisconsin and follows common route segments east until Cleveland Road where it separates into two route alternatives near Black Earth Creek. From here it travels east along common route segments until it terminates at the Cardinal Substation in Middleton, Wisconsin. The Dane County Routing Area alternatives are identified in Table 2-6 and displayed in Figure 9-1

Table 2-6 Dane County Routing Area route alternatives

Route Alternative	Route Subsegments
Common Route Subsegments	W03, W04, Y01A, Y01B, Y01C, Y05, Y06A, Y07, Y08
Black Earth Creek-North*	Y06B
Black Earth Creek-South *	Z02, Z01B

*See Appendix C for an additional route options under consideration by RUS.

2.1.7. Additional project options under consideration by RUS

As stated in Section 1.7 and noted in Tables 2-3 through 2-6, RUS is considering an alternative Hill Valley Substation site in Montfort, Wisconsin as well as additional route options near Platteville, Livingston, Montfort, Dodgeville, Mount Horeb, Cross Plains, and Black Earth Creek. These additional project options came up during the federal EIS scoping process, and were identified in Appendix M of the CPCN Application[29]. At this time, the applicants are not proposing these additional project options in docket 5-CE-146. Additional details regarding these project options can be found in Appendix C of this draft EIS.

2.2. ENGINEERING AND DESIGN OF NEW TRANSMISSION FACILITIES

2.2.1. Transmission structures and configurations

The applicants propose to use several structure types and configurations to accommodate the wide range of environments encountered by this project. The majority of the transmission line structures would be self-supporting tubular steel monopoles, whether as single-circuit or double-circuit, and would have a galvanized or weathering steel finish. In general, structure heights for this project would range from 120 to 175 feet tall with spans of 750 to 1,100 feet between structures. The typical ROW width would be 150-feet, with few exceptions. Diagrams of typical structure configurations have been included in Figures 1 through 14 (Appendix D).

Single-circuit tangent and small angles would typically be in a delta configuration. Where the available ROW width is limited, the conductors could be constructed in a vertical configuration. Single-circuit medium-angle, large-angle, and dead-end structures would be either in a vertical or delta configuration. Double-circuit tangents, angles, and dead-end structures would generally all be in a vertical configuration.

[29] PSC REF#: 350875

For the Mississippi River crossing, the applicants propose to span the entire river with crossing structures placed on the banks of the river in Wisconsin and Iowa. These crossing structures would be double-circuit steel pole H-frames arranged in a horizontal configuration that are designed to carry a new 345 kV line. The height of these river crossing structures would be between 173 and 198 feet tall with a minimum wire to ground clearance between 91 and 94 feet. A diagram of the river crossing structures is found in Figure 1 (Appendix D).

Between the Mississippi River crossing location and the Hill Valley Substation (Mississippi River and Western Routing Areas), the spans would typically be in the 800 to 1200-foot range for single-circuit and double-circuit sections.

Between the Hill Valley and Cardinal substations (Eastern and Dane County Routing Areas), the spans would typically be in the 750 to 900 foot for sections with 138 kV under build, and 850- to 1,100-foot span range for single-circuit and double-circuit back-to-back configurations. Typical structure heights would range from 120 to 175 feet. Where the line would be double-circuited with an existing line, existing structures along the proposed routes would generally be removed and the transmission circuit would be double-circuited with the proposed 345 kV line.

The proposed transmission line would be energized at 345 kV. The applicants propose the use of a bundled pair of TP-477 kcmil 24/7 ACSR (Hawk) conductors for each phase of the 345 kV circuit. Where existing lower voltages are being rebuilt as part of the Project, a single TP-477 kcmil 24/7 ACSR (Hawk) conductor or a single 477 kcmil Type 13 ACSR (Flicker/Oval) conductor or a conductor of similar capacity would be used per phase.

The proposed transmission line would typically use two shield wires to help protect the phase conductors from lightning strikes. Depending on the line configuration, the two shield wires may consist of one standard steel stranded wire and one steel and aluminum stranded wire containing a fiber optic bundle core (generally known as optical ground wire or OPGW) or two OPGWs. OPGW allows both lightning protection and a communication path between substations

All segments would use two shield wires to help protect the phase conductors from lightning strikes. Depending on the line configuration, the two shield wires may consist of one standard steel stranded wire and one steel and aluminum stranded wire containing a 48-fiber optic bundle core (generally known as optical ground wire or OPGW) or two OPGWs. OPGW allows both lightning protection and a communication path between substations.

For the proposed line from the Mississippi River crossing to the Hill Valley Substation (Mississippi River and Western Routing Areas), the conductors would be supported by polymer insulators in a V-string or I-string configuration.

For the proposed 345 kV line between the Hill Valley and Cardinal substations (Western and Dane County Routing Areas), the conductors would be supported by glass or porcelain insulators in a V-string configuration. In locations where the proposed 345 kV circuit would be double-circuited with an existing lower voltage line, a mixture of glass or polymer V-string assemblies, I-string assemblies, or polymer braced post assemblies would be used for the lower voltage circuit depending on if the lower voltage circuit is located at the same elevation or in an underbuilt configuration.

2.2.2. Electric distribution facilities

The applicants propose to construct a new 345 kV transmission line where there are several existing 161 kV, 138 kV and 69 kV transmission lines. There are also a number of distribution lines along the proposed alignments for all of the route alternatives. These distribution lines, if approved, would be removed and relocated along the selected route. This would be done to eliminate physical conflicts with the proposed project or to increase separation with the proposed transmission line to comply with the Wisconsin Electrical Code. This would also be done to ensure safe operating distances from transmission facilities and to address other parameters like stray voltage and neutral to earth voltage issues.

For all of the proposed route alternatives, approximately 14 miles of distribution lines would need to be removed and relocated. Some of these distribution facilities would be underbuilt with the proposed 345 kV transmission line and the rest would be relocated to eliminate physical conflicts with the proposed project or to increase separation with the proposed transmission line. Table 2-7 identifies the distribution facilities owned by Alliant Energy and Madison Gas and Electric Company (MGE) that would need to be removed or relocated if the associated route alternative is selected. A few examples of the proposed configuration for distribution facilities to be underbuilt or increase separation from transmission facilities can be seen in the revised application.[30]

Table 2-7 Distribution facilities owned by Alliant Energy and MGE in the proposed project area

Route Alternative	Route Subsegments
Western-South	H02, H06, H09, I01, I02, I05, I06, I07, K01, L01,
Eastern-South	Q02, Q04, S01, , S04, T2, T05, V02, V04, V06
Eastern-North	P03, P04, P05, P06, P09 W01
Dane County-Common Segments	W03

If the project is approved, the applicants would work with the affected distribution utilities to obtain required distribution line outages. Additionally, the applicants have identified potentially impacted facilities and would work with the owners to address their concerns. This includes coordinating with the local distribution companies to perform pre- and post-construction testing in accordance with established protocols of potentially impacted facilities to ensure that no adverse impacts result in terms of induced voltages.

2.2.3. Transmission structure foundations

A preliminary geotechnical evaluation was conducted for the entire study area to assess the soil and geologic conditions that could be encountered. Based on that evaluation, there are two types of traditional structure foundations would be primarily used for this project, direct embedded and reinforced concrete caissons. The bulk of the structures are anticipated to be supported by reinforced concrete caissons. General construction steps and photos for the installation of these types of foundations are described in Section 4.2.4. All construction materials, equipment, and labor would be brought to remote foundation sites over temporary access roads, using special matting, where required, to protect underlying soils and vegetation. Typical equipment for this phase of construction includes dump trucks, drill rigs, cranes, vacuum trucks, and tanker trucks.

In some places, access is limited and/or protection of a natural resource is paramount, making alternative construction methods prudent for consideration. Helicopters can provide a low impact alternative for almost all phases of construction. In some difficult locations, their use may reduce required construction time, eliminate the need for extensive road building, and reduce the construction footprint considerably. Light helicopters may be used along the entire length of this project in stringing operations and the installation of conductors, shield wires, and bird. Heavy helicopters may be used to transport equipment and materials including the tower components to remote locations. They are also used in the construction

[30] Figures 19, 32, 40 and 42 in Revised Application, Appendix G, Exhibit 1, EMF Report (PSC ERF# 353622)

of alternative types of foundations, including micro-piles and vibratory caissons, both of which are described below.

2.2.3.1. Direct embedded structures

For direct embedded structures, the excavated holes would range from 3 to 6 feet in diameter and 20 to 30 feet in depth depending upon the soil conditions. The integrity of the hole may be protected with the installation of a permanent culvert or the use of a temporary casing during construction only. After the hole is excavated to the required depth, the embedded portion of the steel structure is inserted into the hole, the structure is plumbed, and the hole is backfilled with a granular engineered material which is compacted in lifts until reaching the ground surface.

2.2.3.2. Reinforced concrete caissons

For reinforced concrete caissons, the excavated holes would range from 5 to 14 feet in diameter and 20 to 60 feet in depth. If poor soil conditions exist, greater diameters and depths may be required. After the hole is drilled to the required depth, concrete caissons are formed using a rebar and anchor bolt cage that is placed into the excavation and the hole is filled with concrete. After the caisson is allowed to cure, the structure is bolted onto the exposed anchor bolts.

2.2.3.3. Micro-pile foundations

Micro-piles are an alternative to conventionally drilled foundations. They are a set of components for a type of deep foundation that is used to support the bottom of transmission structures. Each element is usually high-strength and relatively small-diameter casing and/or rod. The size and number used depends on the transmission structure requirement for weight and lateral forces such as wind and turning angles. The other major design issue is the subsurface soil conditions and profile of materials at various depths. A typical pile is approximately three to 10 inches in diameter. The casing is advanced to the design depth using a drilling technique. Reinforcing steel in the form of an all-thread bar is typically inserted into the micropile casing and high-strength cement grout is then pumped into the casing. The micro-piles are then commonly capped with concrete collars to which the transmission tower is affixed.

This type of foundation is suitable for remote rocky locations. While vehicle access to transmission structure sites are still necessary for micro-pile foundation construction, the vehicles would be small excavators and pick-up trucks, as opposed to larger and heavier cranes and concrete trucks. Utilization of this type of foundation in remote rocky areas would reduce environmental impacts.

2.2.3.4. Helical pier foundations

A second alternative foundation is helical pier foundations which are suitable for areas with high water tables or unstable conditions where a deep foundation would typically be required. Helical piers are also known as screwpiles. They are composed of a steel shaft with screw or helix tip that upon rotation pulls the shaft into the ground. A large hydraulic auger system twists the piles down and measures the torque for the correct resistance for the design loadings. After the piers are installed, they are capped with concrete or a welded steel collar to which transmission towers are affixed. This installation method requires no soil excavation or removal as is common with other drilling techniques. Furthermore, in mucky and wetland environments, no fill is added.

This type of foundation is suitable for areas of deep wet and mucky environments. In other transmission construction projects, marsh buggies were used during frozen conditions to access the constructions sites. The hydraulic augers were also installed on the marsh buggies and further minimized the impact to the natural resource.

2.2.3.5. Vibratory piles

Vibratory piles or hammer-driven piles are the most common driven pile system with the pile being either an H-beam or pipe. A pile foundation consists of installing a cluster of steel piles to a depth of as much as 120 feet. This type of foundation is used where poor soil conditions would result in excessively large drilled pier foundations. Vibratory piles can be installed either with conventional pile driving hammers or by vibratory methods. A rectangular shaped concrete pile cap is installed to tie the pile cluster together to form a structural unit. The pile cap could vary in size from 10 to 30 feet wide, 20 to 40 feet long, and 3 to 6 feet thick. The bottom of the pile cap is installed to a depth of seven to 10 feet below grade.

Construction traffic associated with this construction method is considerably heavier than that for micropiles. Vibratory piles require a large track mounted crane for installation of the piles. The benefit of using vibratory or hammer driven piles is that low ground pressure track equipment can be used to minimize environmental impacts and the potential footprint of the impact. It avoids the need for extensive matting required for concrete trucks to access the foundation sites.

2.2.3.6. Vibratory caissons

For lightly loaded structures (tangents) in sandy soil, vibratory caissons may be employed as an alternative to vibratory or hammer driven piles. The vibratory caisson is a special case type of pile whereby an inverted steel caisson is vibrated into the soil to serve as the foundation for the steel pole. The benefits of this type of installation are the same as those for vibratory or hammer driven piles. Vibratory driven steel caisson installation consists of a crane and a vibratory hammer, which vibrates the steel cylinder foundation. The weight of the steel and the vibratory hammer pushes the foundation into the ground.

2.2.3.7. Depth to bedrock

Depth to bedrock can be a determining factor in designing a transmission line using appropriate structures and foundations. Some members of the public have expressed concerns about constructing the proposed transmission line in areas of shallow bedrock because of potential adverse effects on local springs and seeps. A map of the depth to bedrock can be found in Figure 5, Appendix A.

2.2.4. Proposed right-of-way configuration

A high-voltage electric transmission line ROW is a strip of land that an electric utility uses to construct, operate, maintain, or repair a power line. Transmission lines are often centered in the ROW, but may be offset, if all the conductors are located on one side of the structure. The structures (usually poles and arms) keep the wires away from the ground, other objects, and each other. Structure height, type, and configuration, along with span length and ROW width are interconnected. For example, to increase the distance between transmission structures, such as when avoiding a field or crossing a river, structure heights and ROW widths may need to increase. Additionally, factors such as topography and the acuteness of turn angles affect the width of the ROW and the height of the structures. Refer to Appendix D for line drawings of the proposed structures and conductor configurations for this project.

The proposed transmission ROW should be wide enough to keep conductors a safe distance from buildings, trees, the ground, and other features as they hang between the transmission poles or other structures. A ROW should also be wide enough for equipment to access the ROW to maintain, operate, and construct the line. In addition, temporary ROW is often utilized during construction of large utility infrastructure projects. If the ROW cannot be accessed within the approved ROW, additional easements would be secured for off-ROW access during construction and/or ongoing maintenance of the line. Off-ROW access roads proposed for this project are discussed in greater detail in Section 2.2.5 as well as throughout Chapters 6 through 9.

To ensure that high-voltage transmission lines are kept clear of potential hazards such as buildings, incompatible vegetation, and other structures that could interfere throughout the life of the facilities, utilities acquire easement agreements with landowners. As stated by the applicants, all new high-voltage transmission easements would be acquired for the proposed project and the disposition of the existing high-voltage transmission easements would be determined on a case-by-case basis after the project is constructed. This is a departure from what utilities have typically done in the past. Typically, existing easements are released when new easements are acquired to accommodate the existing and new electric facilities. An example easement has been included in Appendix F. Ownership, construction, and initial easement acquisition of the proposed ROW is identified in Table 2-8. For more information about ROW easements and landowner rights refer to Section 4.4.

The proposed ROW width for the Cardinal-Hickory Creek project is 150 feet, with few exceptions. These exceptions include Subsegments D10B, N07, Y01A, Y01B, and D10C where the ROW width would be between 80 and 120 feet. Throughout the project area the proposed ROW would be adjacent to and share corridors with existing high-voltage transmission lines, electric distribution lines, roads, railroads, and natural gas pipelines. If the easements for existing electric facilities are not released after the proposed project is built (if approved), then the new ROW width would be significantly greater in some areas than the applicants' stated 150 feet. Details about ROW widths and lengths for the proposed route alternatives can be found in Sections 6.1.2, 7.1.2, 8.1.2, and 9.1.2 of this EIS.

Table 2-8 Ownership, construction, and operation of proposed ROW

Routing Area	Easement Owner[31]	Construction Manager	Easement Acquisition[32]
Mississippi River	ITC (95.5%) and DPC (4.5%)	ITC	ITC
Western	ITC (95.5%) and DPC (4.5%)	ITC	ITC
Eastern	ATC (95.5%) and DPC (4.5%)	ATC	ATC
Dane County	ATC (95.5%) and DPC (4.5%)	ATC	ATC

Table 2-9 Proposed ROW metrics for each route alternative

Routing Area	Route Alternative	Total ROW Length (Miles)	Total ROW Area (Acres)	ROW Area (Acres) Shared With Existing ROW (Percent)
Mississippi River	Nelson Dewey-North	1.5	28	25%
	Nelson Dewey-South	1.8	33	10%
	Stoneman-North	1.8	33	35%
	Stoneman-South	1.1	20	38%
Western	North	32.5	591	35%
	South	50.4	915	35%
Eastern	North	46.0	835	16%
	South	48.7	877	48%
Dane County	Common Route Subsegments	3.0	53	38%
	Black Earth Creek-North	1.4	26	33%
	Black Earth Creek-South	1.5	28	33%

2.2.5. Proposed Off-ROW areas

Off-ROW areas such as access roads, laydown yards, and temporary workspaces may be utilized where limitations prevent the applicants from accessing the ROW from acquired easements or public roads. If

[31] Response to Data Request 1.37 (PSC REF#: 346685)
[32] Response to Data Request 4.13 (PSC REF#: 353712)

the project is approved and additional laydown yards, staging areas, or off-ROW access roads are utilized to construct the project the applicants are required to notify the Commission and submit the necessary information prior to establishing any such areas as identified in Wis. Admin. Code § PSC 111.71.

2.2.5.1. Off-ROW access roads

As stated in the application, wherever possible the construction crews would access the approved ROW from public roads that intersect the ROW, unless the contractor is able to negotiate alternative off-ROW access that minimizes environmental and/or landowner impacts. Examples of areas where off-ROW access roads may be utilized include:

- slopes greater than 20 percent,
- river crossings wider than can be safely crossed using a TCSB, and
- access limitations along roads and railroads.

In the application, a 30-foot width was assumed for all off-ROW access roads[33]. This is a departure from past projects, for example in the Badger Coulee docket (5-CE-142) the off-ROW access roads were proposed to be 16-feet wide. If the project is approved, the applicants have stated that there may also be areas the off-ROW access would be greater than 30 feet. Refer to Chapters 6 through 9 for additional information on proposed access roads in each routing area.

If the project is approved, the applicants would re-evaluate their proposed access plan based on the route approved by the Commission, field reviews, and negotiations with private landowners. Prior to construction, off-ROW access roads may need modifications such as vegetation removal, grading, and/or gravel placement to allow for safe equipment movement to and from the ROW. Permanent wetland fill for off-ROW areas are not being proposed at this time. If wetland fill were to become necessary, the applicants could use a range of methods to avoid placing fill in wetlands that include the use of ice roads, limit construction activities to only dry or frozen conditions, utilizing low ground pressure equipment, or construction mats. Any methods used in wetlands may be subject to DNR permitting review and approval. Once construction is completed, temporary off-ROW access roads should be restored to pre-construction conditions. Depending on negotiations, the newly created or modified access road may be left in place for the landowner.

Table 2-10 Proposed off-ROW access roads for each route alternative

Routing Area	Route Alternative	Number of Roads	Total Off-ROW Length (Miles)	Total Off-ROW Area (Acres)
Mississippi River	Nelson Dewey-North	2	1.52	5.44
	Nelson Dewey-South	1	0.26	0.92
	Stoneman-North	1	0.26	0.96
	Stoneman-South	None identified		
Western	North	90	36	130.9
	South	64	24	87.3
Eastern	North	41	16.3	59.2
	South	35	4.2	15.2
Dane County	Common Route Subsegments	None identified		
	Black Earth Creek-North	None identified		
	Black Earth Creek-South	1	0.07	0.27

33 Commission staff are waiting for additional information about the proposed width of off-ROW access roads (PSC REF#: 358044).

2.2.5.2. Laydown yards

Additional off-ROW areas that would be utilized as a part of the proposed project include laydown yards, which are also commonly referred to as staging areas. These areas are used for storing construction materials, vehicles, temporary staff buildings, and structures.

A typical laydown yard for the proposed project would be approximately 10 acres in size with a minimum 30-foot-wide driveway for ingress and egress. At the time of the application, preliminary locations for 16 laydown yards have been identified based on the construction requirements for the proposed project. Additional information about the locations and potential impacts of the proposed laydown yards can be found in Sections 6.1.5, 7.1.5, 8.1.5, and 9.1.5 of this draft EIS.

These potential yards could change or additional sites could be identified at a later date based on negotiations with landowners and the updated construction needs of the project. If the project is approved and the applicants identify that additional laydown yards would be necessary to construct the project, prior to establishing any such areas the applicants would notify the Commission of these new locations and submit the necessary information in accordance with Wis. Admin. Code § PSC 111.71.

2.2.5.3. Temporary workspaces

Additional off-ROW areas for the proposed project include helicopter landing zones/pads may be utilized during construction along the approved project corridor. Generally, heavy-lift helicopters would require temporary laydown areas between 1 and 2 acres to provide enough area for the landing pad, tower assembly, equipment, and material storage. These landing zones would be every 5 to 7 miles. Light-duty helicopters would require 50 by 50 foot landing area, and would be spaced every 3 to 4 miles near the approved ROW.[34] The areas chosen could require a temporary easement or agreement with a landowner, and may require work to create a level, stable surface. Agreements with the landowner(s) for these areas would specify how they would be restored or left after work is completed.

Throughout construction, temporary workspaces for wire pulling and handling areas would also be required approximately every 10,000 feet along the approved project corridor. This distance would depend upon the type of conductor that would be installed. These temporary workspaces would be located in open upland areas, where possible.

Table 2-11 Temporary workspace that may be required if the project is approved

Type of Temporary Workspace	Average Size	Average Spacing	Approximate Number of Workspaces*	Approximate Area for Temporary Workspaces*
Heavy-lift helicopter temporary laydown areas	1-2 acres	5-7 miles	12-21	12-42 acres
Light-duty helicopters landing areas	50 x 50 feet [2,500 feet]	3-4 miles	21-35	1-2 acres
Wire pulling and handling workspaces	Varies	Every 10,000 feet	44-55	Unknown[35]

* Based off the approximate range of route alternative options, between 84 and 105 miles.

[34] Commission staff are waiting on clarification on whether this would be within or off the proposed ROW.
[35] Commission staff are waiting on clarification.

2.3. PROPOSED SUBSTATION DESIGNS AND MODIFICATIONS

The proposed project includes the construction of a new 345/138 kV substation in Montfort, Wisconsin and modifications at several existing substations throughout the project area. The design and engineering modifications for each of these substations are discussed in greater detail in this section, from west to east. The construction activities and associated environmental and socioeconomic impacts for each substation are discussed in Chapter 5.

2.3.1. Hickory Creek Substation proposed modifications

The existing Hickory Creek 161 kV Substation is located east of New Vienna in Dubuque County, Iowa. The new 345kV transmission line would begin at this substation. The applicants propose to connect the new 345 kV transmission line into a new 345 kV terminal in the Hickory Creek Substation.

2.3.2. Turkey River Substation proposed modifications

The existing Turkey River 345/161 kV Substation is located east of Millville just across the Mississippi River in Clayton, Iowa. If a new Mississippi River crossing is approved (Nelson Dewey-North or Nelson Dewey-South), the following substation work would be required to support the addition of the 161 kV transmission line from the Turkey River 161 kV Substation:

- Reconfiguring the Nelson Dewey Substation with two 161/69 kV transformers, four new 161 kV circuit breakers, and five new 69 kV circuit breakers;
- Installing one 161 kV line steel dead-end structures with concrete foundations to terminate the transmission lines;
- Installing protection and control panels for the new Turkey River Substation configuration;
- Installing fiber optic communication and SCADA equipment for system protection, remote control, and monitoring of the substation; and
- Installing disconnect switches, buswork, lightning protection structures, instrument transformers, surge arresters, and all associated equipment for a complete substation installation.

2.3.3. Stoneman Substation proposed modifications

The existing Stoneman Substation is located near Cassville in Grant County, Wisconsin and is currently connected to the existing 161/69kV transmission lines that cross the Mississippi River. If a new Mississippi River crossing is approved for the proposed project (Nelson Dewey-North or Nelson Dewey-South), the following work would be done at the existing Stoneman Substation to support the removal of the existing 161 kV and 69 kV transmission lines at the existing Stoneman Substation:

- Removal of the existing 161 kV and 69 kV transmission line terminals; and
- Removal of the existing protection and control relays from the control house.

If the existing high-voltage transmission crossing of the Mississippi River remains at the Stoneman Substation (Stoneman-North or Stoneman-South route alternatives), the following work would be done at the existing Stoneman Substation:

- Removal of the existing 69 kV transmission line terminals; and
- Removal of the existing protection and control relays from the control house.

2.3.4. Nelson Dewey Substation proposed modifications

The existing Nelson Dewey Substation is located near Cassville in Grant County, Wisconsin. If a new Mississippi River crossing is approved at the Nelson Dewey Substation (Nelson Dewey-North or Nelson Dewey-South), the existing Nelson Dewey-Eden 138 kV transmission line (X-16) is proposed to connect to the new Hill Valley Substation in Montfort, Wisconsin. The applicants propose the following substation modifications at the existing Nelson Dewey Substation:

- Replacing a protection and control panel for the 138 kV transmission line to the proposed Hill Valley Substation;
- Installing fiber optic communication and SCADA equipment for system protection, remote control, and monitoring of the substation; and
- Replacing disconnect switches and buswork to meet required electrical ratings.

2.3.5. Hill Valley Substation proposed design and construction

The applicants propose to construct a new intermediate Hill Valley 345/138 kV Substation just south of the village of Montfort in Grant County, Wisconsin. The location of this new substation significantly impacted the applicants' proposed route options for the new 345kV transmission line through southwestern Wisconsin, as discussed in Section 2.1.2. The applicants' proposal calls for the substation to be constructed as a four-position 345 kV ring bus and three-position 138 kV ring bus with one 345/138 kV transformer. The applicants' ultimate design for the proposed substation would accommodate a full build out to a six-position 345 kV breaker-and-a-half bus configuration, eight-position 138 kV breaker-and-a-half bus configuration, and two 345/138 kV autotransformers.

The applicants' proposed scope of work at the new Hill Valley Substation would include:

- Installing five 345 kV circuit breakers, foundations, and associated control cables for transmission line switching;
- Installing three 138 kV circuit breakers, foundations, and associated control cables for transmission line switching;
- Installing one 345/138 kV, 500 MVA autotransformer, foundation, and associated control cables;
- Installing one 345 kV, 80 MVAR, oil filled shunt reactor with foundation, secondary oil containment, and associated control cables;
- Installing 138 kV line steel dead-end structures with concrete foundations to terminate the transmission lines;
- Installing 345 kV line steel dead-end structures with concrete foundations to terminate the transmission lines;
- Installing a new building complete with auxiliary systems to house all necessary protection and control, communication, and SCADA equipment;
- Installing fiber optic communication and SCADA equipment for system protection, remote control, and monitoring of the substation; and
- Installing disconnect switches, buswork, lightning protection structures, instrument transformers, surge arresters, and all associated equipment for a complete substation installation.

2.3.6. Eden Substation proposed modifications

The existing Eden Substation is located just east of Montfort in Grant County, Wisconsin. In order to connect the existing Nelson Dewey-Eden 138 kV transmission line to the proposed Hill Valley Substation, the applicants propose the following substation modifications to the existing Eden Substation near Montfort, Wisconsin:

- Replacing a protection and control panel for the 138 kV transmission line to the proposed Hill Valley Substation;
- Installing fiber optic communication and SCADA equipment for system protection, remote control, and monitoring of the substation; and
- Replacing disconnect switches and buswork to meet the required electrical ratings.

In addition to the proposed project that is being routed into and out of the Montfort area due to the location of the new Hill Valley Substation, there are several other utility infrastructure projects planned for the Montfort area (past, present, and future). Depending upon the projects that are approved and constructed in the near future in the Montfort area, the modifications that are proposed in this docket for the Eden Substation may change. Refer to Section 5.9 for additional details on other utility infrastructure projects in the area.

2.3.7. Wyoming Valley Substation proposed modifications

The existing Wyoming Valley Substation is located approximately 1.28 miles south of the Wisconsin River in the town of Wyoming in Iowa County, Wisconsin. If approved, the addition of the proposed Cardinal-Hickory Creek project (including the new Hill Valley Substation) to the transmission system would increase the fault current at the existing Wyoming Valley Substation. Nine 16-foot ground rods would be installed to mitigate the identified fault current increase.

2.3.8. Cardinal Substation proposed modifications

The existing Cardinal Substation is located west of Middleton in Dane County, Wisconsin. The new 345kV transmission line would end at this substation. In order to connect the proposed 345 kV transmission line to the existing Cardinal Substation, the applicants propose the following substation modifications:

- Installing two 345 kV dead-end structures with concrete foundations to terminate the proposed transmission line;
- Installing a 345 kV circuit breaker, foundations, and control cables for transmission line switching;
- Installing a protection and control panel for the new 345 kV transmission line;
- Installing fiber optic communication and SCADA equipment for system protection, remote control, and monitoring of the substation; and
- Installing disconnect switches, buswork, lightning protection structures, instrument transformers, surge arresters, and all associated equipment for a complete substation installation.

2.4. PROJECT COSTS

The estimated cost of the proposed project as the sum of year-of-occurrence dollars ranges from about $474 million to $560 million, depending on a route selected. These costs are estimated in 2023 dollar costs, which is the projected in-service year for the project. The estimated project cost includes substation modifications, the new Hill Valley Substation, distribution line relocations, land acquisitions, precertification, and allowance for funds used during construction (AFUDC) for ITC and DPC. A more detailed description of the project costs and financing can be found in Section 3.8.1.

2.4.1. Estimated project costs

Transmission line and substation costs by route alternative for the various sections of the line are included in Table 2-12. Total project costs for four possible route alternatives are included in Table 2-12. Table 2-12 does not include all possible subsegment combinations. If the Commission were to select a route not presented in this table, additional cost information would be required.

Table 2-12 Total project costs for four possible route alternatives

Route Alternatives	Western-North Eastern-South	Western-South Eastern-North	Western-North Eastern-North	Western-South Eastern-South
Transmission Line Costs				
Mississippi River Crossing to Hill Valley Substation Transmission Lines	$133,697,000	$192,368,000	$133,697,000	$192,368,000
Hill Valley Substation to Cardinal Substation Transmission Lines	$191,851,000	$175,722,000	$175,722,000	$191,851,000
Subtotal Transmission Line Costs	$325,548,000	$368,090,000	$309,419,000	$384,219,000
Substation Costs				
Total Cost for all Substation Modifications[36]	$38,274,000	$38,274,000	$38,274,000	$38,274,000
Calculation of Amounts Subject to Impact Fees				
Subtotal Transmission Line and Substation Costs	$363,822,000	$406,364,000	$347,693,000	$421,493,000
Less costs not subject to impact fees[37]	$82,178,000	$101,377,000	$87,457,960	$95,096,040
Subtotal Costs Subject to Impact Fees	$281,644,000	$304,987,000	$260,234,040	$326,396,960
Other Project Costs				
One-time 5.0% Environmental Impact Fee	$14,082,000	$15,249,000	$13,011,702	$16,319,848
Annual 0.3% Impact Fee (Calculated During 2-Year Construction Period Only)	$1,914,000	$1,944,000	$1,768,502	$2,218,127
Allowance for Funds Used During Construction-ITC	$18,779,000	$25,820,000	$18,088,280	$26,486,508
Allowance for Funds Used During Construction-DPC	$626,000	$626,000	$626,000	$626,000
Precertification Costs-ATC	$16,000,000	$16,000,000	$16,000,000	$16,000,000

[36] Refer to Table 2-13 for additional information on estimated costs for each substation.
[37] Described in response to Data Request 01.97 (PSC REF#: 197427).

Route Alternatives	Western-North	Western-South	Western-North	Western-South
	Eastern-South	Eastern-North	Eastern-North	Eastern-South
Precertification Costs-ITC	$10,490,000	$10,490,000	$10,490,000	$10,490,000
Precertification Costs-DPC	$1,577,000	$1,577,000	$1,577,000	$1,577,000
Post-WI Order Costs-DPC	$2,035,000	$2,035,000	$2,035,000	$2,035,000
Subtotal Other Project Costs	$65,503,000	$73,741,000	$63,596,484	$75,752,483
Project Cost-Wisconsin	$429,325,000	$480,105,000	$411,289,484	$497,245,483
Project Cost-Iowa	$62,891,000	$62,891,000	$62,891,000	$62,891,000
Total Project Cost with the Nelson Dewey Crossing*	$492,216,000	$542,996,000	$474,180,484	$560,136,483
Difference in Total Project Cost with the Stoneman Crossing	$1,357,000	-$3,462,000	$1,357,000	-$3,462,000
Total Project Cost with the Stoneman Crossing*	$493,573,000	$539,534,000	$475,537,484	$556,674,483

*Total estimated project costs assume that the costs for Black Earth Creek-North and Black Earth Creek-South would be the same, pending additional information provided by the applicants.

Table 2-13 Estimated costs for proposed substation modifications

Substation	Estimated Cost
Cardinal Substation	$2,549,000
Eden Substation and Wyoming Valley grounding improvements	$624,000
New Hill Valley Substation	$33,101,000
Nelson Dewey Substation	$1,752,000
Stoneman Substation	$248,000
Total Estimated Cost for all Substation Modifications	$38,274,000

Table 2-14 Estimated project costs by route alternative and Mississippi River crossing

Route Alternatives	Western-North	Western-South	Western-North	Western-South
	Eastern-South	Eastern-North	Eastern-North	Eastern-South
Total Project Cost with the Nelson Dewey Crossing*	$492,216,000	$542,996,000	$474,180,484	$560,136,483
Total Project Cost with the Stoneman Crossing*	$493,573,000	$539,534,000	$475,537,484	$556,674,483

*Total estimated project costs assume that the costs for Black Earth Creek-North and Black Earth Creek-South would be the same, pending additional information provided by the applicants.

2.4.2. Environmental impact assessment fees

Wisconsin communities in which high-voltage transmission lines at 345 kV or greater are constructed receive both a one-time payment and annual payments from fees paid by the utility. Under Wis. Stat. §§ 16.969 and 196.491(3g), and Wis. Admin Code ch. ADM 46, construction applicants that receive a CPCN from the Commission for a 345 kV line are required to pay an annual impact fee and a one-time environmental impact fee to the Department of Administration (DOA). The Commission is responsible for approving the cost of the project and the base cost from which the fees represent a percentage of that base cost. DOA distributes the money to the local municipalities and counties through which the transmission line is built. The fee payments may not be used to offset any other mitigation measure that is required of the applicants in the CPCN order from the Commission. The communities that would receive these fees depend upon the route selected by the Commission. All of the communities in Wisconsin that could be directly affected by the proposed project are identified in Table 1-9 in Section 1.4.1.

2.4.2.1. One-time environmental impact fees

Under Wis. Admin. Code § ADM 46.05, the one-time environmental impact fee, to be paid in the calendar year when construction begins, is equal to 5.0 percent of the cost of the transmission line as determined by the Commission in the CPCN. DOA distributes 50 percent of the funds from this one-time fee to the eligible counties in proportion to the length of line that is constructed through each county. Likewise, it distributes the other 50 percent of the funds to the eligible towns, villages, and cities in proportion to the percentage of the line that is constructed through each eligible political subdivision. The Commission determines the appropriate allocation after a project is approved.

As stated in Wis. Stat. § 16.969(4), a county, town, village, or city that receives money for the one-time environmental impact fee may use its distribution only for park, conservancy, wetland, or other similar environmental programs. The local government can request from the Commission approval of a different use for the funds, provided the use is in the public interest. This is usually done by submitting a formal written request to the Commission.

For the proposed project, 50 percent of the one-time fee would be allocated between Dane, Iowa, Lafayette, and Grant counties. The other 50 percent would be allocated among all the towns, villages, and cities along the selected route described in the Commission's Order. It should be noted that it is possible that a route could be selected for the proposed project that would not pass through Lafayette County, and in that event Lafayette County and the towns and municipalities in Lafayette County would not receive one-time environmental impact fees.

2.4.2.2. Annual impact fees

Under Wis. Admin. Code § ADM 46.04, the annual fee to DOA would equal 0.3 percent of the cost of the line as determined by the Commission under Wis. Stat. § 196.494(3)(gm). DOA distributes the funds from the annual fee to each eligible town, village, and city in proportion to the length of line constructed through each municipality as determined by the Commission in the CPCN. After construction of the line is completed and final costs are submitted to the Commission, the annual fee may be adjusted to reflect the actual cost of the line.

2.4.3. Cost allocation in the MISO footprint

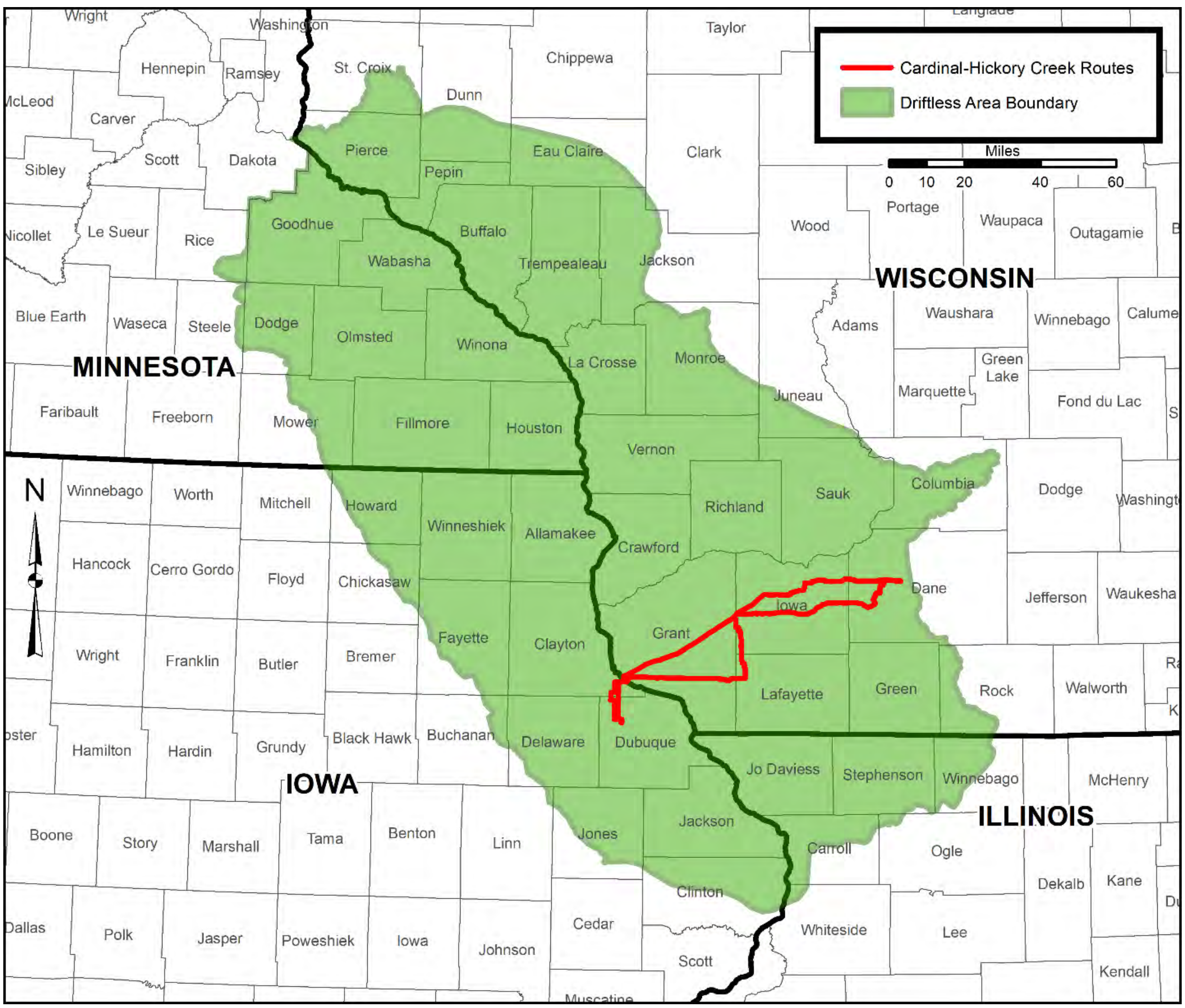
As stated throughout this EIS, the proposed project has been designated as a MISO Multi-Value Project (MVP). This means that a large portion of the project's revenue requirement would be allocated across the entire MISO footprint (Figure 3-1). If approved, the estimated capital cost of the proposed project would be between $474 million and $560 million which would be allocated to the entire MISO footprint. The proposed project's net present value revenue requirement (PVRR) to Wisconsin customers is estimated to be between $66.2 million to $71.8 million depending on a route selected. Comprehensive details of the cost-benefit analysis for the proposed project and its alternatives are contained in Chapter 3 of this document.

2.5. REGIONAL NATURAL RESOURCES IN THE PROJECT AREA

2.5.1. Southwestern Wisconsin and the Driftless Area

The proposed Cardinal-Hickory Creek project traverses southwestern Wisconsin from the Mississippi River to Middleton, Wisconsin, which is well-known and often referred to as the "Driftless Area." The Driftless Area occurs in southeastern Minnesota, northeastern Iowa, southwestern Wisconsin, and northwestern Illinois (Figure 2-1). During the Wisconsin Glaciation, edges of the Laurentide Ice Sheet did not reach portions of southern and western Wisconsin and because these areas free from glacial drift they are collectively referred to as the "Driftless Area". Wisconsin's Driftless Area has not been glaciated for at least the last 2.4 million years and consists of significant topographic variation and unique plant communities.

Figure 2-1 Driftless Area



The Driftless Area contains steep forested ridges, deeply dissected river valleys, and karst geology with plenty of spring-fed and cold-water trout streams. The ecological communities found within the Driftless Area (Section 2.5.2) have been experiencing dramatic change in recent decades from habitat loss and fragmentation, fire suppression, invasive species, climate change, high rates of herbivory, and the widespread replacement of oak forests, woodlands, and savannas with late-successional mesic hardwood forests[38].

In addition to the unique ecology of the Driftless Area, its social and economic significance may be considered unquantifiable to those who live and visit the area. Many have recognized the Driftless Area as a unique resource worthy of ecological, cultural, and economic importance; and thus, this area is the focus of several governmental, non-profit, and private partnerships and organizations that are solely focused on the conserving, restoring, and enjoying this unique area in Wisconsin. Concerns for the impacts the proposed Cardinal-Hickory Creek project could and would have on the Driftless Area are a common theme found in many comments submitted to the Commission (refer to Section 1.2.4.3). Refer to Chapter 4 of this EIS which addresses several of the general environmental and socioeconomic concerns regarding construction of a new high-voltage transmission line. More specific impacts from the proposed facilities on certain areas or resources within the project area can be found in Chapters 5 through 9.

2.5.2. Ecological Landscapes

The proposed project traverses three ecological landscapes in Wisconsin. The DNR and U.S. Forest Service defined these ecological landscapes based on a combination of physical and biological variables that included climate, geology, topography, soils, water, and vegetation. These variables are known to control and/or influence biotic composition and ecological processes.[39]

The proposed Cardinal-Hickory transmission line traverses the following ecological landscapes (Figure 3, Appendix A):

- Western Coulees and Ridges
- Southwest Savanna
- Central Sand Hills

Most of the proposed project falls within the Western Coulees and Ridges and Southwest Savannah landscapes; the Central Sand Hills landscape only occurs along a small portion of the project near the Cardinal Substation (Middleton, Wisconsin). Consideration of these ecological landscapes and their physical, biological, and socio-economic components may be useful in identifying potential construction issues and assessing short- and long-term environmental and socio-economic impacts of the proposed project. The potential construction considerations and possible impacts from the proposed Cardinal-Hickory 345kV transmission line are discussed in Chapters 6 through 9.

2.5.2.1. Western Coulees and Ridges

The Western Coulees and Ridges ecological landscape[40], which comprises a portion of the Driftless Area, is characterized by its highly eroded, unglaciated topography with ridges and deeply incised, steep-sided valleys. It contains high-gradient headwater streams with extensive stream networks and dendritic drainage patterns. In this ecological landscape, porous sedimentary bedrock (especially sandstone) discharges cold groundwater into the streams that occupy the numerous valleys of this highly dissected landscape.

---

[38] Shea, M.E., Schulze, L.A., and Palik, B.J. 2014. Reconstructing vegetation past: pre-euro-american vegetation for the Midwest drifless area, USA. Ecological Restoration. Accessed at: https://www.fs.fed.us/nrs/pubs/jrnl/2014/nrs_2014_shea_001.pdf

[39] Wisconsin Department of Natural Resources (DNR). 2014. The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management.

[40] Wisconsin Department of Natural Resources. 2015. *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management*. Chapter 22, Western Coulees and Ridges Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS-1131X 2015, Madison.

In general, the predominant forest cover type group in the Western Coulees and Ridges is oak (51 percent of the forested land area), followed by northern or central hardwoods, mostly maple and basswood (26 percent), lowland hardwoods (10 percent), and aspen (6 percent). All other forest types each occupy five percent or less of the land area. The Western Coulees and Ridges area also supports the state's best examples of dry prairie and sand prairie; however, good quality sand prairies are very rare, with most of the historical acreage converted to irrigated agricultural fields, red pine plantations, or subdivisions

The floodplain forests associated with some of the major waterways are some of the largest in the upper Midwest. Large stands of floodplain forest are highly significant to forest-interior birds and other species, especially when they contain riverine lakes and ponds and adjoin extensive areas of upland forest. Marshes are also common within the large river floodplains. Spring seeps are plentiful, though they are small and highly localized features on the toe slopes along many rivers and streams.

The ridge tops and valley bottoms have been mostly cleared and the lands have been converted to agricultural uses because of their rich, productive soils.

A mantle of loess (wind-deposited silty material) covers most of the landscape, with the thickest deposits on the ridges and closer to the Mississippi River. Soils on hilltops and side slopes are formed of loess, loamy to clayey residuum, and loamy colluvium over limestone or sandstone. Particularly on south- and west-facing slopes, the soils tend to be dry and erodible, and their shallow depth to bedrock can limit management options. Some of the ridge top loess was moved downslope by erosion and has been incorporated into floodplain deposits. Soils of the narrower valleys are predominantly silty and loamy residuum and alluvium. These soils range from well-drained to very poorly-drained and have areas subjected to periodic flooding. Organic soils are uncommon within the Western Coulees and Ridges.

In the portion of this ecological landscape in which the project is proposed, the bedrock is composed of mostly Paleozoic sandstones and dolomites and exposed as cliffs and, more locally, as talus slopes.

2.5.2.2. Southwest Savanna

Similar to the previously described ecological landscape, the Southwest Savanna[41] is also part of the Driftless Area. The topography is characterized by broad, open ridgetops, deep valleys, and steep, wooded slopes.

The predominant current land cover within the Southwest Savanna includes agricultural crops (corn, soybeans, small grains, hay), with lesser amounts of pasture, grassland, forest, and residential areas. Although the majority of pastureland is currently used for agricultural purposes, some pastures have never been plowed, and those that historically supported prairie may retain remnants of the former prairie flora. Pastures with scattered open-grown oaks still exist in some areas, mimicking oak savanna structure. The major forest types are oak-hickory and maple-basswood. Prairie remnants of varying quality persist in a few places, mostly on rocky hilltops or slopes that are too steep to farm.

Soils on hilltops are silt loams mostly silt loams. In some areas soils are shallow, with bedrock or stony red clay subsoil very close to or at the surface. In other locales the ridgetops have a deep cap of loess-derived silt loam (these are the most productive agricultural soils). Valley soils include alluvial sands, loams, and occasionally, peats. In terms of bedrock, the Southwest Savanna landscape is underlain by sedimentary bedrock, especially dolomites and sandstones.

---

[41] Wisconsin Department of Natural Resources. 2015. *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management.* Chapter 20, Southwest Savanna Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS1131V 2015, Madison

The drainage patterns of streams in the Southwest Savanna are dendritic, which is a pattern characteristic of unglaciated regions but absent or uncommon in most of Wisconsin. Flowing waters include warmwater rivers and streams, coldwater streams, and springs. Natural lakes are virtually absent throughout this landscape; although, there are a few associated with the floodplains of the larger rivers. Impoundments and reservoirs have been constructed on some rivers and streams, and check dams have been built in ravines to hold storm and snow runoff.

2.5.2.3. Central Sand Hills

The rounded, hilly topography in the Central Sand Hills[42] is the result of numerous glacial moraines, including a portion of the Johnson Moraine, that were later partially covered by glacial outwash. Other glacial features include numerous small kettle lakes associated with pitted outwash, although these are most common north and east of the project area. The sandstone bedrock is typically buried at depths greater than 50 feet; bedrock exposures are limited but include Precambrian rhyolite bluffs.

In some areas sandy, nutrient-poor soils support a mixture of farm land, woodlots and a variety of wetlands. Agriculture is successful here with the use of center pivot irrigation, but there is a considerable amount of less productive and idle agricultural land. In other areas of this landscape, silty and clayey soils were deposited by Glacial Lake Oshkosh. Organic soils underlie the sandy soils in a few areas and muck farming still occurs in some locations.

The dominant species are white and red pine, white, red, and black oaks, and on more mesic sites, red maple. The understory is typically not very diverse and consists primarily of huckleberry, blueberry, bracken fern, and Pennsylvania sedge. Small barrens and savanna remnants are also present in some upland areas, while fens, wet prairies, and rare coastal plain marshes occur less commonly in some lowlands.

High concentrations of coldwater streams and rivers also occur in the Central Sand Hills and a few other landscapes because of the glacial moraines that discharge cold ground water into streams. Excessive groundwater withdrawal due to the large number of high capacity wells appears to be reducing stream flows and lake levels in some portions of this area.

2.5.3. Southwest Wisconsin Grassland and Stream Conservation Area and Military Ridge Prairie Heritage Area

The Southwest Wisconsin Grassland and Stream Conservation Area (SWGSCA) is a partnership between the DNR and other agencies, organizations and landowners that have the collective goal of improving grasslands, savannas, and streams in southwest Wisconsin. Southwest Wisconsin has been recognized for years as one of the best grassland conservation opportunities in the Upper Midwest[43]. This area is home to exceptional populations of grassland birds, prairie remnants, concentrations of endangered resources, and spring-fed streams embedded in a rural landscape well-known for open fields, farming, oak woodlands, and pastures (Figure 9, Appendix A). The prairie remnants found throughout this region are the relics of the tallgrass prairies and oak savannas that once covered this part of the state. Many of the plant and animal species in this region, several of which are now rare, are adapted to the open, treeless landscape of prairies and savannas.

---

[42] Wisconsin Department of Natural Resources. 2015. *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management*. Chapter 9, Central Sand Hills Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS-1131K 2015, Madison.

[43] Feasibility Study, Master Plan and Enviornmental Impact Statement for the Southwest Wisconsin Grassland and Stream Conservation Area (2009). Accessed at: https://dnr.wi.gov/topic/Lands/Grasslands/documents/SWGFeasStudy.pdf.

Within this landscape is also the Military Ridge Prairie Heritage Area (MRPHA). This 95,000 acre grassland landscape contains more than 60 prairie remnants and is identified as the highest priority for landscape-scale grassland protection by the DNR.

The Commission has received several comments regarding the potential impacts the proposed project could have on SWGSCA and MRPHA. Western-South and Eastern-South would bisect the SWGSCA, and Eastern-South would pass through the MRPHA from Ridgeway to Mount Horeb, Wisconsin. Refer to Sections 7.2.3.2 (Wester-South) and 8.2.3.2 (Eastern-South) for more specific information on how these route alternatives could impact the grasslands located along these routes.

2.5.4. Water Resources

The proposed project crosses a large number of rivers and creeks throughout southwestern Wisconsin. Some of these rivers are quite large and dominate the landscape. In addition to having to cross the Mississippi River, the project also crosses the Grant River (Segments D and E), the Platte River (Segments D and E), and Black Earth Creek (Segments Y and Z). The proposed transmission line routes also span several smaller rivers and may require the construction of transmission poles below the high-water mark in areas with large floodplains or wide rivers. Some rivers are designated by the DNR as an Outstanding Resource Water (ORW) or an Exceptional Resource Water (ERW), and others are designated as Trout Streams (Figure 4, Appendix A).

Table 2-15 Proposed route alternatives crossing DNR Classified Outstanding Resource Waters (ORW) or Exceptional Resource Waters (ERW)

Route Alternative	Water Resource	DNR Classification (ERW/ORW)	Route Subsegment(s)
Western-South	Little Platte River	ERW	E19
	Galena River	ERW	G08
Eastern-North	Blue River	ERW	P02
	Garfoot Creek	ERW	P09
Eastern-South	Gordon Creek	ERW	S13
	Deer Creek	ERW	S13
	Fryes Feeder	ERW	S13
	Schalpbach Creek	ERW	T01
	Sugar River	ERW	T03
Dane County	Black Earth Creek	ORW	Y01B, Y05, Y06A, Y06B, and Z02

Table 2-16 Proposed route alternatives crossing DNR Classified Trout Streams

Route Alternative	Trout Stream (Class)	Subsegment(s)
Western-North	Austin Branch (II)	D08
	Platte River (II)	D08
	Martinville Creek (II)	D08
Western-South	Platte River	E16, L04
Eastern-North	Blue River	P02
	Narveson Creek (II)	P02
	Otter Creek (II)	P03
	Lowery Creek (II)	P09
	West Branch Blue Mounds Creek (II)	P09
	East Branch Blue Mounds Creek (II)	P09
	Vermont Creek (II)	P09
Eastern-South	Gordon Creek (II)	S13
	West Branch Sugar River (II)	S13
	Sugar River (tributary)	T01

Route Alternative	Trout Stream (Class)	Subsegment(s)
Dane County	Garfoot Creek (II)	P09
	Black Earth Creek (I)	Y01B, Y05, Y06A, Y06B, and Z02

2.5.5. Upper Mississippi River National Wildlife and Fish Refuge

The Upper Mississippi River National Wildlife and Fish Refuge (Refuge) is located along the banks of the Mississippi River as it flows through portions of Minnesota, Wisconsin, Iowa, and Illinois (Figure 9, Appendix A). This area was established in 1924 as a refuge for fish, wildlife, and plants. The Refuge encompasses a total of 240,000 acres and is primarily managed by the USFWS; however, some areas are also managed by USACE. The Refuge contains one of the largest blocks of riverine habitat in the contiguous United States, as it spans 261 river miles between the Chippewa River in Wisconsin and Rock Island in Illinois. The Refuge has also been designated as a Wetland of International Importance (The Ramsar List) and a Globally Important Bird Area[44]. In addition to the ecological importance and function of the Refuge, it is also an important economic feature for the neighboring communities. Some of the activities that draw people to the area include hunting, fishing, canoeing, kayaking, boating, and wildlife viewing, and camping just to name a few.

Portions of proposed route alternatives within the Mississippi River Routing Area would be constructed either within or adjacent to the Refuge (Figure 9, Appendix A). Refer to Chapter 6 for more information about the proposed project that crosses the Mississippi River.

2.5.6. Important Bird Areas

The southwestern portion of Wisconsin contains several areas that provide unique and vital resources for birds. Some of these areas include:

- the Mississippi Flyway,
- the Upper Mississippi River National Wildlife and Fish Refuge, and
- several Important Bird Areas.

The Mississippi Flyway is an avian migration route that generally follows the Mississippi River from the Gulf of Mexico to Canada that encompasses states on either side of the river. According to Audubon[45], more than 325 bird species make the round trip each year between their wintering grounds along the Gulf of Mexico and throughout Central America, South America, and the Caribbean, and their breeding grounds in Canada and the northern United States.

The Upper Mississippi River National Wildlife and Fish Refuge also provides critical habitat for breeding migratory birds. Over 150 bird species, including large numbers of bald eagles, are known to migrate through the refuge each spring. During the breeding season songbirds, waterfowl, raptors, and others utilize the refuge to breed and raise young. Of particular importance are the 15 rookeries located within the refuge, these colonial nesting areas provide habitat for breeding great-blue herons and great egrets. In the fall, thousands (and for some species hundreds of thousands) of waterfowl migrate along the river including tundra swans, canvasbacks, common mergansers, common goldeneyes, mallards, northern shovelers, blue-winged teal, and American coots[46]. During winter, unfrozen pockets of water along the river provide hunting grounds for a large population of bald eagles.

---

[44] Accessed at: https://www.fws.gov/refuge/Upper_Mississippi_River/about.html.
[45] National Audubon Society. 2017. Audubon in the Mississippi Flyway. Accessed at: https://action.audubon.org/sites/default/files/3.0_Audubon_in_the_Mississippi_Flyway.pdf
[46] US Fish and Wildlife Service. Upper Mississippi River National Wildlife and Fish Refuge Bird List. Washington: USFWS, 1999. Vol. 1.

The project area is also home to several designated Important Bird Areas (IBAs). The Important Bird Area (IBA) program is a part of an international effort to identify and conserve areas that are critical to birds and biodiversity in general. These areas are administered by the National Audubon Society and implemented by the Wisconsin Bird Conservation Initiative. They provide essential habitat to one or more species of breeding or non-breeding birds, particularly species of conservation concern. These areas are collectively owned and managed by many public and private entities, and are important on global, continental, regional, national, and state levels. The designation of a site as an IBA does not confer any legal status or carry any regulatory requirements, and the inclusion of land within an IBA boundary is entirely voluntary.

The proposed project come into direct contact with, or within 1/2 mile of five different IBAs. These IBAs are identified in Table 2-17 and Figure 6 (Appendix A). Additional information regarding avian risk and high-voltage transmission line construction can be found in Section 4.6.8.1 with specific references in Sections 6.1.3.2, 7.1.3.2, 8.1.3.2, and 9.1.3.2.

Table 2-17 Important Bird Areas located near the project area from west to east

Important Bird Area (IBA)	Route Alternative	Route Subsegment(s)
Wyalusing to Dewey IBA	Nelson Dewey-North	A01B, A02, A03
	Nelson Dewey-South	C02A, C02B
Upper Mississippi River National Wildlife Refuge IBA	Nelson Dewey and Stoneman route alternatives	A01A, B01
Pecatonica River Prairie IBA	Eastern-South	Q02
Military Ridge-York Prairie IBA	Eastern-South	S09, S10A, S10B, S10C, S10D, S12, and S13
Governor Dodge State Park IBA	Eastern-North	P07

2.5.6.1. Wyalusing to Dewey IBA

The Wyalusing to Dewey IBA contains critical floodplain and upland forest habitat for southern forest interior birds[47]. It is considered a cerulean warbler core, with up to 8,000 acres of suitable habitat. Many other high conservation priority bird species have robust populations here, including red-shouldered hawk, acadian flycatcher, Kentucky warbler, hooded warbler, prothonotary warbler, and Louisiana waterthrush. Wyalusing is one of only a handful of sites in Wisconsin where yellow-throated warblers can be found (often in supercanopy white pines), and the most reliable. It is also the site that yielded the most probable evidence of breeding activity for this species during field work for the Breeding Bird Atlas[48]. Shrub, savanna, and grassland habitats throughout this site hare known to support black-billed cuckoo, red-headed woodpecker, Bell's Vireo, brown thrasher, blue-winged warbler, field sparrow, Henslow's sparrow, bobolink, and eastern meadowlark, among others. The site attracts thousands of migrating land birds, particularly in spring.

2.5.6.2. Upper Mississippi River National Wildlife Refuge IBA

The Upper Mississippi National Wildlife Refuge IBA (Upper Mississippi River NWR IBA) follows the boundary of the Refuge from the Minnesota-Iowa border, along the Mississippi River, to Reads Landing, MN. The IBA includes Pools 4, 5, 5a, 6, 7, 8, and part of 9 (in refuge Districts Winona, La Crosse and McGregor). The IBA provides high quality habitat for large numbers of fall migrating waterfowl (especially canvasback and tundra swan), nesting waterbirds, as well as breeding and wintering bald eagles. Bald eagle wintering numbers on this IBA vary both between, and within, years depending on weather and ice cover. Mid-winter counts ranged from 321 in 2004 to 58 in 2005 between Winona and LaCrescent, as viewed from the Minnesota side of the river. Winter eagle roosts are located at Read's Landing and Whitman Dam.

[47] **National Audubon Society.** *Important Bird Areas in the U.S.* s.l. : National Audubon Society, 2013.
[48] **National Audubon Society**. *Important Bird Areas in the U.S.* s.l. : National Audubon Society, 2013.

2.5.6.3. Pecatonica River Prairie IBA

The Pecatonica River Prairie IBA[49] encompasses the upper reaches of the Pecatonica River watershed which is characterized by a rolling landscape with a network of stream systems cutting through the hills. This area was formerly considered the core of the largest prairie in Wisconsin; however, this site is now largely agricultural with significantly large areas of prairie pasture and pastured savanna that have retained the landscape's extensive open aspect and importance to grassland and savanna bird populations. Native prairie remnants, wooded savanna, pastured floodplain and sedge meadow, and cropland also are present. This IBA is one of three focus areas targeted for grassland bird conservation in the DNR's Southwest Grassland and Stream Conservation Area, a landscape-scale project aiming to protect functioning grassland, savanna, and stream ecosystems. The Pecatonica River Prairie IBA harbors some of the best grassland and savanna bird populations in the state, including upland sandpiper, red-headed woodpecker, willow flycatcher, Bell's vireo, brown thrasher, sedge wren, Henslow's sparrow, grasshopper sparrow, field sparrow, bobolink, and dickcissel.

2.5.6.4. Military Ridge-York Prairie IBA

The Military Ridge-York Prairie IBA50 is located in Wisconsin's Driftless Area, and features many streams, hills, ridges, and valleys with the Military Ridge along the northern boundary of the site. Once covered by prairie and oak savanna, this area is now largely agricultural, consisting of cropland, pasture, and idle grassland (mostly Conservation Reserve Program fields). Smaller areas of woodland, savanna, shrub, and riparian habitats also are present. The area contains a significant concentration of prairie remnants on slopes and areas of thin soil that were never plowed. Most of the site is in private ownership, save for the York Prairie State Natural Area and several county parks. The Nature Conservancy owns two preserves in the area. This IBA also harbors some of the best grassland bird habitat remaining in the state. It is one of three focus areas targeted for grassland bird conservation in the DNR's Southwest Grassland and Stream Conservation Area, a landscape-scale project aiming to protect functioning grassland, savanna, and stream ecosystems. Many priority grassland birds have high populations here, including Northern harrier, upland sandpiper, Henslow's sparrow, grasshopper sparrow, dickcissel, bobolink, Eastern meadowlark, and Western meadowlark. Various priority savanna species also breed here in high numbers: red-headed woodpecker; willow flycatcher; Bell's vireo; brown thrasher; and field sparrow. Short-eared owls occur regularly in winter.

2.5.6.5. Governor Dodge State Park IBA

The Governor Dodge State Park IBA[51] encompasses Bethel Horizons, a Lutheran retreat center and educational facility, as well as the state park. The IBA contains a variety of characteristic Driftless Area habitats such as bluffs, ravines, oak-hickory forests, several pine relicts, oak savanna, shrublands, restored prairie, and cool-season grasslands. There also are three impoundments formed by damming of streams. The diversity of habitats supports varied assemblages of forest, shrub, and grassland birds. Priority forest breeders include yellow-billed cuckoo, acadian flycatcher, eastern wood-pewee, wood thrush, cerulean warbler, worm-eating warbler, and Louisiana waterthrush. black-billed cuckoo, red-headed woodpecker, brown thrasher, willow flycatcher, and blue-winged warbler are among the shrub and savanna breeders, while grassland species include field sparrow and Henslow's sparrow. The impoundments provide habitat for waterfowl and waterbirds. The site also receives heavy use by migrating landbirds in both spring and fall.

---

[49] **National Audubon Society.** *Pecatonica River Prairie IBA.* s.l. : National Audubon Society, 2018
[50] **National Audubon Society**. *Military Ridge-York Prairie.* s.l. : National Audubon Society, 2018
[51] **National Audubon Society.** *Governor Dodge State Park.* s.l. : National Audubon Society, 2018.

CHAPTER

3

3. Project Assessment of Need and System Solutions

The following discussion of the need for the proposed Cardinal- Hickory Creek project focuses on the applicants' justification of the project, as described in the project application. Commission staff's evaluation of the need for, and alternatives to, the proposed project is ongoing, and staff anticipates that this discussion will be expanded in the final EIS as Commission staff's review of the need for the project continues, and that the need for the proposed project will be a subject of scrutiny throughout the Commission's review process, including during the public and technical hearings.

3.1. DESCRIPTION OF MIDCONTINENT INDEPENDENT SYSTEM OPERATOR, INC.

The Midcontinent Independent System Operator, Inc. (MISO) is a not-for-profit, member-based organization that administers the wholesale electricity market in the mid-continental U.S. and Manitoba, Canada. MISO is responsible for providing transmission service, coordinating daily operations of generation and transmission facilities, administering bulk electric system markets, and transmission system planning. MISO manages the energy and operating reserves markets using security-constrained economic dispatch of generation. The energy and operating reserves markets include a day-ahead market, a real-time energy market, and a financial transmission rights[52] (FTR) market. These markets are operated and settled separately.[53]

Figures 3-1 and 3-2 show the MISO market and reliability coordination areas. The MISO reliability coordination area is shown in Figure 3-2.

[52] FTRs are pure financial instruments that may be used to provide a financial hedge to help market participants manage risk associated with congestion on the transmission system. The value of FTRs are determined by the transmission congestion charges that arise in the day-ahead and operating reserves markets. These charges lead to differences in the Marginal Congestion Components (MCC) of Locational Marginal Prices (LMPs).
[53] MISO Corporate Fact Sheet: https://www.misoenergy.org/about/media-center/corporate-fact-sheet/

Figure 3-1 Map of the MISO Market Area[54]

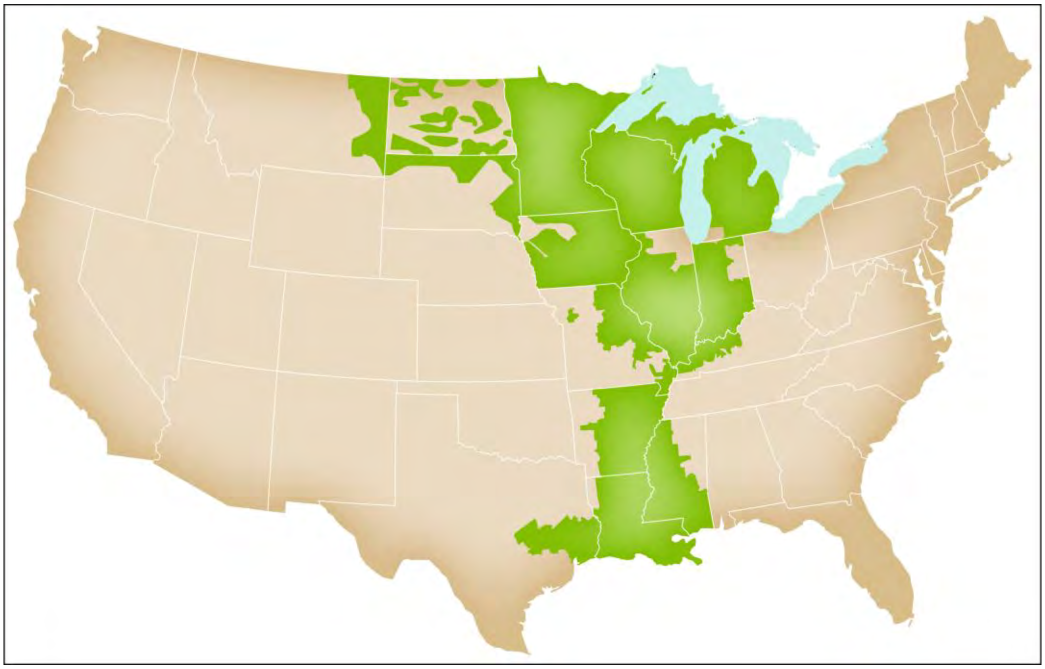
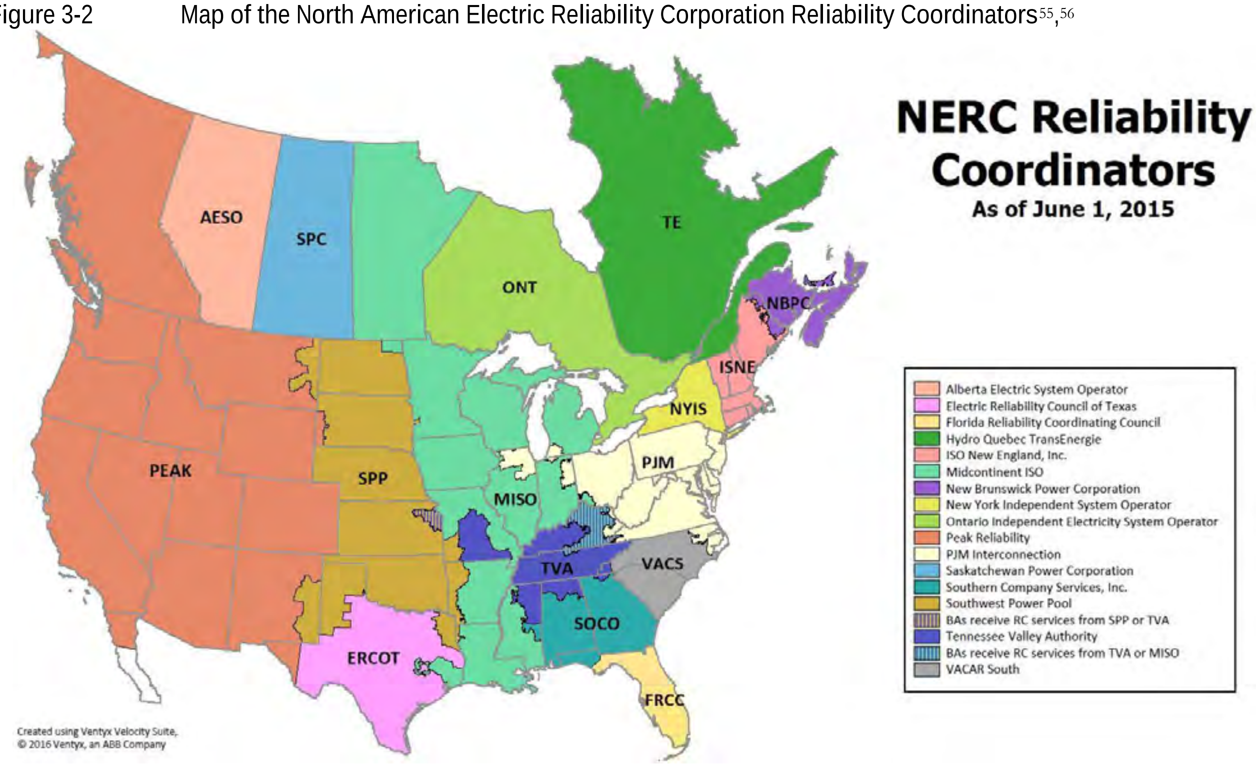


Figure 3-2 Map of the North American Electric Reliability Corporation Reliability Coordinators[55],[56]



[54] This map was obtained from the MISO website.

[55] North American Electric Reliability Corporation is known as NERC. This image is current as of June 1, 2015. An image of this map can be downloaded from the NERC website here: https://www.nerc.com/pa/rrm/TLR/Pages/Reliability-Coordinators.aspx

[56] It should be noted that PEAK Reliability has announced it intends to shut down at the end of year 2019. Thus, the map shown in Figure 3-2 should change significantly as the Load Serving Entities will have to receive Reliability Coordination services from other parties. This should have no impact on MISO's role as the Midcontinent's Reliability Coordinator.

3.1.1. Transmission planning process in MISO

The transmission planning process for the MISO region is documented in the MISO Business Practice Manual for Transmission Planning, BPM-020-r18.[57] The manual describes the annual process used to develop a comprehensive transmission plan to meet reliability and wholesale economic needs. Entities interested in the plan, known as stakeholders, participate in the evaluation of system alternatives. Each annual planning cycle results in a MISO Transmission Expansion Plan (MTEP) which is typically approved by the MISO Board of Directors each December. The Organization of MISO States (OMS)[58] is an active stakeholder and participant in the MISO planning process. Each approved MTEP includes a list of transmission projects that are deemed necessary by the MISO board.

MISO has five planning principles that guide the process with transmission owners, generation owners, load serving entities (LSE), OMS, environmental groups, electricity marketers, other regional transmission organizations (RTO), and other stakeholders. These five principles are:

- Make the benefits of a competitive energy market available to electricity customers by providing access to the lowest possible energy costs;
- Provide transmission infrastructure that safeguards local and regional reliability;
- Support federal and state renewable energy objectives by facilitating access to all such resources (i.e., wind, solar, biomass, and demand-side management);
- Create a mechanism to ensure that approved transmission investment is implemented in a timely manner;
- Develop a transmission system scenario model and make it available to federal and state energy policy makers to provide context and information regarding potential policy choices.[59]

It is a goal of MISO that the transmission planning process be fully compliant with planning principles presented in the Federal Energy Regulatory Commission's (FERC) Order Nos. 890 and 890-A.[60] In Order No. 890, FERC identified nine planning principles "that must be satisfied for a transmission provider's planning process to be considered compliant with the final rule." MISO has incorporated each of the FERC Order No. 890 planning principles into its transmission planning process, and describes each of these planning principles in BPM-020.[61] These nine planning principles include:

- Coordination
- Openness
- Transparency
- Information Exchange
- Comparability
- Dispute Resolution
- Regional Participation
- Economic Planning Studies
- Cost Allocation for New Projects

---

[57] MISO BPM-020-revision 18, dated May 1, 2018, is available for download here: https://www.misoenergy.org/legal/business-practice-manuals/

[58]OMS is a collection of each of the state Commissions in the MISO region. The website of OMS is here: http://www.misostates.org/

[59] MISO BPM-020-revision 18, p. 17

[60] Available at http://www.ferc.gov/whats-new/comm-meet/2007/021507/E-1.pdf
and http://www.ferc.gov/whats-new/comm-meet/2007/122007/E-1.pdf.

[61] MISO BPM-020-revision 18, pgs. 17-18

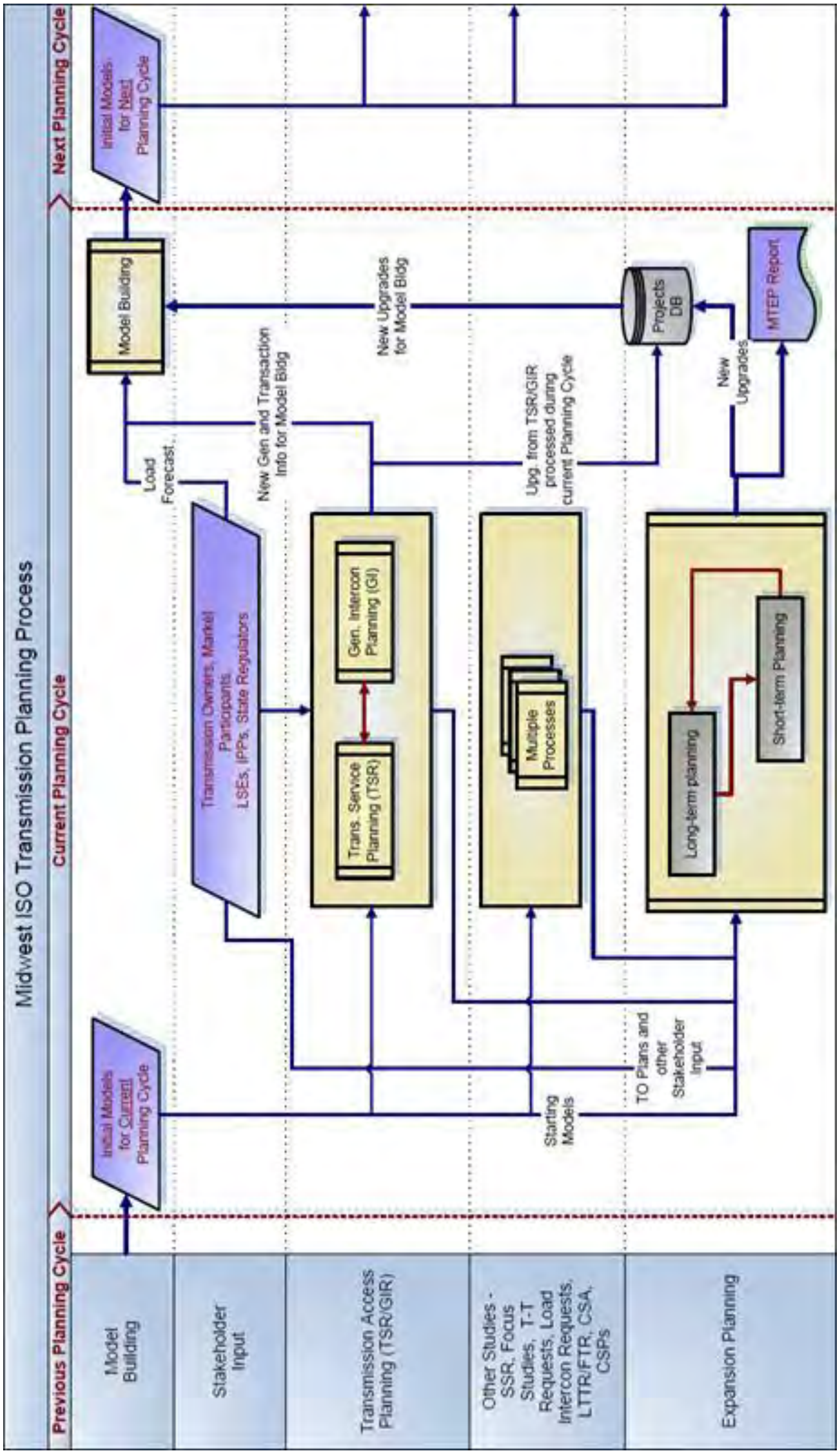
There are many different planning functions during the different phases of MTEP development. The major planning functions are listed below:[62]

- Model Development
- Cyclical Baseline Reliability and Economic Planning
- Transmission Access Planning
- Generator Interconnection Planning
- Transmission Service Planning
- Coordinated Inter-regional Planning (with other RTOs and Regions)
- Non-cyclical Planning Needs
- System Support Resource (SSR) Studies for generator unit de-commissioning
- Transmission Interconnections
- Load Interconnections
- Focus Studies – Studies initiated during the cyclical baseline planning process that cannot wait until the next planning cycle (for example, NERC/FERC directives, and near-term critical operational issues)

Some planning functions, such as transmission access planning and generator interconnection planning are conducted on an on-going basis. A flow diagram of the MISO transmission planning process is included in Figure 3-3.

[62] MISO BPM-020-revision 18, p. 18

Figure 3-3 MISO High-level Transmission Planning Process Flow Diagram[63]



[63] MISO BPM-020-revision 18, p. 19

3.1.2. MISO model building and analysis techniques

Computer models used by MISO for reliability analysis have both near-term (one to five years) and long-term (six to ten years) planning horizons. Economic studies include five, ten, and 15-year model runs so that conditions may be evaluated over a period of time.

The primary focus of the MTEP process is to assure compliance with NERC planning and operating standards including the NERC Regional Entity standards. One of the most significant NERC planning standards is the Transmission System Planning Performance Requirements specified in NERC TPL-001 through 004, dated October 17, 2013. These standards address transmission system performance under normal and emergency conditions. NERC standard MOD-001 through 033 prescribe methods for modeling transmission system elements to evaluate various capabilities and limitations of the transmission system.

3.1.3. Planning Advisory Committee

The MISO Planning Advisory Committee (PAC)[64] is a significant source of input for the MISO planning staff during the MTEP development process. The committee is comprised of one member from each of the following MISO stakeholder groups:

- Transmission owners
- Municipal and cooperative electric utilities and transmission-dependent utilities
- Independent power producers and exempt wholesale generators
- Power marketers and brokers
- Eligible end-use customers
- State regulatory authorities
- Representative of public consumer groups
- Environmental and other stakeholder groups
- Transmission developers

The MISO PAC meets monthly to review the progress of the current MTEP process.

3.2. MISO MULTI-VALUE PROJECT PROCESS

3.2.1. Evolution of transmission planning for renewables – the Upper Midwest Transmission Development Initiative[65]

In late 2008, the governors of Wisconsin, Minnesota, Iowa, North Dakota, and South Dakota, formed the Upper Midwest Transmission Development Initiative (UMTDI). The overall goal of the UMTDI was to identify and begin to resolve some of the regional transmission design issues and cost allocation issues associated with the delivery of large amounts of new renewable energy from areas with better wind resources into the MISO energy market.

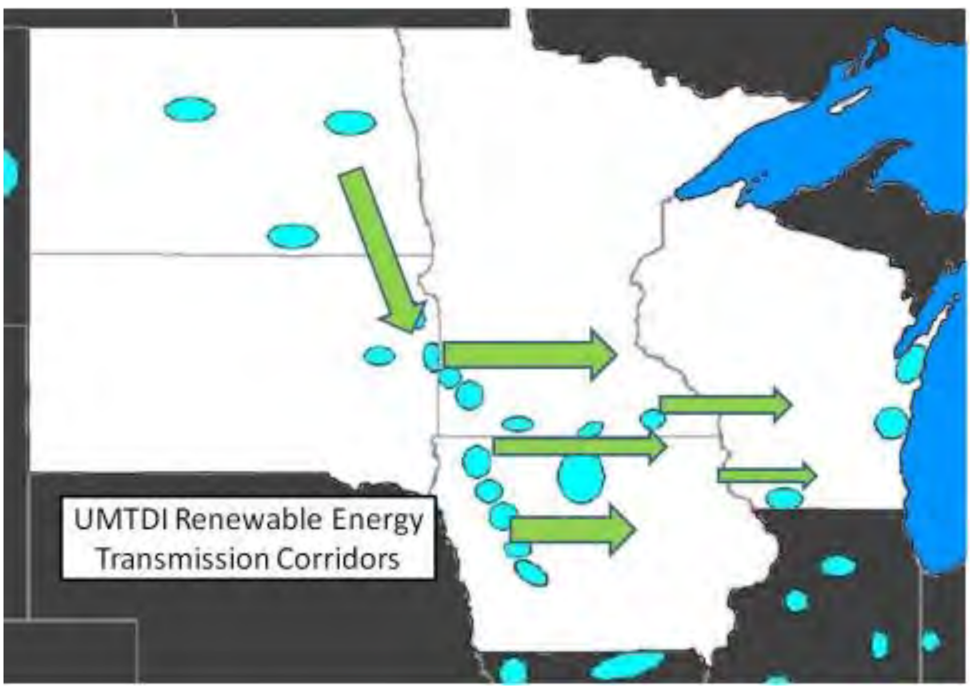
This effort by the governors and the associated state regulatory commissions was the foundation for the further studies by MISO on the development of planning considerations for integrating non-traditional

[64] https://www.misoenergy.org/stakeholder-engagement/committees/planning-advisory-committee/
[65] The original UMTDI summary report is no longer searchable on the MISO website. However, a copy can be found on the PSC Electronic Regulatory Filing System, PSC REF#: 218112

generation into the real-time, locational marginal pricing (LMP)[66] energy market of MISO and neighboring RTOs and Independent System Operators (ISO). UMTDI determined the primary wind resource locations based on numerous local state siting considerations. The renewable energy zones were mapped and power flow models built with various transmission configurations to evaluate the transmission system improvement alternatives for delivering renewable energy to load centers.

Preliminary analysis showed that locating wind electric generation facilities near load centers reduced transmission requirements, but energy production from such wind electric generation facilities would be limited because of the lower average wind speeds that exist near major load centers in the eastern MISO area. Computer modeling with wind turbines placed in the higher average wind speed areas to the west resulted in a greater amount of transmission system elements necessary to deliver the energy to the load centers in the east, but required fewer wind electric generation facilities because of the better wind resource availability to the west. Power flow models were developed to evaluate where energy would flow from both expanded renewable and conventionally dispatched generation. Figure 3-4 illustrates the wind zones and energy flow from the UMTDI report.

Figure 3-4 UMTDI Renewable Energy Transmission Corridors[67]



The UMTDI executive committee's final report, issued September 2010, indicated five transmission projects in the area which would likely be first-movers.[68] Included in this list are the North La Crosse-North Madison, and Dubuque (Iowa)-Spring Green- Cardinal (West Middleton) 345 kV transmission line projects. The proposed Cardinal-Hickory Creek project is the project listed as Dubuque-Spring Green-Cardinal 345 kV transmission line, and is one of the projects listed in the UMTDI as likely to work in the MISO real-time energy market.

---

[66] Locational Marginal Pricing is used by MISO to price energy purchases and sales in the MISO market, price transmission system losses, and to price transmission system congestion costs.
[67] UMTDI Final Summary Report, p. 5, PSC REF#: 218112
[68] UMTDI Final Summary Report, p. 5, PSC REF#: 218112

3.2.2. Further MISO area renewable energy integration studies

Besides the UMTDI, three other more detailed and broader transmission system expansion initiatives were conducted which considered existing individual state renewable portfolio standards (RPS) mandates and goals within the regional energy markets. These studies include:

- **Strategic Midwest Area Renewable Transmission (SMARTransmission) Study**[69] – The SMARTransmission Study analyzed various combinations of 345 kV, 765 kV, and high-voltage direct current (HVDC) transmission lines to deliver renewables to the real-time energy markets. The study concluded that if wind energy development increased in the upper Midwest, then more transmission was effective in the delivery of the wind energy to load. The study estimated that approximately 57,000 MW of wind energy could be generated in the Midwest and be injected into the MISO and PJM systems.

- **MISO**[70] **2008 Regional Generation Outlet Study (RGOS)**[71] – The RGOS report identified the drivers of transmission expansion, including the individual state RPS mandates and goals for renewable energy, and all of the proposed generation in the MISO queue. The study identified a transmission plan to accommodate all of the MISO states with their individual RPS requirements and minimize real-time LMP costs. The RGOS study determined the balance of the capital investment in wind generation and extra high-voltage (EHV) transmission. This balance resulted in a blend of local and remote wind energy and energy supplied by conventional, synchronous generation.

Table 3-1 shows the RPS mandates and goals and targeted year of compliance for the upper Midwest states:

Table 3-1 RPS Mandates or goals and targeted year of compliance for the upper Midwest states[72]

State	Targeted Year of Compliance	Mandate or Goal
Illinois	2025	25 percent
Indiana	2025	10 percent
Iowa	-	105-3000 MW
Kentucky	-	None
Michigan	2015	10 percent
Minnesota, Xcel Energy	2020	30 percent
Minnesota, Others	2025	25 percent
Missouri	2021	15 percent
Montana	2015	15 percent
North Dakota	2015	15 percent
Ohio	2024	12.5 percent
South Dakota	2015	10 percent
Wisconsin	2015	10 percent

---

[69] http://www.smartstudy.biz/include/pdf/phase_one_report.pdf and http://www.smartstudy.biz/include/pdf/phase_two_report.pdf

[70] At the time, MISO was known as the Midwest Independent Transmission System Operator, Inc.

[71] The original RGOS study is no longer searchable on the MISO website, however, RGOS is discussed in detail in the original MISO Multi-Value Project portfolio report.

[72] Adapted from the MISO 2017 MVP Triennial Review report, dated September, 2017, p. 12, https://cdn.misoenergy.org/MTEP17%20MVP%20Triennial%20Review%20Report117065.pdf

3.2.3. Multi-value project portfolio

In part as a result of the detailed RGOS study, a list of projects was developed for bringing renewable energy into the real-time energy market. These projects are referred to as the Multi-Value Project portfolio (MVP).[73] The final MVP portfolio report was issued on January 10, 2012 after the projects were approved by the MISO board of directors as part of the MTEP11 process in December 2011. MVP projects are designated by MISO because the projects would provide reliability, public policy, and economic benefits. The MVP criteria are described in MISO Attachment FF[74] to its tariff. The three main criteria are described below:

- **Criterion 1 –** The projects to be developed deliver energy in a reliable and economic manner to support the law enacted or adopted through state or federal legislation or other regulatory requirements.
- **Criterion 2 –** The MVP must provide multiple types of economic value across multiple transmission pricing zones with MVP benefit to cost ratios of 1.0 or higher.
- **Criterion 3 –** An MVP must address at least one transmission issue associated with a projected violation of NERC or Regional Entity standards and at least one economic-based transmission issue across multiple transmission pricing zones.

The proposed Cardinal-Hickory Creek[75] project is included in the final MVP portfolio report[76] which recognizes the concept that integration of non-dispatchable wind generating facilities into the real-time LMP market require a balance of locating wind generators in areas with better wind resources, while minimizing transmission investment by balancing the transmission system with existing and future conventional synchronous generation under various scenarios. This concept was initiated in the UMTDI and RGOS, and is discussed in greater detail in the final MVP portfolio report.[77]

The MVP portfolio report concluded that it would result in benefit to cost ratios greater than one for all seven MISO north and central Local Resource Zones (LRZ) when considering a range of future scenarios. These calculated benefit to cost ratios are provided in Figure 3-2. Benefit to cost ratios are calculated by comparing reductions in real-time market energy losses and congestion relief in the MISO footprint to the capital cost of the MVP portfolio. The 17 MVP projects approved in MTEP11 are shown in Figure 3-3 and listed in Table 3-2. An updated project list from the MTEP17 Triennial Review report with the corresponding projected project costs and project in-service dates is listed in Table 3-3.

[73] The MISO Multi-Value Project Portfolio report, https://cdn.misoenergy.org/2011%20MVP%20Portfolio%20Analysis%20Full%20Report117059.pdf

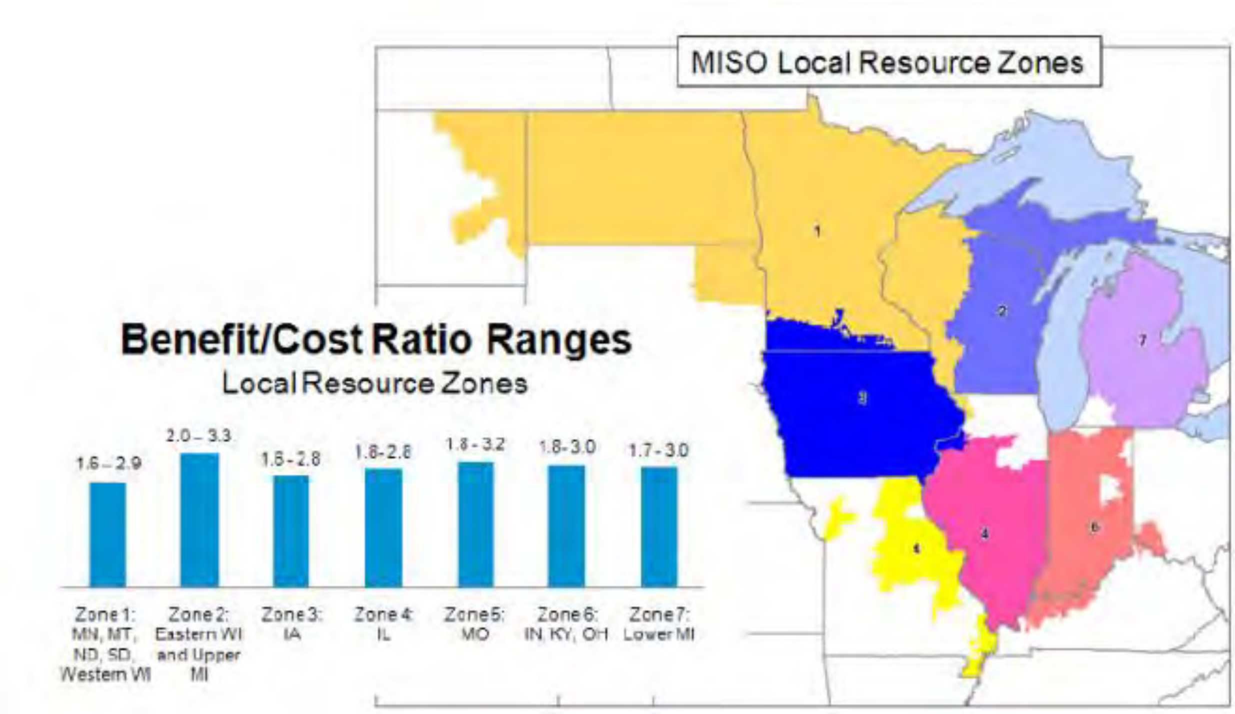
[74] MISO Attachment FF, p. 58, https://cdn.misoenergy.org/Attachment%20FF240221.pdf

[75] At the time of the issuance of the original MVP portfolio report, the proposed Cardinal Hickory was known as the Dubuque Co.-Spring Green-Cardinal project, as the second half of the larger N. La Crosse-N. Madison-Cardinal & Dubuque Co.-Spring Green-Cardinal project.

[76] MISO Multi-Value Project portfolio report, pp. 27, 28.

[77] MISO Multi-Value Project portfolio report, pp. 16-17.

Figure 3-5 North and Central MISO Local Resource Zones Benefit/Cost Ratio Ranges[78]



[78] MISO Multi-Value Project portfolio report, p. 6.

Figure 3-6 MISO MVP Portfolio Map[79]

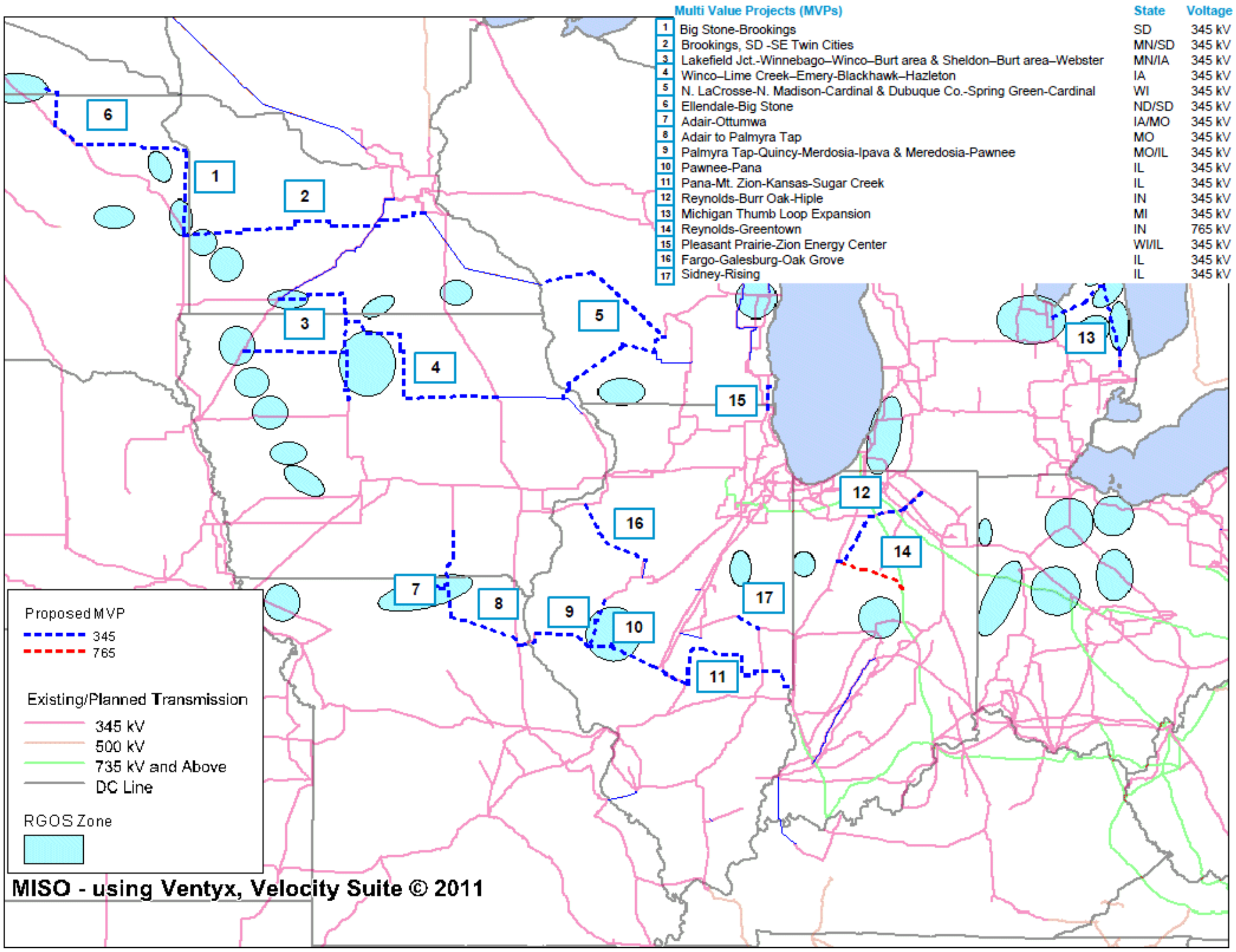


Table 3-2 Original MVP Portfolio List of Projects and Estimated Cost[80]

MVP Project Number	MVP Project Name	State	Voltage (kV)	In-Service Year	Cost (million, 2011 $)
1	Big Stone-Brookings	SD	345	2017	$191
2	Brookings, SD-SE Twin Cities	MN/SD	345	2015	$695
3	Lakefield Jct. –Winnebago–Winco–Burt area and Sheldon–Burt area–Webster	MN/IA	345	2016	$506
4	Winco–Lime Creek–Emery–Black Hawk–Hazleton	IA	345	2015	$480
5	N. LaCrosse–N. Madison–Cardinal & Dubuque Co. – Spring Green–Cardinal	WI	345	2018/2020	$714
6	Ellendale–Big Stone	ND/SD	345	2019	$261
7	Adair–Ottumwa	IA/MO	345	2017	$152
8	Adair–Palmyra Tap	MO/IL	345	2018	$98
9	Palmyra Tap–Quincy–Merdosia–Ipava & Meredosia–Pawnee	IL	345	2016/2017	$392

79 MISO Multi-Value Project portfolio report, p. 1.
80 Adapted from the MISO Multi-Value Project portfolio report, pgs. 22-41

MVP Project Number	MVP Project Name	State	Voltage (kV)	In-Service Year	Cost (million, 2011 $)
10	Pawnee–Pana	IL	345	2018	$88
11	Pana–Mt. Zion–Kansas–Sugar Creek	IL/IN	345	2018/2019	$284
12	Reynolds–Burr Oak–Hiple	IN	345	2019	$271
13	Michigan Thumb Loop Expansion	MI	345	2015	$510
14	Reynolds–Greentown	IN	765	2018	$245
15	Pleasant Prairie–Zion Energy Center	WI/IL	345	2014	$26
16	Fargo-Galesburg–Oak Grove	IL	345	2018	$193
17	Sidney–Rising	IL	345	2016	$90
Total					$5,197

Table 3-3 MTEP17 MVP Triennial Review Updated MVP Project Costs and In-Service Dates[81]

MVP Project Number	MVP Project Name	State	Voltage (kV)	In-Service Year	Cost (million, 2017 $)
1	Big Stone-Brookings	SD	345	2017	$141
2	Brookings, SD-SE Twin Cities	MN/SD	345	2013-2015	$670
3	Lakefield Jct.-Winnebago-Winco-Burt area and Sheldon-Burt area-Webster	MN/IA	345	2015-2018	$651
4	Winco-Lime Creek-Emery-Black Hawk-Hazleton	IA	345	2015-2019	$564
5	N. La Crosse-N. Madison-Cardinal (aka. Badger-Coulee)	WI	345	2018	$1,016
	Cardinal-Hickory Creek	WI/IA	345	2023	
6	Big Stone South-Ellendale	ND/SD	345	2019	$320
7	Ottumwa-Zachary	IA/MO	345	2018-2019	$226
8	Zachary-Maywood	MO	345	2016-2019	$172
9	Maywood-Herleman-Meredosia-Ipava and Meredosia-Austin	MO/IL	345	2016-2017	$723
10	Austin-Pana	IL	345	2016-2017	$135
11	Pana-Faraday-Kansas-Sugar Creek	IL/IN	345	2015-2019	$423
12	Reynolds-Burr Oak-Hiple	IN	345	2018	$388
13	Michigan Thumb Loop Expansion	MI	345	2012-2015	$504
14	Reynolds-Greentown	IN	765	2013-2018	$388
15	Pleasant Prairie-Zion Energy Center	WI/IL	345	2013	$36
16	Fargo-Sandburg-Oak Grove	IL	345	2016-2018	$204
17	Sidney-Rising	IL	345	2016	$88
Total					$6,651

3.2.4. Multi-Value Project cost sharing

The cost of the approximately $5.2 billion[82] MVP portfolio is allocated 100 percent to load based on a load ratio share. The justification for this approach to cost allocation was that all users of electricity share the

[81] MISO MTEP17 MVP Triennial Review report, p. 19, https://cdn.misoenergy.org/MTEP17%20MVP%20Triennial%20Review%20Report117065.pdf

[82] The $5.2 billion is the original estimate of the cost of the MVP portfolio, in 2011 dollars. The most recently estimated cost of the MVP portfolio in the 2017 MVP Triennial Review report is $6.65 billion in 2017 dollars. This summary can be found in the 2017 MVP Triennial Review on p. 19, https://cdn.misoenergy.org/MTEP17%20MVP%20Triennial%20Review%20Report117065.pdf

benefits of these projects. Cost allocations are determined by a formula that balances the costs of the MVP projects with the benefits of meeting:

- state renewable energy targets,
- reduced market prices, and
- avoided local reliability projects.

The allocations in 2020, when all MVP projects were originally slated to be in-service,[83] for the MVP portfolio for the load balancing authorities (LBA) are included in Table 3-4. The formula used and resulting allocations assume that all LSEs in MISO share the benefits and costs of the MVP portfolio.

Table 3-4 Estimated MVP Charges by LBAs **in ATC's Footprint and Other LBAs**

LBA	Approximate Allocation (may not add due to rounding)
Alliant Energy (ALTE)	2.5%
MGE	0.7%
Upper Peninsula Power Company (UPPC)	0.2%
Wisconsin Electric Power Company (WEC)	6.9%
Wisconsin Public Service Corporation (WPSC)	2.9%
Total ATC	13.3%
DPC	1.2% (Wisconsin operations 0.6%)
Northern States Power Company-Wisconsin (NSPW)	9.6% (Wisconsin operations 1.4%)
All Others	75.9%

This table represents the originally estimated MVP charges by LBA in the MISO MVP portfolio report, as issued in 2012. However, the applicants have updated the calculation and estimate that the LBAs in the ATC footprint will be assigned 13.42 percent of the MVP portfolio charges, as opposed to the original estimate of 13.3 percent. In addition, the applicants estimate that Northern States Power Company will be responsible for 10.16 percent (with Northern States Power Company-Wisconsin being responsible for 1.52 percent) of MVP portfolio charges and Dairyland Power Cooperative for 0.10 percent of MVP portfolio charges.

The cost of each MVP is allocated on a system wide basis to all transmission customers who withdraw energy from the MISO system. The annual carrying charges are set by LBA and can be found in MISO Schedule 26-A.[84] MISO Schedule 26-A is updated twice annually.

3.2.5. Regional market MVP review

Starting with MTEP14, MISO is required to conduct a full review of the benefits of the approved MVP portfolio every three years. This MVP triennial review will not change MVP cost allocation. Rather, the intent is to identify potential modifications to the MVP process for any future MVP portfolio approved by

[83] Due to the complexity of the actual construction, routing, and approval of the MVP projects, some projects (such as the proposed Cardinal- Hickory Creek project) were not placed in-service by the expected in-service dates projected in the original MVP portfolio report. Thus, these load ratio shares are based on the original MVP portfolio report.
[84] Available at https://www.misoenergy.org/ by searching for "Schedule 26-A."

MISO. The analysis uses models to evaluate the MVP portfolio with processes and benefit valuations consistent with the original business case completed in MTEP11.[85]

The MVP review provides an updated view into the projected public policy, economic and qualitative benefits of the MVP portfolio, and provides information on the following issues:

- **Public Policy Benefit –** Quantifies how much wind energy the MVP portfolio enables to meet state Renewable Portfolio Standards.
- **Economic Benefits –** Refresh of six MVP tariff-defined economic benefit metrics; benefit to cost ratios will be provided by Local Resource Zone, including:
  - Congestion and Fuel Savings
  - Decreased Operating Reserves
  - Decreased System Planning Reserve Margins
  - Decreased Transmission Line Losses
  - Decreased Wind Turbine Investment
  - Elimination of Need for some Future Transmission
- **Social Benefits** – Updated qualitative discussion of additional benefits not included in the business as usual case, such as carbon emissions reductions, decreased natural gas price volatility, and fuel flexibility.
  - For example, in the Business As Usual case and Low Demand and Energy, the MVP portfolio was estimated to reduce fossil generation and replace this generation with additional wind energy. This results in a reduction in projected year 2026 carbon dioxide emissions of 18 million tons.
- Any significant differences between MTEP17, MTEP14, and MTEP11 have been quantified through sensitivity analysis. The major areas of focus include: generation fleet changes across the MISO footprint, natural gas price projections, and demand and energy growth rates.
- Both the MTEP14 and MTEP17 Triennial Reviews[86] include updated project costs and in-service dates as reported in the corresponding MTEP quarterly status reports.

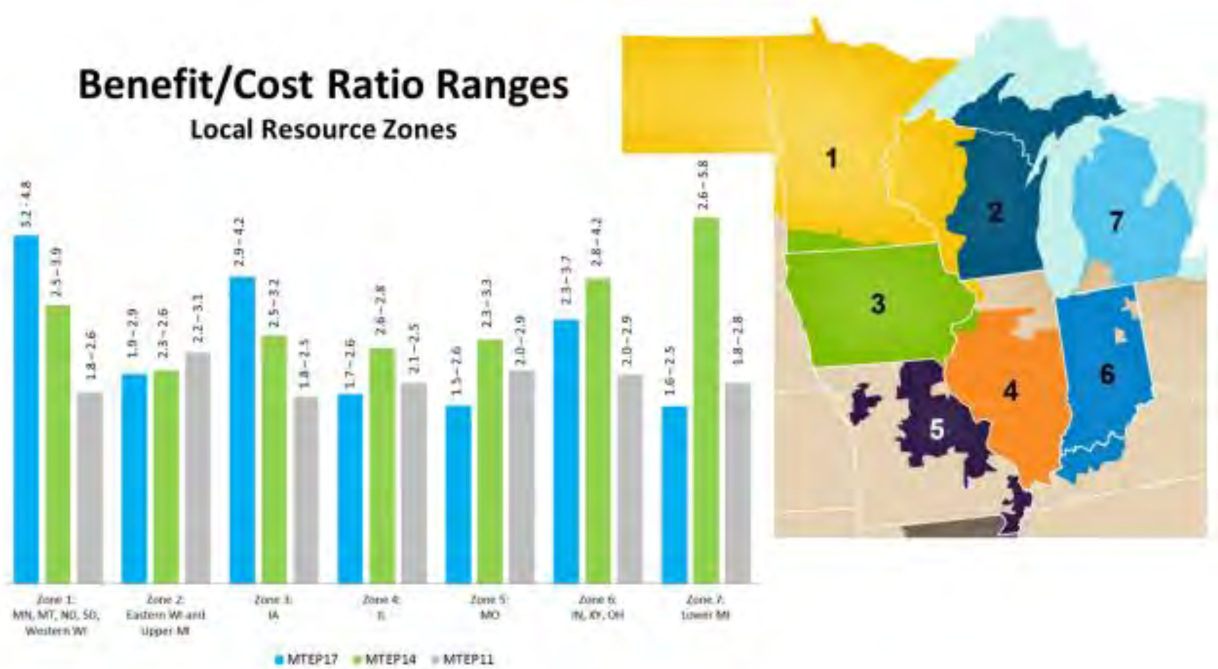
The results of the MVP Triennial Reviews were published as a part of MTEP14 and MTEP17. These results were reviewed and presented to the MISO Planning Advisory Committee via the MTEP review process. Table 3-5 shows the comparison of key PROMOD[87] model assumptions between MTEP17, MTEP14, and MTEP11. Figure 3-7 shows MISO's production cost benefit to cost ratio calculation by LRZ and by MTEP cycle for MTEP11, MTEP14, and MTEP17.

[85] MISO MVP compliance filing with FERC dated April 7, 2014, available at http://elibrary.ferc.gov/idmws/search/fercgensearch.asp by searching docket "ER12-1564." See also the April 8, 2014, supplemental filing.
[86] A copy of the MTEP14 MVP Triennial Review can be found here: https://pubs.naruc.org/pub.cfm?id=3139EF15-0FF1-F820-4EB4-5D4E903D0020 and a copy of the MTEP17 MVP Triennial Review can be found here: https://cdn.misoenergy.org/MTEP17%20MVP%20Triennial%20Review%20Report117065.pdf
[87] PROMOD is the market LMP forecasting tool used by MISO. The model is used by MISO to evaluate the impacts of various economic variables on the electricity markets and is used to evaluate the wholesale economic impact of transmission projects.

Table 3-5 Key PROMOD Model Assumptions for the MTEP17, MTEP14, and MTEP11 Evaluations of the MVP Portfolio[88]

		MTEP17 PR	MTEP14 BAU	MTEP11 Low BAU	MTEP11 High BAU
Demand and Energy	Demand Growth Rate	0.64%	1.06%	1.26%	1.86%
	Energy Growth Rate	0.65%	1.06%	1.26%	1.86%
Natural Gas Forecast	Starting Point	2.26 $/MMBTU	3.75 $/MMBTU	5.38 $/MMBTU	5.38 $/MMBTU
	2021 Price	3.85 $/MMBTU	6.26 $/MMBTU	6.07 $/MMBTU	6.58 $/MMBTU
	2026 Price	4.45 $/MMBTU	8.36 $/MMBTU	6.62 $/MMBTU	7.59 $/MMBTU
	2031 Price	5.20 $/MMBTU	10.59 $/MMBTU	7.22 $/MMBTU	8.77 $/MMBTU
Fuel Cost (Starting Price)	Oil	Powerbase Default	Powerbase Default	Powerbase Default	Powerbase Default
	Coal	Powerbase Default	Powerbase Default	Powerbase Default	Powerbase Default
	Uranium	1.08 $/MMBTU	1.23 $/MMBTU	1.21 $/MMBTU	1.21 $/MMBTU
Fuel Escalation Rates	Oil	2.50%	2.50%	1.74%	2.91%
	Coal	2.50%	2.50%	1.74%	2.91%
	Uranium	2.50%	2.50%	1.74%	2.91%
Other Variables	Inflation	2.50%	2.50%	1.74%	2.91%
	Generation Retirements	Known + Historical Retirement Trend ~16,000 MW	Known + EPA Driven Forecast MISO ~12,600 MW	Known Retirements MISO ~400 MW	Known Retirements MISO ~400 MW
MISO Footprint		Duke and FE in PJM; Includes MISO South	Duke and FE in PJM; Includes MISO South	MTEP11	MTEP11

Figure 3-7 MISO MVP Portfolio Production Benefit to Cost Ratios by LRZ and MTEP Cycle[89]



88 MISO MTEP17 MVP Triennial Review, p. 16, https://cdn.misoenergy.org/MTEP17%20MVP%20Triennial%20Review%20Report117065.pdf
89 MISO MTEP17 MVP Triennial Review report, p. 24

MISO's MTEP17 MVP Triennial Review shows benefit to cost ratios for the MVP portfolio have remained consistent through the three MTEP cycles in which the portfolio was evaluated. The difference in transmission congestion and fuel savings benefits in MTEP17 relative to MTEP14 is explained primarily due to the inclusion of carbon costs in MTEP17, an increase in wind penetration, and footprint generation topology changes. However, it should be noted that MISO only evaluated the MVP Portfolio as a whole using the Policy Regulations Future of MTEP17. MISO did not evaluate the Portfolio across any other futures, nor did MISO evaluate any projects individually.

Commission staff's evaluation of the economic impacts of the proposed Cardinal-Hickory Creek project, as an individual project, across a wide range of future scenarios, is a central piece of the Commission's review process.

3.3. EXISTING BULK ELECTRIC FACILITIES IN GEOGRAPHIC AREA

3.3.1. Existing transmission system in Cardinal-Hickory Creek project study area

As shown in Figure 2 (Appendix A) southwest and southcentral Wisconsin is served by a network of 161 kV and 69 kV lines along with some 138 kV lines. The Badger Coulee 345 kV project (docket 5-CE-142) connects the new 345 kV transmission line from the Briggs Road Substation in Onalaska on the west end to the North Madison Substation in the town of Vienna and the Cardinal Substation near Middleton on the east end.

The existing Eden 138/69 kV Substation (Montfort, Wisconsin) does not have any transmission facilities above the 138 kV voltage level. The existing Hickory Creek 345/161 kV Substation is connected to the Hazleton-Salem 345 kV line.

The applicants' state:

- There is need to improve west to east power flow capability in order to relieve transmission system congestion;
- The proposed project would increase the transfer capability of the electric system between Iowa and southwest and southcentral Wisconsin by approximately 1,300 MW;
- The proposed project would provide an outlet for approximately 25 gigawatts (GW) of wind resources in Iowa and areas west of Wisconsin;
- The proposed project would eliminate the need for three transmission system Operating Guides in southwest and southcentral Wisconsin, which currently require load shedding, other operational actions, or a combination of both under certain contingencies due to reliability concerns in the area.

---

https://cdn.misoenergy.org/MTEP17%20MVP%20Triennial%20Review%20Report117065.pdf

3.3.2. Existing electric generation in the Cardinal-Hickory Creek project study area

The ability of the regional transmission system to serve the project study area depends on the status of local power plants. The names, capacities, fuel types, location, and potential retirements of major existing generating facilities in the Cardinal-Hickory Creek project study area are listed in Table 3-6.

Table 3-6 Major existing electric generating facilities in project study area

Plant	Capacity (MW)	Fuel Type	Location	Projected to Retire?
John P. Madgett	387	Coal	Alma, WI	No
Genoa Unit 3	346	Coal	Genoa, WI	No
Columbia	1,023	Coal	Portage, WI	No
Wisconsin Rapids Paper Mill	21	Coal	Wisconsin Rapids, WI	No
Lansing Coal	314	Coal	Lansing, IA	No
French Island Peaking Units	188	Combustible Renewable	La Crosse, WI	No
Wisconsin Rapids Pulp Mill	72	Combustible Renewable	Wisconsin Rapids, WI	No
Quilt Block Wind Farm	98	Wind	Darlington, WI	No
Glacier Hills Wind Park	162	Wind	Randolph, WI	No
Montfort Wind Farm	30	Wind	Montfort, WI	No
Prairie du Sac Hydro Plant	31	Hydro	Prairie du Sac, WI	No
Castle Rock Hydro Plant	15	Hydro	Adams, WI	No
Petenwell Hydro Plant	20	Hydro	Necedah, WI	No
Riverside Energy Center	696	Natural Gas	Beloit, WI	No
Riverside Energy Center Expansion	702	Natural Gas	Beloit, WI	No
Blount Generating Station	100	Natural Gas	Madison, WI	No
West Campus Co-gen Facility	169	Natural Gas	Madison, WI	No
Fitchburg Plant	58	Natural Gas	Madison, WI	Yes, 2018
Nine Springs	16	Natural Gas	Madison, WI	Yes, 2018
Charter Street UW Madison	10	Natural Gas	Madison, WI	No
Sycamore Plant	42	Natural Gas	Madison, WI	Yes, 2018
RockGen	561	Natural Gas	Cambridge, WI	No
Whitewater Co-gen	284	Natural Gas	Whitewater, WI	No
Concord	437	Natural Gas	Watertown, WI	No
Sheepskin	40	Natural Gas	Edgerton, WI	No

3.3.3. Major load centers in the project study area

Major load centers within the Cardinal-Hickory Creek project study area are listed in Table 3-7.

Table 3-7 Major load centers in the project study area

Platteville, Wisconsin
La Crosse, Wisconsin
Madison, Wisconsin
Janesville, Wisconsin
Wisconsin Rapids, Wisconsin
Wisconsin Dells, Wisconsin
Dubuque, Iowa

3.4. AVOIDED TRANSMISSION RELIABILITY PROJECTS

3.4.1. Cost of avoided transmission reliability projects

The application includes a list of transmission projects that would be required to be constructed if the proposed Cardinal-Hickory Creek project is not constructed. The applicants' stated avoided reliability benefit was calculated by comparing the capital improvements required to maintain compliance with NERC transmission planning standards under the No Action Alternative to the capital improvements that would be needed under each of the other alternatives.

In order to determine the list of capital improvements that would be required to maintain an adequate level of transmission system reliability, the applicants conducted a steady state reliability analysis of the existing transmission system (i.e., the No Action Alternative) in accordance with the NERC transmission planning standards.[90] The applicants then ran this analysis with a particular alternative included to determine if that alternative would eliminate the need for any capital improvements in the preliminary list. The applicants' stated avoided reliability benefit for each alternative is the sum of the avoided capital improvements required to maintain NERC reliability standard compliance for that alternative.

Table 3-8 provides the cost estimates for each of the projects the applicants state would be needed to eliminate violations of NERC reliability standards in 2027 under the applicants' No Action Alternative.

Table 3-8 Applicants' conceptual projects for thermal overloads with NERC No Load Loss Allowed Contingencies

Overloaded Branch	Line ID	Solution	Capital Cost ($M-2018)	Avoided Reliability Benefit[91] ($M-2018 PV)
Turkey River-Stoneman 161 kV	Q-10	Hickory Creek-Nelson Dewey 345 kV Line[92]	79.5	31.9
Stoneman-Nelson Dewey 161 kV	Q-2E			
Townline Road-Bass Creek 138 kV	X-95	Rebuild 9.5 miles[93]	11.2	10.3
Paddock-Townline Road 138 kV	X-39	Paddock Area Solution[94]	5.4	5.0
Paddock 345/138 kV Transformer	PAD T21			
West Middleton-Timberlane Tap 69 kV	6927	Rebuild 2.0 miles	2.9	2.7
Columbia 138/69 kV Transformer	COL T31	Replace terminal equipment	0.1	0.1

[90] NERC Standard TPL-001-4 for Transmission System Planning Performance Requirements, https://www.nerc.com/files/TPL-001-4.pdf
[91] The applicants' stated Avoided Reliability Benefits are the capital costs escalated to the assumed in-service date of 12/31/2023, planning-level estimates of revenue requirements are added, and the total is discounted to year 2018.
[92] The capital cost of the conceptual Hickory Creek-Nelson Dewey 345 kV transmission line is the cost for the entire solution. The applicants' stated Avoided Reliability Benefit of this conceptual project is the present value of all costs to Wisconsin customers. Consistent with the planning level cost estimates of non-MVP alternatives, only the portion of the solution in Wisconsin is assumed to be paid by Wisconsin customers.
[93] The Townline Road-Bass Creek 138 kV normal and emergency rating would be limited by terminal equipment to 246 and 335 MVA for summer normal and summer emergency ratings, respectively. The line itself would be rated to 321 and 436 MVA.
[94] The Paddock Area Solution is a combination of moving the proposed 5 ohm series reactor from Paddock-NW Beloit to Paddock-Townline Road 138 kV, installing a 6 ohm reactor on Paddock-NW Beloit, and replacing the Paddock 138/69 kV transformer. The impedance of the reactor could vary slightly with each alternative.

Overloaded Branch	Line ID	Solution	Capital Cost ($M-2018)	Avoided Reliability Benefit[91] ($M-2018 PV)
Portage-Columbia 138 kV circuit 1	X-13	Reconductor double circuit	5.0	4.6
Portage-Columbia 138 kV circuit 2	X-20			

Table 3-9 summarizes the reliability projects and costs that would be avoided if a given alternative were constructed. The applicants assert that constructing the proposed Cardinal-Hickory Creek project would eliminate the need to construct approximately $42 million in reliability projects and would also result in avoided overloads on a variety of transmission lines during NERC Load Loss Allowed, Planning Event P3 and P6 contingencies.

Table 3-9 Applicants' calculated Avoided Reliability Benefits of each alternative

	Avoided Reliability Benefit ($M-2018 PV)			
Overloaded Branch	BASE	NTA	LVA	Cardinal-Hickory Creek
Turkey River-Stoneman 161 kV			31.9	31.9
Stoneman-Nelson Dewey 161 kV				
Townline Road-Bass Creek 138 kV			10.3	10.3
Paddock-Townline Road 138 kV				
Paddock 345/138 kV Transformer				
West Middleton-Timberlane Tap 69 kV[95, 96]			2.7	
Columbia 138/69 kV Transformer				
Portage-Columbia 138 kV circuit 1				
Portage-Columbia 138 kV circuit 2				
Total ($M-2018 PV)	0.0	0.0	44.9	42.2

3.4.2. Factors that may affect the avoided transmission reliability projects

The following factors may change avoided reliability projects, by either adding more projects or removing projects because they would no longer be necessary:

- New projects in the MISO generation interconnection queue being constructed in the project study area. Injection of power from new resources in southwestern Wisconsin could reduce power flows coming from the west into Wisconsin.
- New projects in the MISO generation interconnection queue being constructed in other states in the upper Midwest. Additional new generation to be located in Iowa or Minnesota could increase power flows coming from the west into Wisconsin.
- Additional generator retirements in Wisconsin could increase power flows coming from the west into Wisconsin as the lost generation is made up from imports.
- Additional generator retirements in the Pennsylvania-New Jersey-Maryland Interconnection LLC (PJM) could have an unknown impact on power flows in southwestern Wisconsin.

[95] The LVA avoids a rebuild of the West Middleton-Timberland Tap 69 kV transmission line for both the Avoided Reliability Benefits and the Asset Renewal Benefits. When these benefits are combined, only the Asset Renewal Benefits are included to avoid double-counting the benefit.

[96] The applicants state that if Cardinal-Hickory Creek is approved and the route for the project completely rebuilds the WMD-TLT 6927 transmission line, then $2.7 million in Avoided Reliability Benefit should be added to the Cardinal-Hickory Creek alternative.

- Peak load projections could either increase or decrease going into the future. Reductions in peak demand for electricity could reduce the number of avoided reliability projects necessary should the proposed Cardinal-Hickory Creek project not be constructed. Likewise, increases in peak demand for electricity could increase the number of avoided reliability projects necessary should the proposed Cardinal-Hickory Creek project not be constructed.
- Changes in environmental regulations in the future could impose carbon constraints or further incentivize additional renewable generation development. A larger increase in new renewable generation to the west of Wisconsin could increase the power flows coming from the west into Wisconsin. This increase in renewable generation could increase necessary transmission projects even if the proposed Cardinal-Hickory Creek project is constructed. Additionally, the need to integrate the additional renewable generation into the MISO real-time energy market while maintaining system reliability could increase the value of the proposed project.
- Asset renewal benefits

The applicants assert that many transmission lines in southwestern Wisconsin will be candidates for a partial or complete asset renewal (rebuild) in the future. The majority of 69 kV and 138 kV transmission lines in the project study area are either wood monopole or wood H-frame type structures. The lifespan of wood transmission structures can vary due to several factors including weather, pole decay and deterioration, woodpecker damage, below-ground decay, and how well the poles are maintained. The applicants state that the lifespan of wood transmission structures is typically 60 to 70 years. Given this information, the applicants' engineering assessment of the existing structures on each of the potential routes for the proposed project shows that many of these structures are expected to require asset renewal within the 40-year lifespan of each of the applicants' proposed alternatives.

If constructed, the transmission alternatives considered in the application (i.e., the proposed project and the LVA) would involve the replacement, refurbishment, or a combination of both, of various existing transmission system components along the route selected. These components are expected to require replacement or repair in the next 40 years under the No Action Alternative. The applicants state that Wisconsin customers would benefit by avoiding the cost of rebuilding or refurbishing these components in the future by including the rebuild as a part of the transmission alternatives studied by the applicants. Table 3-10 shows the applicants' calculated asset renewal benefits for the system components that would need to be replaced in the next 40 years under the No Action Alternative, but would instead be rebuilt as part of the respective transmission alternative.

Table 3-10 **Applicants'** calculated asset renewal benefits by alternative route

Asset Renewal Benefit ($M - 2018 PV)						
				Cardinal-Hickory Creek and LVA		NTA
Transmission Line Asset Renewed	Line ID	Original In-Service Date	Renewal In-Service Date	Preferred Route	Alternate Route	N/A
Nelson Dewey-Eden 138 kV (1st Upgrade)	X-16	1959	2029	22.1		
Nelson Dewey-Eden 138 kV (2nd upgrade)	X-16	1959	2060	3.8		
Eden-Dodgeville 69 kV	Y-138	1977	2055	9.1		
Wally Road-Stagecoach 69 kV	Y-128	1957	2029	9.9		
Stagecoach-West Middleton 69 kV (Preferred Route)	6927	1976	2040	2.5		
Stagecoach-West Middleton 69 kV (Alternate Route)	6927	1976	2040		3.2	
Nelson Dewey-Hillman 138 kV	X-15	1958	2032		23.6	

Asset Renewal Benefit ($M - 2018 PV)						
				Cardinal-Hickory Creek and LVA		NTA
Transmission Line Asset Renewed	Line ID	Original In-Service Date	Renewal In-Service Date	Preferred Route	Alternate Route	N/A
Hillman-Falcon 138 kV	X-14	1958	2023		7.2	
Eden-Spring Green 138 kV	X-17	1959	2032		10.4	
Hillman-Eden 69 kV	Y-105	1935	2035		15.2	
Total				47.4	59.6	0.0
Total with Margin[97]				45.0	56.6	0.0

3.5. ENERGY COST SAVINGS

3.5.1. Applicants' stated benefit of access to lower cost energy[98]

The applicants state that the proposed Cardinal-Hickory Creek project would provide net energy cost savings that would be part of a broader group of benefits associated with the project, including economic, reliability, and public policy benefits. Specifically, the applicants assert that the cost of delivered energy for Wisconsin transmission service customers, and transmission customers across the MISO footprint, would be lowered by the inclusion of the proposed Cardinal-Hickory Creek project as compared to the other alternatives studied by the applicants. These other alternatives include:

- Non-Transmission Alternative,
- Low Voltage Alternative, and
- No Action Alternative (base case).

The applicants further state that the operation of the Cardinal-Hickory Creek transmission line would lower overall capacity requirements, which could result in another economic benefit by lowering capacity costs.

The applicants specifically note the proposed project would provide transmission congestion relief as a major part of the economic benefits. Wisconsin utilities and other participants in the MISO market pay congestion charges when transmitting energy from low-priced nodes to higher-priced nodes, unless the difference in nodal prices is due only to losses. The applicants' economic analysis investigated the impact of the proposed project, as compared to the applicants' other studied alternatives, on LSEs in the ATC service territory and how well hedged the LSEs could be against transmission congestion charges using FTRs, as well as the extent to which LSEs must pay marginal loss charges or receive marginal loss refunds from MISO.

3.5.2. PROMOD modeling analysis of energy cost savings

3.5.2.1. PROMOD model description

PROMOD is a computer software model that is owned and maintained by ASEA Brown Boveri Corporation (ABB) that allows electric utilities to perform electric system economic planning. ABB states that PROMOD can estimate LMPs by using algorithms to simulate transmission market system operations

[97] Avoided projects are assumed to rebuild each line in its entirety. However, portions of each line that enter and exit substations along the route would not necessarily be rebuilt. To account for these portions, only 95 percent of the estimated rebuild costs of each line are counted for the applicants' asset renewal benefit of the proposed project.
[98] A detailed discussion of energy cost savings is included in revised Application Appendix D, Exhibit 1, pp. 39-42 of 85, PSC REF#: 341714

in a manner similar to transmission ISOs working in real-time market conditions.[99] PROMOD emphasizes security-constrained economic unit dispatch and an extensive model of transmission grid topology to underlie the calculations. PROMOD also determines costs or benefits associated with financial transmission rights, congestion revenue rights, and transmission congestion contracts by identifying significant binding system constraints and evaluating the economic impact of such constraints. Intermittent generation resources such as wind and solar generation can also be simulated, including energy curtailment and the effects of transmission congestion from intermittent sources. PROMOD allows the evaluation of the economic and congestion impacts of proposed electric transmission projects, based on a set of underlying assumptions by the user.

PROMOD has been used previously by ATC as part of its analysis of previously proposed transmission projects requiring Commission review and approval.

3.5.2.2. Description of applicants' PROMOD modeling runs

As described in detail in Section 3.9.3, the applicants considered the following transmission system alternatives in the analysis of the proposed Cardinal-Hickory Creek project:

- Cardinal-Hickory Creek 345 kV line as proposed
- No Action Alternative (base case)
- Non-Transmission Alternative (NTA)
- Low Voltage Alternative (LVA)

The applicants state that they developed PROMOD simulations based on data from MTEP17. The applicants used PROMOD to simulate all of the major transmission and generation facilities within the ATC and DP) service territories, using the MTEP17 data as a starting point. The applicants assert that they relied on MISO's MTEP17 data set as the basis for their calculation of economic benefits, that the data had gone through a thorough vetting process by MISO stakeholders,[100] and was the most current at the time the applicants performed the analysis. The applicants modeled and evaluated each of the transmission system alternatives against five different "futures," based on three futures included as part of MTEP17. These futures[101] include:

- Existing Fleet (EF);
- Policy Regulation (PR);
- Policy Regulation with MISO low energy demand (PRLE);
- Policy Regulations with Foxconn (PRFoxconn); and
- Accelerated Alternative Technologies (AAT).

Each of the futures have different assumptions about load growth, energy use, fossil fuel generation, and other factors that affect demand for and production of electricity. Two of the futures, PRLE and PRFoxconn, were specially developed by the applicants for the proposed project to establish specific sensitivities within the broader PR future.[102] The applicants also state that they performed updates to the MTEP model to reflect system changes that had occurred after the MTEP17 models were finalized.[103]

---

[99] https://new.abb.com/enterprise-software/energy-portfolio-management/market-analysis/promod.
[100] Application Appendix D, Exhibit 1, p. 32, PSC REF#: 341714.
[101] The five futures are described in detail in Application Appendix D, Exhibit 1, pp. 35-9 of 85, PSC REF#: 341714.
[102] Application Appendix D, Exhibit 1, p. 34, PSC REF#: 341714.
[103] Application Appendix D, Exhibit 1, p. 34, PSC REF#: 341714; Appendix D-12, PSC REF#: 341716.

The EF future[104] was intended largely as a "business as usual" model, with a generation fleet that was similar to its current makeup, though generators were still removed for age related retirement. Renewable energy resources were mostly incorporated at levels represented by RPS requirements of states in the MISO footprint, or beneficial economics for particular projects. Natural gas prices were assumed to be consistent with recent prices and relatively stable. Electric demand and energy growth were assumed to be lower than the other futures. Fossil fuel electric generators were removed at appropriate unit age points,[105] though nuclear units were kept in operation with appropriate license renewals. The generation mix seen in the EF future resulted in a 14 percent reduction in CO_2 emissions[106] across the footprint by 2030.

The PR future[107] was modeled with the goal of a 25 percent CO_2 reduction across the MISO footprint. Decreased use of coal-fired electric generation resulted in an increase in natural gas-fired electric generation as well as more penetration of renewables. Electric demand and energy growth rates were developed as a mid-range forecast of all of the MTEP17 futures. Natural gas prices were modeled using long-term industry forecasts. Non-coal fired electric generators were retired upon reaching age limits and coal-fired electric generators were retired either by age or economics.

The applicants also developed two sensitivity futures (PRFoxconn and PRLE) using the PR future with changes determined by the applicants.[108] The PRFoxconn future retained all of the features of the original PR modeling, but established an additional load in the ATC footprint to represent the approximate power consumption of the proposed Foxconn manufacturing facility starting in 2021. The PRLE future maintained all of the features of the PR future, but reduced energy and demand growth from a MISO described "medium" level to a "low" level.

The AAT future[109] emphasized:

- technological innovation,
- a stronger market share for demand response, energy efficiency, distributed generation, and
- CO_2 reductions of 35 percent across the MISO footprint.

Higher natural gas prices were modeled, to reflect higher natural gas demand, with natural gas treated as a primary fuel source. More coal-fired electric generation plants were retired due to economic considerations, leaving other fuel resource types (such as natural gas and renewable generation) to generate most of the base load requirements until retirement due to age limits.

For natural gas prices in MTEP17, MISO used the New York Mercantile Exchange (NYMEX) forecast prices for the years 2016-2017. Natural gas prices going into the future were based on an average of the Wood Mackenzie No Carbon and U.S. Department of Energy, Energy Information Administration (EIA) forecasts. The various futures (EF, PR, and AAT) then set natural gas pricing based on the assumptions described above at various levels.[110]

[104] Application Appendix D, Exhibit 1, p. 38, PSC REF#: 341714.
[105] Coal generators were assumed to retire at 65 years of age.
[106] CO_2 is the chemical formula of carbon dioxide.
[107] Application Appendix D, Exhibit 1, p. 38, PSC REF#: 341714.
[108] Application Appendix D, Exhibit 1, p. 39, PSC REF#: 341714.
[109] Application Appendix D, Exhibit 1, p. 39, PSC REF#: 341714.
[110] Application Appendix D, Exhibit 1, pp. 35-9, PSC REF#: 341714.

To determine a forward-looking estimate for energy use, the applicants adopted the MISO MTEP17 gross and net peak demand forecasts, with bounding values between a "low" case of 0.4 percent growth and a "high" case of 0.6 percent growth over a twenty year period.[111]

The applicants state that, while the Clean Power Plan has been stayed by the United States Supreme Court, the PR and AAT futures still contain some assumptions about carbon emissions reductions as decided by MISO stakeholders.[112] The applicants note that the effect of some aspects of the Clean Power Plan are still coming to pass due to economic-related retirements of certain coal-fired electric generation facilities, instead being replaced by natural gas-fired and wind electric generation facilities. The applicants further assert concurrence with the PR future, which is believed to be the most likely of the three futures considered in MTEP17 by the applicants.[113] However, it is unclear whether the applicants agree that including a CO_2 price or tax as part of the underlying assumptions in the PR and AAT futures is appropriate at this time.[114]

3.5.2.3. Applicants' PROMOD modeling results

The applicants used the PROMOD outputs and a formula described in the Cardinal-Hickory Creek project application and Appendix D documents to estimate the benefits of each of the studied alternatives.[115] Using this methodology, the applicants assert that the proposed project provided the largest net economic benefit of all the alternatives they considered. The applicants state that the original PROMOD modeling based on MTEP17 data shows the Cardinal-Hickory Creek project has a net positive customer benefit across all of the five futures analyzed in PROMOD.[116] The applicants estimated overall PVRR benefits, discounted to year 2018 dollars, to be between $23.5 million for the EF future[117] and $350.1 million for the AAT future. All of the PR futures fell between these points, ranging from $106.3 million for the MISO defined PR future to $156.9 million for the PR low energy future.[118] However, the applicants note that actual future events are more likely to move among the various futures outlined in the MTEP17 process, rather than remaining fixed.

Upon completion of the staff requested updated modeling, the applicants state that the projected net benefits of the proposed project improved beyond the original PRFoxconn net benefit of $130 million, to a new net benefit of $157.8 million.[119] This result is subject to revision based on the results of any additional modeling performed by the applicants as requested by Commission staff.

3.5.3. Applicants' energy cost savings evaluation methodology

The applicants identified different methodologies of how potential benefits of each of the applicants' studied alternatives are estimated.[120] The applicants estimated the potential benefits of each of the studied alternatives for NSPW and DPC using the adjusted production cost (APC) method that is consistent with

---

111 Application Appendix D, Exhibit 1, p. 35, PSC REF#: 341714.
112 Application Appendix D, Exhibit 1, p. 36, PSC REF#: 341714.
113 Application Appendix D, Exhibit 1, p. 37, PSC REF#: 341714.
114 The base assumptions for the MTEP17 PR and AAT futures include a CO_2 price which filters into the PROMOD outputs as higher LMPs.
115 Application Appendix D, Exhibit 1, p. 66, PSC REF#: 341714.
116 Application, p. 4, PSC REF#: 352698.
117 As described in the application, the proposed Cardinal-Hickory Creek project did not provide net economic benefit using production cost savings, rather the asset renewal and avoided reliability project benefits of the proposed project were greater than the project cost. The projected production cost savings using the EF future were not deemed to be high enough, using the applicants' methodology, to show net economic benefit for the proposed project.
118 Application Appendix D, Exhibit 1, pp. 66-67, PSC REF#: 341714.
119 PSC REF#: 351943, p. 3.
120 Application Appendix D, Exhibit 1, p. 40, PSC REF#: 341714.

MISO's methodology for evaluating the economics of transmission projects, including the MVP portfolio. The APC method adds the production cost of generation to the payments for power imports to the region, then subtracts the revenue for power exported out of the region to arrive at a final calculated production cost. However, the applicants assert that ATC's customer benefit metric (CBM) approach is more appropriate for evaluating each of the studied alternatives in the ATC footprint. Specifically, ATC states that the APC methodology cannot appropriately account for LSEs in the ATC footprint being hedged against transmission costs through FTR acquisition and how much LSEs must pay marginal loss charges and receive refunds.[121] Thus, the summarized benefits and costs were presented differently for the various members of the combined applicants.

Net present value (NPV) benefit calculations were made for each of the studied futures and alternatives, using PROMOD model outputs as a basis.[122] The proposed project was assumed to be in service at the end of 2023, with benefits being interpolated off of a straight line for the years 2024 and 2025 from the data modeled for years 2021 and 2026. The years 2027 to 2030, inclusive were modeled using a straight line interpolation based on the data modeled for years 2026 and 2031. The benefits for the rest of the 40-year life, years 2032 to 2063, of the project (and the other studied alternatives) were based on an extrapolation assuming inflation at 2.5 percent per year and a nominal discount rate of 6.4 percent.

The applicants indicated that the LVA alternative performed comparably to the proposed project, so they performed further analysis to investigate which alternative would be better. The applicants concluded that the Cardinal-Hickory Creek project could actually lead to congestion at the Eden Substation, which could limit the claimed economic benefit of the project.[123] After performing updates to resolve the potential additional congestion at the Eden Substation, the applicants found that the Cardinal-Hickory Creek could provide better net results than the LVA alternative.[124] Regardless, the applicants did not pursue resolution of the potential constraints, even if such action could result in an increase of claimed benefits since approval is not being sought for the additional work that would be required to ameliorate the constraints described. The claimed energy cost savings benefits were thus modeled on the basis of not resolving the potential additional constraints at the Eden Substation.[125]

3.6. TRANSMISSION SYSTEM RELIABILITY

3.6.1. Area load forecast

As discussed previously, modeling included in the application for the proposed Cardinal-Hickory Creek project was based on MTEP17 assumptions. The applicants modeled five futures with the varying assumptions on electric demand and load growth described in Section 3.5.2.2. Since the future is uncertain, the applicants estimated the benefits of the proposed project under a number of different futures with different regulatory and economic conditions.

The average annual load growth by future is:

- 0.4 percent for the Existing Fleet Future (EF) and Policy Regulations with low MISO Demand and Energy Growth Future (PRLE);

[121] Application Appendix D, Exhibit 1, p. 40, PSC REF#: 341714.
[122] Application Appendix D, Exhibit 1, p. 40, PSC REF#: 341714.
[123] Application Appendix D, Exhibit 1, p. 41, PSC REF#: 341714.
[124] The net benefits of the proposed project are higher than the LVA since the applicants assumed the entirety of the LVA's costs would have to be recovered from Iowa and Wisconsin customers exclusively, rather than the entire MISO footprint.
[125] Application Appendix D, Exhibit 1, p. 42, PSC REF#: 341714.

- 0.5 percent for the Policy Regulations Future (PR) and Policy Regulations with Foxconn Future (PRFoxconn);
- 0.6 percent for the Accelerated Alternative Technologies Future (AAT).

The applicants used PR and AAT futures to analyze the transmission system reliability benefits of the proposed project. Commission staff has issued a data request[126] seeking additional modeling sensitivities evaluating the projected economic and reliability benefits of the proposed project under both zero and negative load growth futures.

3.6.2. PowerWorld modeling analysis of transmission system reliability

3.6.2.1. PowerWorld model description

The applicants used Power System Simulator for Engineering (PSS®E)[127] to assess the reliability benefits of the proposed Cardinal-Hickory Creek project. PSS®E is a modeling software that can be used to perform a wide variety of analysis functions, including power flow, dynamics, short circuit, contingency analysis, and other analyses. The applicants used the PSS®E model to evaluate reliability impacts of each of the studied alternatives. Commission staff uses another software called PowerWorld Simulator[128] which has similar capability and is interchangeable with the modeling software used by the applicants.

3.6.2.2. Description of applicants' PowerWorld modeling runs

The applicants evaluated the proposed Cardinal-Hickory Creek project and the other alternatives described in Section 3.9.3 in accordance with NERC planning and operating standards and ATC's transmission planning criteria.[129] The applicants' reliability analysis focused on the transmission system in Wisconsin, including the ATC and DPC footprints. This reliability study included:

- power flow contingency analysis evaluating the transmission system reliability under NERC TPL-001-4, Category P0-P7 contingencies; and,
- first contingency incremental transfer capability (FCITC) analysis to evaluate change in transfer capability and competition.

The applicants evaluated the Cardinal-Hickory Creek, NTA, LVA, and no-action "base case" (NA) alternatives using four different modeling scenarios. The four modeling scenarios represent the expected electric system in 2027 for varying load forecasts during different times of the year and futures:

- 2027 summer peak load;
- 2027 summer peak load 90/10;
- 2027 shoulder peak load; and,
- 2027 shoulder peak load with a west-to-east flow bias.

These modeling scenarios were originally created in the first quarter of 2017 for ATC's ten-year assessment (TYA). While ATC's footprint was updated as a part of 2017 TYE, the remainder of the applicants' power flow modeling inputs were based on the MISO 2016 Multiregional Modeling Working

[126] Commission staff Data Request 8, PSC REF#: 359354.
[127] Information on PSSE is available at: https://new.siemens.com/global/en/products/energy/services/transmission-distribution-smart-grid/consulting-and-planning/pss-software/pss-e.html.
[128] https://www.powerworld.com/.
[129] https://www.atc10yearplan.com/about/planning-criteria-and-tools/.

Group (MMWG) models. Loads included in this study are from MISO's 2016 load forecast, and any modifications determined by the various LSEs within MISO.

3.6.2.2.1 Contingency analysis

The applicants' steady state contingency analysis evaluated each alternative using the planning event contingencies defined in NERC Standard TPL-001-4. In particular, NERC standard TPL-001-4[130] sets forth the requirements that transmission owners need to abide by to ensure that the bulk electric system continues to successfully operate in the event of failure of one or more transmission system elements.

The applicants studied various No Load Loss Allowed contingencies (NLL) that focused on the Alliant Energy (ALTE), MGE, DPC, and ITC areas, but also included selected contingencies in MidAmerican Energy Company, Xcel Energy (NSPW and NSPM), and Commonwealth Edison Company (ComEd) areas as well. The controlled Load Loss Allowed contingencies, specifically the events that would be categorized as NERC planning event category P3 and category P6 contingencies, focused on a smaller area within southwest and southcentral Wisconsin with 69 kV, 138 kV, 161 kV, and 345 kV transmission system elements.

The steady state analysis monitored the current loading and bus voltages for ATC, DPC, ITC and NSPW. The impacts of the studied planning event P1.1 contingencies within ATC were screened using the normal operation equipment ratings. The P1.1 contingencies external to ATC were studied using the emergency equipment ratings, consistent with all other P1-P7 contingencies. This analysis used a DC solution option and monitored the study area. The DC power flow solution is useful since it provides a very good approximation of a large AC system. An AC solution set requires the convergence of a complex, non-linear system of equations, which makes a large AC system very difficult to solve.

3.6.2.2.2 FCITC analysis

The applicants claim that the transmission congestion and reliability constraints have limited, and will continue to limit, the flow of low-cost wind energy from areas to the west into Wisconsin. They believe that the proposed project would help address these issues by increasing the transfer capability of the electric system as the high-voltage transmission systems in southwest and southcentral Wisconsin would be better connected to Iowa.

FCITC measures the transfer capability of the system. The FCITC analysis performed by the applicants measured the incremental FCITC for the proposed project and the NTA, NA and LVA alternatives. The applicants state that an increase in FCITC is an indicator of increased transfer capability of the system and thus increased competitiveness of the wholesale power market.

3.6.2.3. Applicants' PowerWorld modeling results

The applicants' Transmission System Reliability Analysis results are summarized below. However, it is important to note that the applicants are not exclusively proposing the Cardinal-Hickory Creek project as a reliability project. Instead, the applicants performed a reliability analysis as the MVP tariff requires each MVP project to provide reliability benefits by correcting projected violations of NERC Standards.

The applicants' contingency analysis results show that the proposed Cardinal-Hickory Creek project has reliability benefits for Wisconsin. The results of the contingency analysis are critical energy infrastructure

[130] NERC Standard TPL-001-4, or the Transmission System Planning Performance Requirements Standard, can be found here: https://www.nerc.com/files/TPL-001-4.pdf.

information (CEII) and exempted from disclosure in a public document. The public version of the contingency analysis results are available in the application and Appendix D.[131]

The applicants' performed a FCITC analysis[132] to compare the studied project alternatives for their respective effectiveness for increasing west to east transfers. Each of the alternatives, except the No Action Alternative, would add incremental FCITC but the applicants assert that the proposed Cardinal-Hickory Creek project would provide substantially more incremental FCITC than the LVA and NTA in both the summer peak and shoulder modeling scenarios. The applicants also state that the proposed project would provide approximately 1,300 MW of additional FCITC, while the LVA and the NTA would provide approximately 850 MW and 250 MW of additional FCITC, respectively.

3.7. APPLICANTS' OTHER STATED BENEFITS

3.7.1. Capacity loss savings

All LSEs[133] in MISO region must maintain resource adequacy by owning or contractually acquiring generation capacity to cover their load, assigned transmission losses, and an additional planning reserve margin. Any project that decreases an LSE's local load, transmission losses, or increases local generation, would contribute to meeting an LSE's overall capacity requirement.

The applicants state that a new transmission line, such as the proposed Cardinal-Hickory Creek project, would likely reduce transmission system losses and thus reduce each LSE's overall capacity obligation. When electrical energy travels across the conductors of a transmission line, some of that energy is lost as heat. Generally, if more energy flows across the conductors, greater amounts of energy is dissipated as lost heat which leads to the conductors getting hotter. When a new transmission line is constructed, it can reduce the amount of energy that flows across other existing conductors, thereby reducing heat losses.

To calculate the capacity loss savings of each alternative, the applicants calculated the difference in Wisconsin LSE's capacity requirements with and without each alternative. The applicants then calculated the difference in each LSE's capacity cost, with and without each alternative, using the highest historical MISO Local Resource Zone (LRZ) 2,[134] Residual Capacity Auction clearing price of $72/MW-day, and projecting that capacity value with inflation through the 40-year life of each of the applicants' alternatives. The difference in calculated capacity costs with and without each alternative represents the capacity loss savings for Wisconsin customers.

The applicants' calculated capacity loss savings of each alternative was assumed to be the same across all of the applicants' studied futures. The capacity benefits of the applicants' NTA significantly exceed the capacity benefits of all of the other alternatives considered by the applicants, and are estimated to be one of the NTA's largest economic benefits.

The capacity loss savings are estimated by the applicants to be:

- $0 for the No-Action Alternative,
- $2.5 million for the proposed Cardinal Hickory Creek project,

[131] A detailed discussion of the steady state reliability analysis is included in revised Application Appendix D, Exhibit 1, page 55 of 89, PSC REF# 341714

[132] A detailed discussion of the FTITC analysis is included in revised Application, pp. 43 of 174, PSC REF# 352698

[133] Examples of LSEs in the ATC footprint include Madison Gas and Electric Company (MGE), Wisconsin Power and Light (WPL), Wisconsin Public Service Corporation (WPSC), and Wisconsin Electric Power Company (WEPCO).

[134] MISO LRZ 2 represents the ATC footprint. There are 10 LRZs in MISO, Wisconsin has portions of LRZ 1 and the majority of LRZ 2.

- $1.0 million for the Low Voltage Alternative, and
- $27.1 million[135] for the Non-Transmission Alternative.

3.7.2. System failure insurance benefit

The applicants maintain that a project that strengthens the transmission system would also reduce the negative economic impact of severe, long-term generation and transmission outages. The applicants believe that the proposed Cardinal-Hickory Creek project would allow the transmission system to have easier access to a wider set of generation resources and therefore have greater access to lower cost electricity in the event of a long-term outage of a major generation or transmission element.

In order to calculate the insurance benefit of each submitted alternative, the applicants made assumptions about the probability and duration of various outages occurring and then used the PROMOD model to measure the extent to which an alternative would mitigate any wholesale energy cost increases as a result of such significant outages. The applicants' calculated insurance benefit of each submitted alternative is assumed to be the same across all of the applicants' studied futures.

The insurance benefits are estimated by the applicants to be:

- $0 for the No-Action Alternative,
- $6.0 million for the proposed Cardinal-Hickory Creek project,
- $5.8 million for the Low Voltage Alternative, and
- $1.2 million for the Non-Transmission Alternative.

3.8. COMMISSION STAFF'S ANALYSIS OF THE PROPOSED PROJECT

3.8.1. Commission staff's analysis of cost

The applicants estimate the capital cost of the proposed Cardinal-Hickory Creek project would be between $492 million and $543 million in year-of-occurrence dollars.[136] The applicants' calculation of the present value change in net transmission charges used a nominal discount rate of 6.4 percent, which is DPC's FERC formula weighted average cost of capital. However, the construction cost of the proposed project does not incorporate the entire cost associated with operating the project over its expected 40-year life.

After considering all of the costs (including the capital cost, project financing, and operation and maintenance) that would be associated with the proposed project, the projected MVP allocated present value (discounted to year 2018) cost to the MISO footprint of the proposed Cardinal-Hickory Creek project is $629.2 million. However, due to cost sharing described in the MVP tariff, the applicants further

[135] The applicants assumed that the NTA would include 32 MW of utility-scale and rooftop solar generation, and applied a 50 percent capacity credit to that installed solar capacity. This 50 percent capacity credit is assumed to be constant over its 40-year useful economic life.

[136] As described earlier, the actual range of capital cost of the proposed project is $474 to $560 million in year-of-occurrence dollars, if all four "major" route alternatives that were provided by the applicants are considered.

note that the present value (discounted to year 2018 with the discount rate of 6.4 percent) of the change in net transmission charges to Wisconsin transmission network customers is estimated to be $67.0 million.[137]

As shown in ATC's most recent Attachment-O filing[138], ATC uses a capital structure of 50 percent long-term debt and 50 percent equity. ATC's FERC authorized annual return on common equity is 10.82 percent. ITC, as a co-owner of the proposed Cardinal-Hickory Creek project, has a different capital structure than ATC which uses 40 percent long-term debt and 60 percent equity. However, since ITC is classified by FERC as an independent transmission company, ITC's current FERC authorized annual return on common equity is 11.32 percent.[139]

Commission staff's review of the project cost structure is an important piece of the overall need analysis of the project, since the total potential economic benefits have to be evaluated with the overall costs and risks to transmission customers for a large transmission asset with a 40-year expected life.

3.8.2. Commission staff's analysis of reliability

As discussed in Sections 3.6.2 and 3.6.3, the applicants performed a steady state reliability analysis using projected 2027 load models for all the alternatives considered. Commission staff reviewed the PowerWorld modeling and successfully replicated the results using the same set of assumptions used and described by the applicants. Section 3.8.4.2 describes Commission staff's data requests and review of the applicants' responses regarding the PowerWorld modeling used to justify the reliability benefits of the proposed project.

3.8.3. Commission staff's analysis of market impacts and benefits

A large portion of applicants' stated justification for the proposed project is based on the ability of the project to deliver lower cost energy to Wisconsin customers. The economic nature of the stated need for the proposed project requires Commission staff's review to focus on the applicants' PROMOD analysis which forms a major part of the overall project justification. As stated previously, Commission staff has successfully replicated the PROMOD modeling performed by the applicants using the same set of assumptions.

To evaluate the applicants' stated benefits of the proposed project, Commission staff did a thorough review of the assumptions made in the PROMOD models as well as a review of the energy cost savings calculations. Commission staff then issued numerous data requests regarding the applicants' original modeling, which resulted in the applicants providing updated modeling. These updated models have been replicated by Commission staff typically with errors of less than one percent, thus being able to reproduce (within a reasonable margin of error) the same results as the applicants using the same set of basic assumptions.

[137] The applicants' Present Value Revenue Requirement (PVRR) calculation for MISO as a whole, and Wisconsin alone, was provided to Commission staff as part of the applicants' response to data request 01.169, PSC REF#: 347526.
[138] This rate formula is also known as an Attachment-O at FERC. A public link to this filing can be found here: http://www.oasis.oati.com/woa/docs/ATC/ATCdocs/2019_ATC_YE123119_AttO_Proj.pdf.
[139] ITC's Attachment O filing can be found here: https://www.oasis.oati.com/woa/docs/ITC/ITCdocs/ITCTransmission_2019_Projected_Rate_Reporting_Package_08-30-2018.html.

3.8.4. Additional modeling requested by Commission Staff

3.8.4.1. Updated PROMOD modeling requested by Commission staff

Commission staff reviewed the applicants' original PROMOD modeling as part of staff's completeness review of the application to determine whether the application contained sufficient information for the Commission to proceed with the CPCN process. On May 24, 2018 the Commission deemed the application to be incomplete.[140] Accompanying this determination was a list of items that requested additional updates in the PROMOD model that included known important generation portfolio changes and inconsistencies within the applicants' information. As part of the completeness determination, Commission staff sought a uniform and consistent treatment of Wisconsin's generator fleet, across all futures and alternatives in the PROMOD modeling.

In a response dated July 30, 2018, the applicants agreed to provide updated PROMOD modeling.[141] The updates to the applicants' PROMOD modeling include:[142]

- Removing the Wisconsin-Illinois Reliability Project transmission lines from the model, consistent with ATC's withdrawal of the application;
- Retiring Edgewater Unit 4, Pleasant Prairie Units 1 and 2, Pulliam Units 7 and 8, and Presque Isle Units 5-9 in all updated model years and alternatives, consistent with the announced retirements of these facilities;
- Returning South Oak Creek Units 5-8, Genoa, and the Milwaukee Valley units to service in all updated model years and alternatives; and,
- Placing in-service various new generation assets, some of which are currently under review by the Commission, or currently under construction.

On October 19, 2018, the applicants supplied updated PROMOD modeling to Commission staff.[143] The applicants asserted that they had made the requested changes for twelve new runs, involving the PRFoxconn future and each of the four alternatives (base case, Cardinal-Hickory Creek, NTA, and LVA) for the years 2021, 2026, and 2031. The PRFoxconn future was chosen to consider the potential for the proposed Foxconn facility to be in operation. The applicants stated the updated PROMOD modeling showed the proposed Cardinal Hickory Creek project had higher net benefits than originally forecasted.[144]

3.8.4.2. Updated PowerWorld modeling requested by Commission staff

The Commission's determination that the application was incomplete[145] also requested updates to the applicants' PowerWorld modeling. On September 25, 2018, the applicants submitted updated modeling

---

[140] May 24, 2018 Incompleteness Determination Letter and List, PSC REF#: 343192.

[141] Applicants' Supplement to Second Group of Responses to PSCW's May 24, 2018 Incompleteness Letter, PSC REF#: 347526.

[142] The applicants declined to perform other requested modeling sensitivities, including a PROMOD analysis of the impact of large generation facilities that have requested retirement in the PJM Interconnection LLC (PJM) footprint.
(Link to PJM homepage: https://www.pjm.com/). The applicants' asserted that the PJM plant retirements would have negligible effect on the PROMOD analysis and that nuclear unit retirements would not be studied as a sensitivity due to the fact that MISO stakeholders had not considered nuclear unit retirements in any of the MTEP17 futures. The applicants stated that individual generators are not as important as location and capacity, with generator replacement to follow on any plant retirements. (Link to the applicants' supplemental response to Incompleteness letter dated May 24, 2018: PSC REF#: 347526)

[143] Applicants' Economic Planning Results Update, Supplement to Second Group of Responses to PSCW's May 24, 2018 Incompleteness Letter, PSC REF#: 351943.

[144] Applicants' Economic Planning Results Update, Supplement to Second Group of Responses to PSCW's May 24, 2018 Incompleteness Letter, PSC REF#: 351943, p. 3.

[145] May 24, 2018 Incompleteness Determination Letter and List, PSC REF#: 343192.

addressing Commission staff's requests as a part of their response.[146] Commission staff was able to replicate the applicants' PowerWorld modeling results using the same set of assumptions.

Commission staff is working with the applicants to refine their PowerWorld modeling to ensure that it accurately reflects the configuration of the current electric system, specifically around the proposed new Nelson Dewey Mississippi River crossing location in the models, and other changes proposed as part of the Cardinal-Hickory Creek project. Commission staff has also requested PowerWorld modeling revisions that include relocation of the Hill Valley Substation, which may affect the routing of the proposed 345 kV transmission line.

3.9. APPLICANTS' ALTERNATIVES TO THE PROPOSED PROJECT

3.9.1. Non-transmission system alternatives

The applicants considered several NTAs to the proposed Cardinal-Hickory Creek project. The various forms of these alternatives were incorporated into and evaluated in the applicants' PROMOD analysis. These alternatives either take the form of an underlying assumption within the PROMOD models, or they are included as direct alternatives to the proposed Cardinal-Hickory Creek project. These various alternatives were evaluated both within ATC's transmission system and throughout MISO. The NTAs that were evaluated and considered by the applicants include:

- **Energy efficiency and load reduction** – Focus on Energy[147] and various utility demand response programs have historically reduced energy usage and electricity demand. The applicants state that they considered reduced energy consumption and peak load, above that achieved historically by Focus on Energy, in the futures the applicants used to evaluate transmission system alternatives using the PROMOD computer model. At the low end, the applicants assumed gross demand and energy growth rates of 0.37 and 0.40 percent,[148] respectively. This compares to the MTEP17 mid-range gross demand and energy growth rates of 0.64 and 0.65 percent,[149] respectively. The applicants state that the MISO stakeholders preferred the set of assumptions associated with the Policy Regulations Future, which included assumptions provided by Advanced Energy Group regarding incremental Demand-Side

---

146 Applicants' response to second group of data requests, PSC REF# 350642.

147 Focus on Energy is the existing statewide energy efficiency and renewable resource program for Wisconsin. For 2017, Focus on Energy reported a net demand reduction of 64.98 MW, and net energy savings of 475,820 MWh. Focus on Energy program spending in 2017 was $91.6 million. Focus on Energy CY 2017 Evaluation Report, p. 7,
https://www.focusonenergy.com/sites/default/files/WI%20FOE%20CY%202017%20Volume%20I%20FINAL%282%29.pdf.
This represents approximately 0.46 percent of Wisconsin's total peak electric load and 0.69 percent of Wisconsin total electric energy sales. As such, Focus on Energy programs are decreasing electricity demand growth rates by approximately 0.46 percent compared to what would be expected in the absence of such a program. This level of savings is embedded into the historic load data and growth trends used by the applicants in the PROMOD modeling for the proposed Cardinal-Hickory Creek project. The information regarding Wisconsin's peak demand and electricity consumption can be found the 2024 Wisconsin Strategic Energy Assessment, PSC REF#: 341817.

148 The MTEP17 Existing Fleet Future assumes 0.37 and 0.40 percent demand and energy growth rates, respectively. This corresponds to MISO-wide net demand and energy growth rates of 0.35 and 0.39 percent, respectively. This can be found in the MTEP17 Full Report, p. 87,
https://cdn.misoenergy.org/MTEP17%20Full%20Report106032.pdf.

149 The MTEP17 Policy Regulations future assumes gross demand and energy growth rates of 0.64 and 0.65 percent, respectively. This corresponds to MISO-wide net demand and energy growth rates of 0.52 and 0.56 percent, respectively. This can be found in the MTEP17 Full Report, p. 87,
https://cdn.misoenergy.org/MTEP17%20Full%20Report106032.pdf.

Management programs in the Eastern Interconnection.[150] In addition, the applicants included various interruptible loads within their analysis. In their PROMOD modeling, the applicants reflected these types of loads by making assumptions about the placement of system resources at various substation locations near the proposed Cardinal-Hickory Creek project study area and the wholesale market price points where the applicants' state studies have shown customers are willing to consider reducing load.

- **Generation** – The applicants included additional generation resources in the futures they used to perform PROMOD modeling analysis. The additional generation resources included in each of the studied futures are consistent with the associated MTEP17 expansion plan results by LRZ. These new generation sources include new natural gas, wind, and solar resources. In addition, various levels of existing coal power plant retirements were assumed across the MISO footprint in the evaluated futures.

- **No-Build Alternative** – The applicants used the No-Build Alternative as a reference case for evaluating the proposed Cardinal-Hickory Creek project, the other transmission and non-transmission system alternatives considered. In this analysis the applicants evaluated the transmission system with and without each alternative. If the analysis produced more favorable results with a particular alternative than the No-Build Alternative, then the applicants found the No-Build Alternative to be economically inferior to that particular alternative. In addition to the economic factors, the applicants considered reliability impacts and wholesale energy market transfer capability. The applicants state that the No-Build Alternative provides lesser economic benefits, reliability performance, and wholesale energy market transfer capability compared to any of the other transmission system alternatives studied.

3.9.2. Applicants' evaluation of non-transmission system alternatives

The applicants studied a variety of NTAs in accordance with the Energy Priorities Law in Wis. Stat. § 1.12(4) as part of the applicants' planning analysis including:

- energy efficiency,
- demand response, and
- new renewable and conventional generation.

In particular, the applicants studied a specific NTA which included energy efficiency, demand response, and local renewable energy as an alternative to the proposed project. The applicants designed the NTA to have roughly the same projected ratepayer cost to Wisconsin as the proposed Cardinal-Hickory Creek project, and evaluated the benefits of this alternative using the same methodology that was used to evaluate the proposed project and other transmission system alternatives. The main components to the applicants' designed NTA include:

- Additional energy efficiency measures corresponding to a 2.6 MW reduction in peak load;
- Additional demand response measures corresponding to a 31.5 MW reduction in peak load;

[150] The Eastern Interconnection is one of the three main electric grids in the continental U.S. The Eastern Interconnection spreads from the Rocky Mountains to the Atlantic Ocean, including Manitoba, Ontario, Saskatchewan, and excludes the Electric Reliability Council of Texas.

- A utility-scale solar facility connected into the existing Nelson Dewey Substation, with a peak capacity of 30 MW; and,
- Additional residential solar facilities located "behind the meter"[151] in Mount Horeb and Cross Plains, Wisconsin. The peak capacity assumed was 2 MW.

The applicants' NTA would have a total project cost estimate of $90 million in year-of-occurrence dollars (year 2023) and the present value cost of the NTA (discounted to year 2018 dollars) would be $70.3 million. More information about the applicants' studied NTA can be found in the application.[152]

The applicants dismissed an alternative to the proposed Cardinal-Hickory Creek project that exclusively utilized energy efficiency and load reduction measures for the following reasons:

- The applicants were uncertain what level of energy efficiency and load reduction are necessary to equal the quantitative and qualitative benefits of the proposed Cardinal-Hickory Creek project.
- The applicants assert that energy efficiency and load reduction would not provide an increase in transfer capability from the west into the ATC footprint.
- The applicants assert that energy efficiency and load reduction would not provide similar energy cost savings (due to a reduction in transmission system congestion on a cost per MWh basis) as the proposed project for Wisconsin customers.
- The applicants state that an alternative to the proposed project that exclusively utilized energy efficiency and load reduction would have to function as continuous and firm resources.
- The applicants state that most energy efficiency and load reduction programs are voluntary and cannot be relied upon in the same manner as a transmission system asset like the proposed project.

3.9.3. Transmission system alternatives

The applicants considered several transmission system alternatives to the proposed project, which are described in greater detail in the following sections.

3.9.3.1. Proposed Cardinal-Hickory Creek Transmission Project

The proposed project would extend a new 345 kV transmission line from the existing Hickory Creek Substation in New Vienna, Iowa to a new substation located near Montfort, Wisconsin to the existing Cardinal Substation in the town of Middleton, Wisconsin. The proposed transmission line is estimated to cover 100 to 130 miles, depending on the route selected. The existing Hickory Creek 345/161 kV Substation is connected to the Hazleton-Salem 345 kV transmission line in Dubuque County, Iowa. The applicants propose to construct a new 345/138 kV substation, to be called the Hill Valley Substation, near Montfort, Wisconsin. The proposed project would terminate in the existing Cardinal 345/138 kV Substation, located in the town of Middleton, Wisconsin.

The proposed Cardinal-Hickory Creek project has a total estimated cost of $474 million to $560 million in year-of-occurrence dollars, depending on the route selected. The present value (discounted to year 2018) of the change in net transmission charges to Wisconsin transmission network customers is estimated to be between $67.0 million to $72.7 million, also depending on the route selected.

---

[151] "Behind the meter" refers to facilities that do not sell energy into the market, effectively created a load reduction facility since the energy they produce offsets the amount of energy purchased from the grid.
[152] Application, p.36, PSC REF#: 350874.

3.9.3.2. Low-Voltage Alternative (LVA)

The LVA studied by the applicants includes the following:

- A new 138 kV transmission line from Nelson Dewey Substation in Cassville, Wisconsin to Eden Substation near Montfort, Wisconsin;
- An expanded or new 138 kV Eden Substation near Montfort, Wisconsin;
- A new 138 kV transmission line from Montfort, Wisconsin to Middleton, Wisconsin;
- A new 345 kV transmission line from the Hickory Creek Substation in New Vienna, Iowa to an expanded Nelson Dewey Substation in Cassville, Wisconsin (requiring a new Mississippi River crossing); and
- Transmission system facilities associated with the construction proposed above.

The applicants' LVA is assumed to follow the same general route as the proposed project. The existing Nelson Dewey Substation in Cassville, Wisconsin does not have any transmission facilities above 161 kV, so as described previously, the substation would have to be expanded in order to accommodate a new 345 kV transmission line from Iowa. In addition, the existing Eden Substation would have to be expanded to add two breaker positions in order to accommodate the two new 138 kV transmission lines that are a part of the applicants' LVA. This would result in a significantly larger existing Eden Substation; however, the new 345/138 kV Hill Valley Substation would not need to be constructed with this alternative.

The LVA has a total project cost estimate of $356 million in year-of-occurrence dollars and the present value (discounted to year 2018) of the change in net transmission charges to Wisconsin transmission network customers is estimated to be $220.6 million. The applicants assert that the LVA is not an approved MISO MVP and currently the cost of the LVA would be recovered entirely from Wisconsin and Iowa transmission network customers.

3.9.3.3. Other Transmission System Alternatives

The applicants considered and rejected several other 345 kV transmission alternatives to the proposed project. The applicants assert that a substitute transmission alternative to the proposed project should meet the main criteria of this MVP in the MISO 2011 MVP portfolio. To qualify as a project meeting the applicants' criteria, the alternative must:

- Connect the end points for this MVP, namely, northeastern Iowa and the 345 kV network in southcentral Wisconsin near Madison, Wisconsin;
- Cost effectively increase the transfer capability from northeastern Iowa to southwestern and southcentral Wisconsin;
- Reduce transmission system congestion;
- Increase transmission system reliability and alleviate at least one projected violation of a NERC bulk electric system standard; and,
- Support public policy, specifically regarding compliance with state and federal renewable portfolio standards and goals.

The applicants assert there are a limited number of locations to site a transmission line that satisfies these criteria. At the southern end of the proposed project, the Mississippi River divides northeastern Iowa from southwestern Wisconsin. After years of study, the applicants concluded that the only feasible option for crossing the Mississippi River between these two endpoints was near Cassville, Wisconsin. Thus, the applicants assert that the Wisconsin portion of any 345 kV transmission alternative must begin in Cassville.

At the northern end, the applicants point out that there are a number of potential endpoints that meet the criteria listed above. These locations include the:

- existing Cardinal Substation,
- existing North Madison Substation,
- existing Rockdale Substation,
- new Kitty Hawk Substation, and
- Paddock Substation.

The applicants assert that neither the Kitty Hawk Substation nor the Paddock Substation are connected to the 345 kV network in the Madison, Wisconsin area. In addition, the applicants state that during discussions with MISO it was determined that an alternative that terminates at either of these locations would not be considered electrically similar enough to the proposed project to qualify for MVP status. Therefore, the applicants eliminated any transmission alternatives that terminate at the Kitty Hawk or Paddock Substations.

The applicants also contend that a transmission alternative that terminates at the Rockdale or North Madison Substations would be longer, more expensive, and have a later in-service date than the proposed project. In addition, the applicants state that discussions with MISO did not guarantee that a project which terminated at these locations would be considered electrically similar enough to the proposed project to qualify for MVP status. For these reasons, the applicants also eliminated a transmission alternative that terminates at the Rockdale or North Madison Substations from further consideration.

3.9.4. Applicants' evaluation of transmission system alternatives

The applicants state that they performed a full evaluation of each transmission system alternative by comparing all identified benefits and costs for each alternative, both quantitative and qualitative. The applicants stated quantitative benefits include:

- The net PVRR in charges to Wisconsin transmission system customers for construction costs and operating costs of each alternative and any supporting projects.
- Energy cost savings derived from PROMOD modeling and financial spreadsheets.
- Asset renewal benefits associated with each alternative.
- Avoided reliability benefits associated with each alternative.
- Capacity loss savings associated with each alternative.
- Severe system failure insurance benefits associated with each alternative.

The applicants considered the net quantitative benefits associated with each alternative using the following formula:

$$\textit{Net Benefit (Cost)} = \left(\begin{matrix} \textbf{\textit{GREATER OF}}: \\ \textit{Energy Cost Savings} + \\ \textit{Insurance Value} \\ \textbf{\textit{OR}} \\ \textit{Avoided Reliability Benefits} + \\ \textit{Asset Renewal Benefits} \end{matrix} \right) + \begin{matrix} \textit{Capacity Loss} \\ \textit{Savings} \end{matrix} - \begin{matrix} \textit{Costs to} \\ \textit{WI Customers} \end{matrix}$$

The applicants assert that rather than simply adding all of the potential quantitative benefits of each alternative together, the formula shown above ensures that benefits are not double counted.

In addition to the quantitative benefits described above, the applicants considered various additional qualitative benefits of each alternative:

- whether the alternative would provide access to additional renewable resources by increasing the transfer capability from west to east (the FCITC analysis),
- whether the alternative would be eligible to receive MISO MVP cost sharing based on the voltage level, and
- performance in the competitive Herfindahl-Hirschman Index (HHI) analysis[153].

Table 3-11 includes a comparison of the monetized benefits and costs of each of the alternatives considered by the applicants in the application. A detailed PVRR analysis was not performed for the LVA or NTA. Instead, the applicants performed a planning-level analysis of the projected PVRR of these alternatives, based on the expected overall capital cost of these alternatives, assuming neither the LVA or NTA would be eligible for MISO MVP cost sharing.

Table 3-11 Comparison of monetized benefits and costs of system alternatives

	Proposed Cardinal-Hickory Creek 345 kV Transmission Project	Low Voltage Alternative (LVA)	Non-Transmission Alternative (NTA)	No Action Alternative (base case)
Total Estimated Project Cost, $ millions	($492.22)	($356.00)	($70.30)	$0.00
PVRR of Total Estimated Project Cost to WI Customers, millions of 2018 dollars	($67.00)	($220.60)	($70.30)	$0.00
All Futures				
Insurance Value	$6.00	$5.80	$1.20	$0.00
Capacity Loss Savings	$2.50	$1.00	$27.10	$0.00
Sum of Asset Renewal and Avoided Reliability Benefits	$87.20	$89.90	$0.00	$0.00
Existing Fleet				
Energy Cost Savings	$38.90	$35.50	$32.30	$0.00
Net PVRR, Applicants' Formula	$22.70	($132.40)	($9.70)	$0.00
Policy Regulations, Low Demand and Energy				
Energy Cost Savings	$214.60	$195.20	$41.40	$0.00
Net PVRR, Applicants' Formula	$156.10	($18.60)	($0.60)	$0.00
Policy Regulations				
Energy Cost Savings	$164.00	$166.10	$31.70	$0.00
Net PVRR, Applicants' Formula	$105.50	($47.70)	($10.30)	$0.00
Policy Regulations, Foxconn				
Energy Cost Savings	$187.70	$198.50	$17.80	$0.00
Net PVRR, Applicants' Formula	$129.20	($15.30)	($24.20)	$0.00
Accelerated Alternative Technologies				
Energy Cost Savings	$407.80	$484.20	$67.40	$0.00
Net PVRR, Applicants' Formula	$349.30	$270.40	$25.40	$0.00

The applicants selected their preferred transmission system alternative by evaluating each alternative and selecting the one that provides the greatest projected quantitative benefits and achieves as many of the qualitative benefits listed above as possible. The applicants state that the proposed Cardinal-Hickory Creek project has the greatest net quantitative benefits of all the alternatives considered and best provides

153 The applicants describe the HHI as a commonly used metric to evaluate the extent of competition in power markets. In the need study, the applicants have provided the change in the HHI score for the ATC footprint as a result of the proposed Cardinal-Hickory Creek project.

all the qualitative benefits listed above. As such, the proposed Cardinal-Hickory Creek project is the applicants' preferred transmission system alternative.

CHAPTER

4

4. Typical Environmental Considerations for Transmission Line Projects

This chapter provides some general background information about the range of analyses used to evaluate the impacts of constructing and operating electric transmission line projects. It discusses how impacts are assessed and how they might be mitigated, including specific statutory rights of landowners. Mitigation is a common term used in utility construction reviews. It means to lessen the impact force or intensity, to moderate the impact, or to make the impact less severe. It also discusses typical construction phases of a high-voltage electric transmission line. The information in this chapter can be used to help understand the specific environmental and socioeconomic effects that could occur along various portions of the proposed project. It is useful to understand these typical considerations before looking at the specific impacts expected from the proposed project, which are discussed in Chapters 5 through 9.

4.1. ASSESSING TRANSMISSION LINE IMPACTS

4.1.1. Quantifying potential impacts

The environmental and socioeconomic impacts from the construction of a high-voltage electric transmission line may be measured in several different ways including area (acreage), distance (miles or feet), or the number of transmission structures. Precise measurements of impacts are generally not practical for proposed electric transmission line projects. While construction and maintenance activities would generally take place within the proposed ROW, the amount of the ROW actually affected would vary depending on location, type of construction equipment utilized, and soil and weather conditions. The analyses in this EIS generally assume that the entire ROW width could be affected; although actual impacts may differ.

4.1.2. Determining the degree of potential impacts

In general, the degree of impact of a proposed electric transmission line is determined by the quality or uniqueness of the existing environment along the selected route. The quality of the existing environment is influenced by several factors identified below.

- **The degree of disturbance that already exists**
  The significance of prior disturbances can be evaluated by comparing how close the area resembles pre-settlement conditions. This can be determined by examining such items as recent and historical photographs, historical sources, or conversations with local residents. Many areas in Wisconsin have been substantially altered by logging, drainage, cultivation, and commercial or residential developments.
- **The uniqueness of the resource**
  Proposed transmission line routes are reviewed for the presence of species or ecological community types that are uncommon or in decline in the region or state. The environmental review evaluates whether the land along a proposed route possesses features that would make it unique such as its size, species diversity, or whether it plays a special role in the surrounding landscape.
- **The threat of future disturbance**
  The resource is compared to surrounding land uses that may affect the quality of the existing resource over time. Considerations include whether current and likely future land uses or management practices might threaten some aspect of the resource or whether the resource is valued by the adjacent communities and likely to be preserved.

Environmental features such as soil type, topography, land cover, and weather may affect the degree of impact expected from proposed transmission line projects. For example, heavy clay soils may be more affected by compaction than sandy soils if construction occurs when the substrate is wet. Physical features of the proposed project could also affect the degree of impact. Such features may include the design and placement of the structure and the amount of ROW required. For example, a horizontal configuration of conductors may allow the conductors to be located at canopy-level of nearby forests decreasing aesthetic impacts and minimizing potential avian collisions, but it may also require a wider ROW than a vertical configuration of conductors.

4.1.3. Identifying potential cumulative impacts

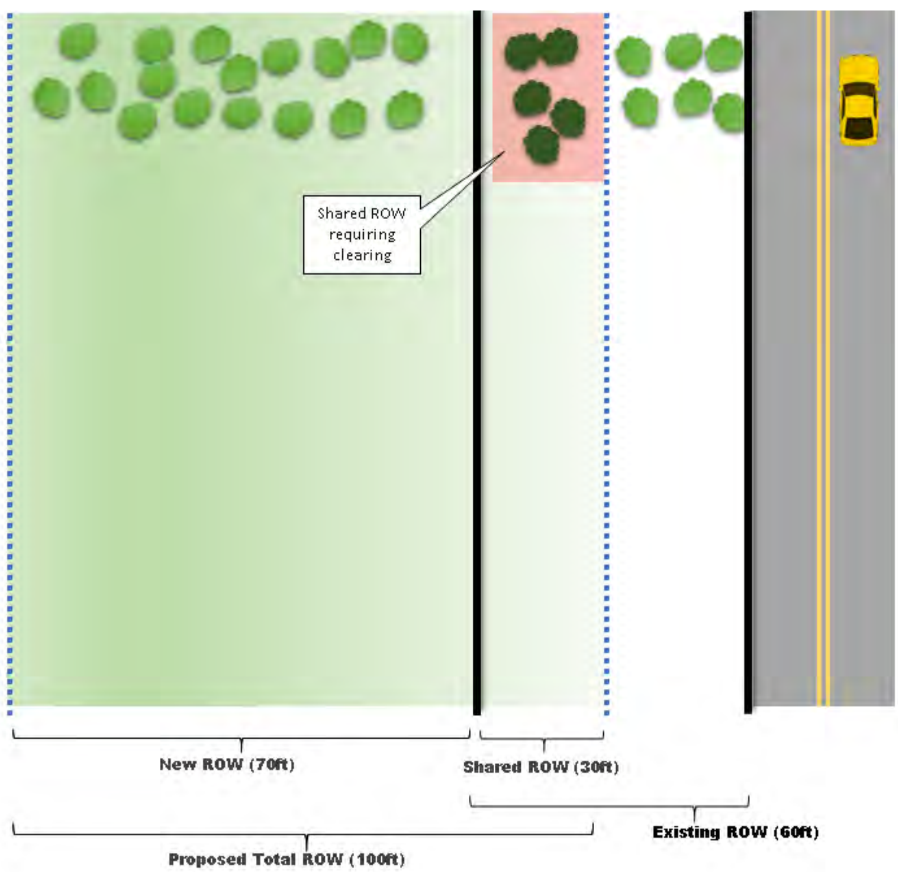
When assessing impacts, it is important to consider the duration of these impacts. In Wisconsin, transmission facilities are designed to operate between 35 and 40 years, but often last upwards of 60 years. Long-term impacts may occur as long, and in some cases longer, as the line exists and short-term impacts may occur only during certain phases of a project or during infrequent intervals. Both short- and long-term impacts are considered in this EIS.

The effect of a new high-voltage transmission line on an area depends on several landscape variables including the topography, land cover, and land use. In forested areas, for example, the entire extent of an approved ROW may be cleared and maintained free of most trees and shrubs for the entire life of the transmission line. The result is a permanent change to the ROW land cover as well as the existing and adjacent ecological community. In agricultural areas, heavy construction vehicles traverse the ROW potentially damaging crops and temporarily suspending the use of land for crop production. After construction ends, and if the fields are properly restored, the land beneath the transmission line can be cropped or pastured. For this reason, the agricultural land permanently affected by the line can be much smaller than the area temporarily affected during construction. Where transmission lines are routed through areas that are valued for their scenic qualities, the visual impacts of the line may extend well beyond the extent ROW.

It is important to note that short-term impacts can become long-term impacts if not properly managed or mitigated. Prevention and mitigation of long-term and short-term impacts is important and can be achieved. Refer to Section 4.2 regarding general mitigation measures that could avoid or minimize impacts of the proposed project.

For purposes of analyzing the potential impacts of a utility construction project, applicants are required to identify existing ROWs that would be shared with the proposed project. The quantification of resources in these areas of the proposed ROW by the applicants are critical for evaluating incremental as well as cumulative impacts of proposed infrastructure with infrastructure that already exists in the landscape. An example of how proposed, existing, and shared ROWs are considered by the Commission is depicted in Figure 4-1. If the existing ROW that would be shared with a proposed project is also a utility ROW where the applicants would continue to manage and own the easement rights to, then the existing ROW would also be included in the total proposed ROW area.

Figure 4-1 **Example ROW figure from PSC's Application Filing Requirements** for Transmission Line Projects



4.2. MITIGATION OF POTENTIAL IMPACTS

4.2.1. General mitigation strategies

Some of the ecological and socioeconomic impacts that could occur as part of the proposed project may be mitigated or avoided entirely by specific construction methods, route siting, as well as other pre-and post-construction best management practices. The Commission can require the applicants to incorporate specific mitigation methods into the project design, construction process, and/or maintenance procedures to minimize and avoid ecological and socioeconomic impacts from the proposed project. Some examples of mitigation strategies are identified in Table 4-1 as well as throughout this EIS (Chapters 4 through 9).

Table 4-1 Examples of mitigation strategies

Project Phase	Feature	Example Design Phase Mitigation Methods
Design Phase	Route Siting (discussed in greater detail in Section 4.2.2)	Use corridor-sharing to minimize new ROW requirements.
	Transmission Structure	Choose a different transmission structure with different construction requirements and aesthetic appeal: • H-frame structures, while requiring wider ROWs, have longer span lengths which may make it easier to cross rivers, wetlands, or other resources with fewer impacts. • The darker color of oxidized steel structures may blend in better with forested backgrounds. • Low profile structures, while necessarily closer together with possibly wider ROWs, can be used near airports to avoid interference with flight approaches.
	Structure Placement (discussed in greater detail in Section 4.2.3)	Make minor adjustments to structure locations to avoid archaeological sites or minimize effects on agricultural operations.
	Add-ons	Add flight diverters to conductors to minimize bird collisions with the wires.
Construction Phase	Timing (discussed in greater detail in Section 4.2.4)	Alter the timing of the construction periods: • Construct when the ground is frozen and vegetation is dormant to minimize impacts to wetlands or other sensitive habitats. • Delay construction in agricultural areas until after harvest to minimize crop damage and reduce soil compaction (if done while ground is frozen).
	Specific Construction Equipment	Use wide-track vehicles and matting to reduce soil compaction and rutting in sensitive soils and natural areas.
	Erosion Control	Install and maintain proper erosion controls during construction to minimize run-off of topsoil and disturbances to natural areas.
Post-Construction Phase	Invasive Species Management	Clean equipment as work finishes in one area to avoid spreading invasive plants to new areas. Annually survey for and eliminate new populations of invasive species caused by construction disturbances.
	Restoration	Decompact soils in agricultural areas to allow soil structure to redevelop and reduce impacts to crop yields. Revegetate ROW with appropriate seed mixes, include native species to the greatest extent practicable, and select plant species with season-long sources of pollen and/or nectar to ROWs for declining pollinator species.
	ROW Vegetation Management	Implement integrated vegetation management (IVM) practices, accredited or supported by the ROW Stewardship Council, to create a long-term compatible vegetative community within the ROW.

Project Phase	Feature	Example Design Phase Mitigation Methods
		Develop maintenance schedules and techniques to enhance habitat for rare or compatible species and communities; delay brush-cutting and mowing until nesting birds have fledged.

A few of the strategies discussed in Table 4-1 are discussed in more detail in the subsections below The other strategies are discussed in particular categories of impacts in this chapter, or in sections of this EIS where they may apply.

4.2.2. Corridor sharing with existing infrastructure

Utilizing corridors with existing infrastructure is recognized as a general state policy when it comes to siting site new electric transmission facilities and mitigating some of the impacts that are associated with new electric transmission corridors, as discussed in Section 1.2.2.3.

Corridor sharing involves sharing all or part of an existing corridor with a new electric transmission line. When properly evaluated, corridor sharing can be a useful method in mitigating or avoiding environmental, property, and community impacts of a new electric transmission line. ROW-sharing with certain types of corridors has more advantages than others. For example, the more a new utility ROW overlaps an existing utility ROW the more benefits are possible. Sharing corridors with existing utility facilities may reduce impacts by:

- reducing the amount of new ROW required,
- concentrating linear land uses and reducing the number of new corridors that fragment the landscape, and
- creating an incremental rather than new impact.

Side by side placement of ROWs with no overlap has fewer benefits than true corridor sharing. Some types of corridor sharing are not beneficial in reducing impacts, and some actually can create additional impacts. Often, the most preferred type of corridor sharing is with an existing electric transmission line. An existing electric transmission line may be double-circuited with a new transmission line and therefore require little or no expansion of the existing ROW. However, if the existing transmission line cannot be double-circuited with the new transmission line that ROW corridor may double in size, impacting significantly more land (acreage). Some examples of these disadvantages are described in Table 4-2.

Table 4-2 Examples of potential disadvantages of corridor sharing

Existing ROW	Examples of Corridor Sharing Drawbacks
Railroads	• Some railroad ROWs have long distances between road crossings, and additional access roads would be needed for construction. • Railroad corridors that pass through wetlands are generally berms that are too narrow to support transmission structures. Therefore, structures would have to be located off the berm, resulting in additional impacts to wetlands. • Some railroad companies require corridor-sharing transmission lines to be located at the edge or outside of the railroad ROW, which might be far enough away that they create a new corridor eliminating the benefits of corridor sharing.
Gas Pipelines	• Pipeline ROWs often run cross-country with little or no visual or agricultural effects. However, electric transmission lines constructed along the same cross-country route might interfere with farm operations, have different vegetation management goals, and produce negative visual impacts.

Existing ROW	Examples of Corridor Sharing Drawbacks
	• For safety reasons, gas pipelines often require an electric transmission line ROW to parallel the pipeline ROW with no or very minimal overlap. This minimizes the potential benefits of corridor sharing.
Rural Roads	• Some local roads may have large trees that form a scenic canopy over the road. The construction of an electric transmission line ROW that overlaps a rural road ROW may result in the loss of these trees. This would negatively impact the ecology of that forest community as well as the aesthetic views along the road and nearby residential properties. • Where wind-blown soil is a problem, a transmission line ROW requiring clear cutting of windbreak trees could lead to soil loss and traffic hazards from "brown-outs," or "white-outs" in winter. • Rural roads typically do not have sufficient ROW available, so additional ROW would need be obtained from adjacent landowners along with associated impacts.
Existing Transmission Lines	• Co-locating a new electric transmission line with an existing line, but on separate structures, could increase the width of the ROW as well as impacts to the existing and adjacent ecological communities, land use, farmlands, and residential communities. • If the new electric transmission line would be double-circuited with the existing line, the new structures may be taller than any existing transmission structures and create additional aesthetic impacts as well as additional hazards for avian or airport flyways. • Increasing the width of an existing corridor could escalate the effects of habitat fragmentation on the existing ecological community.

Corridor-sharing may also require some modification to the proposed electric transmission facilities resulting in additional costs to the project. For example, corridor sharing with a railroad may require the installation of underground communication circuits for the railroad. Sharing a corridor with a gas pipeline may require the installation of cathodic protection to prevent pipeline corrosion caused by induced currents. Transmission structures located within a highway ROW must be moved at the ratepayers' expense if a highway improvement project requires that the transmission line be relocated.

An additional drawback to corridor sharing is that landowners with existing easements could be burdened by additional facilities. Additional utility easements may further limit landowners' rights and the use of their properties. Obtaining just compensation for the additional degradation and loss of use and enjoyment of their property would occur during the easement negotiation process that takes place between the landowner and the utility. Landowner rights are discussed in greater detail in Section 4.5 of the EIS.

4.2.3. Structure design

Transmission line structures can be designed with alternate designs, heights, materials, and colors. Different designs result in different costs as well as environmental and socioeconomic impacts. Transmission line structure design and configurations are discussed in greater detail in Section 2.2.1 and displayed in Figures 1-14 in Appendix D.

Structures can consist of a single pole or multiple poles (such as an H-frame with two poles). Single-pole structures are generally taller and narrower than two-pole structures for similarly sized conductors. Two-pole structures with conductors mounted in a single plane can be used in situations where structure height is a concern, such as near an airport or along important bird migratory pathways. Single-pole structures may be more desirable when crossing agricultural fields or in wetlands because two-pole structures disturb more surface area than single-pole structures and require wider ROW. See Figures 4-1 below and 4-2 represent photos of these two types of transmission line structures.

Figure 4-2 Typical two-pole H-frame structures (image is for illustration purposes only – structures are not necessarily those proposed for this project)

In addition to the structure's physical layout, the structure material (e.g., wood, laminated wood, steel) and the type of insulators and conductors used can affect the appearance and therefore the aesthetics of the transmission line. Steel structures can be galvanized steel (gray), painted (often light blue), or unpainted steel that is designed to oxidize to a brown color. The decision on what surface treatment to use can be influenced by the surrounding environments and aesthetic concerns (see Section 3.2.1.2 for more discussion of aesthetics in this EIS). Structures can be directly embedded into the soil surface or bolted onto buried concrete foundations.

Figure 4-3 Typical single-pole double circuit structures (image is for illustration purposes only – structures are not necessarily those proposed for this project)

4.2.4. Construction timing

In many cases, the timing of construction activities can determine the severity of impacts on the local community and environment. In general, limiting construction to winter months when the ground is frozen and plants are not actively growing can reduce many adverse short- and long-term impacts to agricultural practices and yields, uplands, wetlands, high-quality natural areas, endangered and threatened species, ecological communities, as well as reduce the spread of invasive species and plant diseases (e.g., oak wilt).

More specifically, to avoid impacts to wildlife (especially endangered resources) construction should be minimized or avoided during active nesting or spawning periods. For example, to protect fish habitat activities such as bridge placement or dredging below the ordinary high-water mark are restricted during spawning seasons for trout streams and navigable tributaries. The DNR has developed construction protocols that minimize or avoid construction-related impacts on protected species. These measures include seasonal restrictions on work or other activities that cause disturbance, movement barriers, and other methods. Each project and each species must be evaluated in the context of the entire project and project schedule to ensure protection of resources.

However, in some cases scheduling all construction activities during winter months (or outside of wildlife breeding seasons) may not be practicable due to the size, complexity, and urgency of some utility projects, the availability of skilled labor, and the need to perform construction during scheduled electric outages. In this case, the applicants should work with applicable regulatory agencies to reduce any adverse impacts to the greatest extent practicable.

4.2.5. Independent construction monitors

4.2.5.1. Independent environmental monitor

Independent third-party environmental monitors (IEM) sometimes are required by the Commission in its Order to monitor construction of an approved project. The IEM typically reports directly to Commission staff rather than the applicants or construction subcontractors. Construction activities subject to monitoring and reporting by the IEM could include activities that would affect wetlands, waterways, habitats and occurrences of protected species, archaeological sites, agricultural fields, state and federal properties, and/or private properties with specific issues such as organic farming practices or the disposition of cleared trees. The IEM is responsible for reporting incidents or stopping work, when appropriate, when construction practices violate any applicable permit, approval, order condition, or agreement with regulatory agencies, or are likely to cause unanticipated impacts to the environment or private properties.

4.2.5.2. Independent agricultural monitor

For some transmission construction projects that would affect significant acres of agricultural properties, it is appropriate for an independent agricultural monitor (IAM) to be retained as well. The monitor could be an independent third party similar to the IEM but more typically, the monitor is hired and funded by the applicant with some input from DATCP and without stop work authority. The monitor can be instructed to report to the DATCP and the Commission. Construction activities subject to monitoring and reporting by the agricultural monitor could include activities that might result in the mixing of soils, erosion of topsoil, soil compaction, impacts to agricultural operations, and issues associated with irrigation or drainage. The monitor is responsible for auditing the applicants' compliance with agricultural mitigation plans and compliance with the Commission order. Additionally, the monitor works to facilitate communication between property owners and the applicants including compensation for construction impacts.

4.3. TYPICAL CONSTRUCTION PHASES AND ACTIVITIES

This section describes the general activities often done during different construction phases of a high-voltage electric transmission line. Specific construction methods or activities proposed for this project are described in Chapters 5-9 of this EIS.

4.3.1. Pre-construction activities

Pre-construction activities refer to actions that take place prior to the actual construction of an approved project. Results of these activities inform the construction manager of any modifications or design changes that may need to occur prior to actual construction of an approved project. For example, within a project area different locations and soil conditions may require different construction equipment and techniques as well as a variety of mitigation measures. Soil conditions and stability are tested prior to the start of actual construction using preliminary bore holes. Local variations in some conditions, such as the depth to bedrock, depth to the water table, or volume of rainfall, may require specific engineering or environmental solutions and mitigation measures during project construction.

Most state and federal permits must be acquired prior to the start of construction, as this is a typical condition required by the Commission which ensures that an approved project is permittable. Conditions of these approvals usually require a number of pre-construction environmental surveys. Environmental surveys may include the finalization of wetland boundaries, the presence or absence of protected species, the presence or absence of invasive species, or archaeological site boundaries that are likely to be impacted by construction activities.

To ensure that the applicants have a complete and permittable project, negotiations with landowners are usually concluded prior to the start of construction.

Erosion control measures (i.e. silt fences, slope breakers) are often required to maintain stable site conditions and are installed prior to construction of an approved project.

4.3.2. ROW marking and initial vegetation clearing

The full extent of the ROW is often clearly marked with wooden stakes and flagging, as well as any special land use (e.g. recreational trails, organic farms, etc.) or sensitive land features (e.g. waterways, wetlands, endangered resources, invasive species, etc.) prior to any construction activities within an approved ROW.

During construction, utilities may remove all existing vegetation within the full extent of the ROW to facilitate construction equipment access and ensure safe clearances between vegetation and the new transmission facilities. This results in a significant alteration (conversion) of the existing habitat, and resets the existing vegetative community within that ROW back to an early successional state.[154] ROW clearing during the growing season is extremely impactful to the resources within the ROW. This impact could be easily mitigated by conducting ROW clearing during winter months when vegetation is dormant. In addition, clearing the entire ROW of all woody vegetation prior to construction may not be necessary in all locations. For example, topography within the Driftless Area is often characterized by deep valleys and steep ridges where the conductor heights may be considerably higher than the mature tree canopy. Trees within valleys at ground level may never grow tall enough to reach the conductors and may not need to be cut. This practice would not only save the utility time and money, but it also prevents unnecessary ecological impacts in those areas.

In upland shrubby grasslands and cropped fields, removal of vegetation within an approved ROW is commonly done with some type of mower. ROW in sedge meadows and shrub/scrub wetlands might also be mowed, as needed, to provide a stable work surface.

In upland and wetland forests, several types of equipment might be used to clear the ROW of woody vegetation. Whole tree processors capable of cutting a standing tree at its base, removing all limbs, and sawing the tree trunk into consistent log lengths or poles are often used to clear mature forests (Figure 4-4).

In areas that have a dense woody understory, forestry mowers and chainsaws may be utilized to provide space for tree processors to clear the larger mature trees. Chainsaws may also be used to clear smaller diameter shrubs and trees adjacent to environmentally sensitive areas such as waterways and wetlands, as shown in Figure 4-5.

[154] Refer to Section 4.6.5 for more information about early successional habitats.

Figure 4-4 Tree processor used for forest clearing

Figure 4-5 Hand-clearing trees with chainsaws along a waterway

Generally, pole timber and saw logs are stacked on the edge of the ROW in upland locations, and the smaller diameter limbs and branches (often referred to as slash) are chipped or burned within the ROW. These activities are illustrated in Figure 4-6. According to the landowner's wishes, and honored by the applicants, the wood chips may be spread throughout the ROW, piled to allow transport by the landowner to specific locations, or chipped directly into a truck and hauled off the ROW. Local permits may be required for burning slash within the ROW.

During the initial ROW clearing process, matting may be installed to ensure stable work conditions and reduce impacts in environmentally sensitive areas. The use of mats can reduce rutting and excessive soil disturbance from heavy activity and equipment as well as reduce the spread of invasive species. Timber mats are the most common type of matting used, although new plastic composite mats are also available. These mats are portable and can be installed and moved as needed throughout the ROW. In many cases, these mats may be left in place during all phases of construction (i.e. ROW clearing, foundation installation, tower erection, and wire stringing) to reduce impacts from heavy activity and equipment. Matting is removed at the completion of the project. Once matting is removed, and any recontouring of the soil surface is completed, the existing vegetation as well as any additional vegetation from seed mixes applied within the ROW is allowed to grow.

Figure 4-6 Chipping slash on upland ROW with timber piled on edge of the ROW

If the new transmission line follows an existing transmission ROW, existing electric transmission or distribution facilities may need to be removed before the approved transmission facilities can be installed. The applicants may utilize bucket trucks, cranes or digger derricks, backhoes, pulling machines, pole trailers, or dumpsters to remove existing electric facilities, as needed. Existing wood structures would be cut into segments.

In uplands, the underground portions of the poles would be pulled from the ground and the holes backfilled. In wetlands, these holes would normally close as the pole is removed or after a freeze/thaw cycle. Sometimes in sensitive or high quality wetlands, the old structures are cut off even with the ground surface to avoid the additional soil disturbance from removing the bases of the structures. Pulled or cut structures would be removed from the site and either recycled, taken to a landfill, or given to the landowner with a waiver of liability. Steel structures would be removed in a similar way. If the steel structures have concrete foundations, the foundations would be removed down to a depth of about three feet in non-cultivated areas and four feet in cultivated areas.

4.3.3. Augering and blasting

In upland areas, the soil excavation for the transmission line structures can often be augered using a standard drilling rig (Figure 4-7). The augered soils are temporarily piled off to the side of the excavation.

In wetlands and agricultural fields, the topsoil should be segregated from the subsoils. In wetland locations, the subsoils are often piled on timber matting, as shown in Figure 4-8, or on a geotextile fabric for disposal at a later time. In cropped agricultural fields, the subsoils are often placed on a layer of straw or geotextile fabric separating them from the topsoil below. This enables easier removal and disposal without the risk of disturbing or removing topsoil. After a foundation is completed, the excavated topsoil is spread around the base of the foundation to ensure optimal conditions for revegetation.

Figure 4-7 Augering a foundation excavation in dry upland soils

Figure 4-8 Structure location in wetland – matted work platform, foundation, spoil pile (to be removed), and erosion control

If the water table is encountered during the augering process, dewatering may be needed. Options for dewatering include pumping the water from the excavation to a suitable upland area and allowing it to slowly percolate into the soil, pumping water into silt cells or bags to allow silt to drop out, or pumping the water directly into a tanker truck and transporting it to a suitable upland for release onto the soil surface.

When subsurface soils consist of unconsolidated materials, such as gravel or cobbles, the excavation might need to be continually flooded to prevent the side walls from collapsing (Figure 4-9). The water pressure from this process keeps the walls of the excavation intact during the augering process. When the appropriate depth is reached, a casing is inserted into the excavation and the water is pumped out. Depending on the location of the excavation and the soil characteristics, the water may be slowly released into a drain field and left to percolate into the soil surface, pumped into silt cells or bags to allow silt to drop out, or pumped into a tanker truck and removed to an upland location where it would be allowed to slowly percolate into the ground. It should be noted that, in agricultural fields, flooding can have long lasting adverse effects and should be avoided or specifically controlled.

Figure 4-9 Using flooding of excavation during augering in gravel

When bedrock is close to the soil surface or when subsoils primarily consist of large boulders and large cobbles, blasting might be required to complete the tower excavation. Explosives are placed in holes drilled into the rock and the tower site is covered with blasting mats to keep the rock and debris loosened by the blast from scattering over a wide area. Following the blast, the blasting mats and loosened debris are removed and the drilling rig is used to auger through the broken rock until the appropriate depth is reached. In cropped agricultural fields and wetlands, the topsoil would be stripped from the area around the tower site and stockpiled off to the side. When the excavation was completed and the foundation poured, the topsoil would be replaced around the tower site. This practice would prevent the subsoil from mixing with topsoil and would preserve the rootstocks of native vegetation, enhancing the success of post construction restoration in wetland locations. Figures 4-10 through 4-12 illustrate some of the steps in the blasting process.

Figure 4-10 Prepared blast location – topsoil stripped and stockpiled, blasting mats in place

Figure 4-11 Blasting mats and post-blast soil/rubble pile

Figure 4-12 Augering rocky subsoils

4.3.4. Foundation installation

The excavated hole required to install the foundation of a transmission structure might be cased and framed with rebar to stabilize and strengthen the concrete foundation (Figures 4-13 through 4-15). Refer to Section 2.2.3 for more information on the types of foundations that would be utilized for the proposed project.

Depending on the depth and diameter of the excavation, multiple loads of concrete might be needed. After the concrete is poured, a series of bolts are embedded in the foundation to secure the tower structure when it is installed on top of the foundation.

Figure 4-13 Placing foundation cage inside an excavated hole

Figure 4-14 Final rebar work in preparation for concrete pour

Figure 4-15 Pouring the concrete foundation

When the foundation is completed, the tower site is cleaned up (Figure 4-16). If the tower is in a cropped agricultural field or a wetland, the spoils are moved to a suitable upland location, designated by the landowner as necessary, to dispose of the spoils. In other upland locations, subsoils may be spread around the around the structure and graded into the soil surface to ensure drainage away from the structure.

Figure 4-16 Completed foundation after initial cleanup

In non-agricultural upland areas, the disturbed soils may be mulched and/or seeded with annual oats or rye grass which germinate quickly and help to stabilize the soil surface giving native vegetation an opportunity to reestablish (Figure 4-17).

Figure 4-17 Upland ROW seeded with oats and rye grass for quick soil stabilization

Several alternative foundation designs have been successfully used where conventional drilling, the deposition of concrete, the generation of spoils, or dewatering would cause significant impacts to large wetlands or wetlands that are deemed environmentally sensitive. These alternative structure foundations are often constructed with specially equipped helicopters or marsh buggies to prevent impacts that are traditionally caused by extensive matting, heavy construction equipment, and heavy activity near transmission structure foundation sites. For example, in some wet environments hollow steel caissons can be installed with a high frequency vibration hammer (Figure 4-18). The caisson is installed to a predetermined height above the ground and becomes the platform for the transmission structures. The vibratory hammer can be transported to and from the site by helicopter.

Applicants usually state whether they plan on using any of these alternative construction techniques in the CPCN Application submitted to the Commission, but may adopt such technology after site assessments as needed. The alternative foundations proposed for this project are discussed in Section 2.2.3.

Figure 4-18 Helicopter-based vibratory caisson and hammer unit

Another alternative foundation uses helical pier systems which can be installed with adapted marsh buggies (Figure 4-19). A central hollow larger pile supported by several smaller inclined hollow piles are augered into the subsurface and capped with a plate designed to accommodate the above ground structure.

Figure 4-19 Installation of a helical pier foundation in a wetland with a marsh buggy. The wider tracks are able to **disperse the vehicle's weight** and reduce impacts in wetland environments.

4.3.5. Tower erection and wire stringing

The tower sections are transported to the foundation locations from a laydown yard/staging site in the project area where they are stored. The establishment of staging and laydown yards along the approved ROW is a typical step in the construction of a transmission line. These sites may be located on agricultural lands that are temporarily taken out of production (with compensation to the landowner) for the purpose of temporarily storing tower sections, reels of conductor, and other necessary components. Additional information regarding the laydown yards that have been identified in the CPCN application can be found in Section 2.2.5.2.

Steel transmission structures are erected in sections (Figures 4-20 and 4-21). Cranes are used to lift the tower sections into place. First, the lower section is lifted into place and bolted onto the concrete foundation. The upper sections of the tower, with the arms already attached, are then lifted onto the lower tower section. Sometimes insulators and large pulleys that facilitate wire stringing are also attached to the tower arms before they are raised into position. Alternatively, the pulleys can be attached after the tower erection is completed.

Figure 4-20 Bolting tower to concrete foundation. The crane in the background is holding the tower section in place.

Figure 4-21 Using a crane on frozen ground to install the top section of a tower.

In areas where ground-based cranes are not suitable because of soft or wet ground, steep terrain, or environmentally protected areas, helicopters can be used to transport and erect the steel structures as shown below in Figure 4-22. This may reduce the need for additional access roads or matting and their associated environmental impacts. Helicopters can also be used to string ropes to help with conductor installation, and then later to clip the conductors to the insulators

Figure 4-22 Helicopter setting tower on foundation

Large reels of rope are commonly staged in the ROW, and the individual ropes are drawn through the pulleys from tower to tower. The wire conductor is then attached to the ropes and pulled into place (Figure 4-23). The pulleys are removed and the conductors are attached to the insulators and properly tensioned. If the conductors are double bundled, spacers may be inserted at appropriate distances along the wires. Helicopters can be also used to string wire and then later to clip the conductors to the insulators (Figure 4-24).

Figure 4-23 Pulling cable through structure arms

Figure 4-24 Wire stringing with a helicopter

Sometimes when it is necessary to maintain reliability during construction, temporary transmission conductors and structures may be constructed adjacent to an existing ROW. Temporary conductors are typically supported by wood structures directly embedded into the ground with post insulators. These conductors are removed when the new transmission facility construction is complete and they are no longer needed.

4.3.6. Site restoration

Site restoration consists of the activities required to return the areas impacted by the construction of an approved project back to their original condition, if not better. Restoration typically occurs in any disturbed areas within easements or ROW, temporary construction areas, staging areas or laydown yards, transportation routes, off-ROW access roads, and any other areas used for project related activities.

Wisconsin Stat. § 182.017(7) describes the responsibilities of utilities regarding restoration following the construction of a high-voltage transmission line in any easement or ROW. This statute requires that if excavation within the easement is necessary, the topsoil must be stripped, piled and replaced upon completion of construction or use. Easements must also be restored to their original condition, including any slope, terrace, or waterway that was disturbed by construction or maintenance. As practicable and when the landowner requests, the statutes state that easements used for agricultural production should schedule construction work at times when the ground is frozen in order to prevent soil compaction. Additionally, utilities must clear easements of all debris, stones, and rocks resulting from construction activity upon completion of construction.

This statute has additional requirements for utilities regarding restoration or compensation for private property within easements. They state that any fence damaged because of construction or maintenance operations must be satisfactorily repaired to its original condition. If cutting a fence is necessary by a utility, a temporary gate must be installed and can be left in place at the landowner's request. The utility must repair any drainage tile line within the easement damaged by construction or maintenance. The utility must pay for any crop damage caused by such construction or maintenance. The utility is required to supply and install any necessary grounding for a landowner's fences, machinery or buildings. Lastly, the utility must employ all reasonable measures to ensure that the landowner's television and radio reception is not adversely affected by the high-voltage transmission lines.

The utility is also required by these statutes to control weeds and brush around transmission line facilities. No herbicidal chemicals may be used for weed and brush control without the express consent of the landowner. If weed and brush control is undertaken by the landowner under an agreement with the utility, the landowner would receive from the utility a reasonable amount for such services. Additionally, the landowner must be afforded a reasonable time prior to commencement of construction to harvest any trees located within the easement boundaries, and if the landowner fails to do so, the landowner would nevertheless retain title to all trees cut by the utility. The rights discussed under these statutes may be specifically waived by the landowner in an easement agreement.

If a project disturbs more than 1 acre of land, a Wisconsin Pollution Discharge Elimination System (WPDES) Construction Site Stormwater permit is required to be obtained from DNR prior to construction. This permit requires project proponents to develop an erosion control plan describing specific practices that will be implemented to reduce erosion, divert stormwater from disturbed or exposed construction sites, and to control the transport of sediment during construction. The permit also has specific requirements for site restoration, including revegetation conditions and managing stormwater runoff after construction is complete.

During site restoration, disturbed soils are graded so that the topography and slopes are matched to pre-existing conditions. All ruts and depressions are restored. Stockpiled topsoils and subsoils are put back in place wherever soils had been stripped and segregated. New topsoil is brought in and spread at agricultural locations where topsoil has been lost or mixed with subsoils. Compacted agricultural soils are decompacted to return the soil structure to its original condition.

Areas where crops are not present, such as roadsides, pastures, old fields, upland woods, and wetlands, may be seeded with native seed mixes (or other appropriate seed mixes) and mulched with certified weed-free mulch. In some cases, where it is reasonable to allow the natural ground cover to re-establish itself, annual grasses may be sown to minimize the potential for erosion while re-establishment is occurring. In wetlands, excavated topsoil containing the seeds and rootstocks of wetland vegetation might be spread around the foundation to the pre-existing elevations to enhance the re-establishment of the original wetland vegetation.

Erosion control and ROW monitoring continues until all disturbed area achieve final stabilization, which is characterized as 70 percent perennial vegetation cover. Following completion of restoration and re-establishment of vegetation within the ROW, all temporary restoration erosion control devices not designed to be left in place (*e.g.*, erosion control blankets, silt fencing) are removed and properly disposed. All temporary bridges and construction related materials are removed.

4.3.6.1. Proposed Cardinal-Hickory Creek revegetation plan

The applicants state environmental monitors would be hired to conduct erosion control inspections and to oversee compliance with the erosion control plans and environmental permit requirements and to monitor revegetation.

In response to Data Request 1.123, the applicants have provided a draft revegetation plan for the proposed project[155]. In this plan, the applicants state that restoration activities would begin as soon as practicable and as allowed by seasonal conditions. The applicants plan to analyze the need and approach for restoration and revegetation methods based on the degree of disturbance caused by construction activities, the ecological setting, and satisfying the requirements of the property owner and applicable permit conditions. The application states that restoration might not be required where access or construction of the project can be accomplished without creating significant soil disturbance, and that the need for installing a temporary cover crop and/or permanent seed mix would be made based on site conditions and erosion potential.

The applicants state that following revegetation activities, if there are no signs of re-growth of pre-existing vegetation species within the first month of the subsequent growing season, they would assess the condition and apply an appropriate seed mix consistent with the surrounding vegetation. They state that restoration would comply with DNR-approved technical standards and best management practices (BMP), and be inspected in accordance with Wis. Admin. Code ch. NR 216 and the WPDES general permit conditions, as well as monitored until 70 percent revegetation has been established. More information regarding the seed mixes proposed for the project are included in Section 4.6.3.2.

The application states that areas where invasive species are not present prior to construction would be monitored during the course of construction and restoration activities. The vegetative communities in these locations would be evaluated post-construction and compared to adjacent areas not accessed by construction vehicles in order to determine if invasive species have spread into the area, and if so, the likelihood that the spread was a result of project construction. The post-construction invasive species monitoring would depend on the vegetative community and extent of infestation. Potential remedial actions would be site-specific and developed once these factors are evaluated. General information regarding invasive species can be found in Section 4.6.4 with more specific route information in Sections 6.2.7, 7.2.7, 8.2.7, and 9.2.7.

Since the project would disturb more than one acre of ground disturbance, a WPDES Construction Site Stormwater Permit would be required from DNR. Per Wis. Admin. Code § NR 151.11(8), temporary stabilization activities are required when construction has temporarily ceased and will not resume for at least 14 days, and final stabilization activities are required when construction ceases and final grade has been reached on any portion of the project. Prior to the applicable permit decisions for required permits from DNR, DNR staff would review the applicants' proposed restoration and revegetation plan for compliance with applicable state statutes and administrative codes.

4.3.6.2. Seed mixes

The application states that the restoration of native prairie and grasslands within the approved ROW would include seeding with seed mixes similar to the pre-construction condition of that ROW and the adjacent landscape. This was clarified in the applicants response to Data Request 1.75 which states

[155] Response to Data Request 1.123 (PSC REF#: 347534)

that a high-quality prairie containing a diversity of forb species would be seeded with a seed mix containing native prairie grass and forb species, whereas a pasture would be seeded with a mix of grass species that are commonly found in pastures[156]. Examples of the seed mixes that would be utilized for the proposed project are included in Appendix A of the Draft Revegetation Plan provided in response to Data Request 1.123[157]. The applicants would modify these seed mixes prior to construction as necessary, and state that the locations where these seed mixes would be implemented has not been determined. The implementation of pollinator-enhanced seed options within an approved ROW would occur if the cost of the pollinator-enhanced option seems reasonable.[158] The applicants also state that the costs of these seed mixes have been accounted for in the proposed project cost.[159]

4.3.7. Vegetative maintenance of ROW

Throughout the electric utility industry, incompatible vegetation is commonly identified as vegetation that may pose a threat to safety, security, access, fire, reliability, visibility, line-of-site requirements, and regulatory compliance.[160] Vegetative communities within and adjacent to utility ROWs are continually impacted throughout the life of the transmission facilities placed within those landscape corridors. In this section, "vegetation management" refers to the management of vegetation during the operation and maintenance phases of the electric facilities and the ongoing process of preventing vegetation from interfering with the safe operation of transmission facilities. Once constructed, transmission facilities are designed to operate between 35 and 40 years, but often last upwards of 60 years. Therefore, the impacts of vegetation management throughout the life of the proposed facilities should be considered when evaluating the proposed project.

In the aftermath of the Northeast Blackout that impacted 50 million people in 2003, federal regulations were established to minimize the interaction between trees and high-voltage (>200 kV) powerlines to prevent vegetation-related outages that could lead to cascading[161] blackouts. The NERC standards (FAC-003[162]) were established to help maintain a reliable transmission system by requiring utility monitoring of the ROW and its vegetation, creating work plans to address problems, and carrying out work to ensure distances between vegetation and the transmission lines are maintained. The federal oversight of electric transmission vegetation management by FERC[163] subsequently altered the way many transmission owners view and conduct vegetation management in electric transmission ROWs, directly affecting the landowners within those ROWs.

Commission staff has a history of receiving complaints from landowners about the vegetation management methods implemented in utility ROWs. These complaints escalated substantially after the creation and implementation of federal standards (FAC-003) in 2006. Without adequate notice,

---

156 Response to Data Request 1.75 (PSC REF#: 345369).
157 Response to Data Request 1.123 (PSC REF#: 347534).
158 Response to Data Request 1.125 (PSC REF#: 347534).
159 Response to Data Requests 4.25 and 4.47 (PSC REF#: 353712).
160 Nowak, C.A. 2014. What is this Integrated vegetation management, this IVM – now, today, and into the future. Retrieved at: http://www.rowstewardship.org/resource_pdfs/ivm_history.pdf
161 Cascading refers to the uncontrolled successive loss of system elements triggered by an incident at any location resulting in widespread electric service interruption. North American Electric Reliability Corporation (NERC). 2015. Glossary of terms used in NERC reliability standards. 113 pp. Retrieved at http://www.nerc.com/files/glossary_of_terms.pdf.
162 FAC-003-4 Transmission Vegetation Management Standard. Retrieved at: https://www.nerc.com/pa/Stand/Reliability%20Standards/FAC-003-4.pdf
163 The Federal Energy Regulatory Commission (FERC) is an independent agency that regulates the interstate transmission of natural gas, oil, and electricity. In 2006, FERC certified NERC to develop reliability standards, which are subject to FERC review and approval.

explanation, or education about changes in vegetation management practices, landowners have often expressed concern when more intense methods are utilized where they did not exist earlier. It is important to note that the Commission does not have jurisdiction[164] over how transmission owners choose to conduct vegetation management in the ROW or enforcement authority of the landowner bill of rights.

Each transmission owner has the discretion to choose which vegetation management practices to implement within its ROWs to meet the NERC standards. The type of vegetation allowed to grow in a utility ROW and the utility's right to manage that vegetation are written into each easement[165] acquired for the proposed project. These easements specify the rights of the utility to control vegetation within that ROW as well as any hazard trees located outside of the ROW. As identified in Table 2-7, the proposed project would have different easement owners[166] (ITC/DPC and ATC/DPC) and therefore they may operate and maintain the ROWs differently. ITC would be responsible for maintaining the 345kV transmission line between the Mississippi River and Montfort, and ATC would be responsible for maintaining the 345kV transmission line between Montfort and Middleton[167]. It is important to note that transmission owners may choose to implement the rights in each easement to the fullest extent possible[168], clearing all incompatible vegetation (as determined by the easement owner) for the full width of the ROW during every maintenance cycle (commonly 5 years in Wisconsin). This also includes work beyond the limits of the ROW to remove additional hazards as determined by the transmission owner.

Vegetation management within utility ROWs can be a major source of concern for landowners. The ecological and socioeconomic impacts of vegetation management varies significantly by the region, landscape, and methods implemented by each easement owner. When it comes to the on-the-ground vegetation management conducted for the proposed project[169], it is up to the easement owner[170] to decide how it implements its vegetation management program. The potential management types and methods that could be implemented in a vegetation management program are included in Tables 4-3 and 4-4.

---

164 These disputes would be better addressed by the transmission owner or in the judicial system.
165 Refer to Section 4.4 for more information on landowner rights as well as Data Request Responses 4.14 (PSC REF#: 355945) and 4.13 (PSC REF#: 353712).
166 Data Request Response 4.14 (PSC REF#: 355945).
167 Data Request 4.22 (PSC REF#: 355945).
168 Data Request Response 4.20 (PSC REF#: 355945).
169 Data Request Response 1.51 (PSC REF#: 347534) and 4.20 (PSC REF#: 355945).
170 Data Request Response 4.14 (PSC REF#: 355945).

Table 4-3 Common electric utility ROW vegetation management types as identified in ANSI A300 (Part 7) or ISA IVM BMPs, unless otherwise referenced, and generalized impacts associated within each management type

Management Type	Definition	Impact-Positive	Impact-Negative	Example (i.e. Tools)
Selective	Methods used to control specific vegetation within a prescribed area. Selectivity is entirely up to the applicator/laborer.	Selective methods minimize harm to non-target species/areas.	Requires more qualified staff/contractors to implement correctly. Potentially higher costs initially but could reduce costs over long-term if implemented correctly.	Low-volume backpack spraying of broadleaf selective herbicides (such as 2,4-D or Triclopyr) by a trained applicator targeting incompatible species.
Nonselective	Methods used to control all vegetation within a prescribed area.	Lower initial cost.	This method can have a greater ecological impact since it delays the creation of a stable, low-growing compatible vegetative community within the ROW.	Mechanized mowers or broadcast herbicides utilized throughout the width of a ROW.
Integrated Vegetation Management (IVM)[171]	A system of managing plant communities where compatible and incompatible vegetation is identified, action thresholds are considered, control methods are evaluated, and selected control(s) are implemented to achieve a specific objective. Refer to Section 4.3.7.2.	ROWs dominated by stable, low-growing, compatible plant species have been shown to produce safe, reliable, cost-effective transmission of electricity.[172]	Potentially higher costs initially but could reduce costs in the long-term if implemented correctly. Many transmission owners claim to be doing IVM on their ROWs, when in fact they are not.[173]	Biological, chemical, cultural, manual, and mechanical tools can be used for IVM. The Wire Zone – Border Zone is a method of of implementing IVM.
Cycle-based	A loosely defined term used by the industry to generally describe the time it takes to complete vegetation management practices on their entire electric system[174].	Predictable, manageable timeframe for implementing a vegetation management program.	Vegetative growth and response to disturbance can be unpredictable, requiring work in between cycles (known in the industry as cycle-busters). The longer the cycle the more likely the transmission owner would need to reclaim the ROW.	Transmission owners commonly cite 5 years as a typical vegetation management cycle in Wisconsin.

[171] Refer to Section 4.3.7.2 and Appendix E for more information.
[172] Nowak, C.A., and Ballard, B.D. 2005. A framework for applying integrated vegetation management on rights-of-way. Journal of Arboriculture. 31(1), 28-37.
[173] McLoughlin, K.T. 2014. Integrated vegetation management: from its roots in IPM to the present. p. 227-270. In Environmental Concerns in Rights-of-Way Management 10th International Symposium. Utility Arborist Association.
[174] Cieslewicz, S.R., Novembri, R.R., Gray Jr., W.S., and Wood, D. 2004. Utility vegetation management final report. Federal Energy Regulatory Commission United States Government. Commissioned to support the federal investigation of the August 14, 2003 Northeast blackout. 131pp. Retrieved at http://www.ferc.gov/industries/electric/indus-act/reliability/blackout/uvm-final-report.pdf.

Management Type	Definition	Impact-Positive	Impact-Negative	Example (i.e. Tools)
Hot-spots	Areas where immediate vegetation management is required to ensure the safe operation of the transmission line.	Immediate threat response.	High cost and promotes out of cycle work.	Any out of cycle treatment.
ROW Reclamation	A term used to describe the nonselective techniques used to treat high tree stem densities frequently found on mechanically treated, neglected, or new ROWs.	Seen in the industry as the most cost-effective way to initially clear ROWs of vegetation.	High environmental impact. Refer to the impacts identified from nonselective methods.	Initial clearing for a construction project, or a result of not utilizing optimum cycle lengths.

Table 4-4 Common electric utility ROW vegetation management methods as identified in ANSI A300 (Part 7) or ISA IVM BMPs, unless otherwise referenced, and generalized impacts associated with each management method

Management Method	Definition	Impact-Positive	Impact-Negative	Example (i.e. Tools)
Biological	Management of vegetation by establishment and conservation of compatible, stable plant communities using plant competition, allelopathy[175], animals, insects, or pathogens. In the long run, this type of control is the most desirable method where it can be done effectively.	Reduces the amount of work and cost, including herbicide application, after each successive (and successful) treatment.	Requires more qualified staff/contractors to implement correctly and effectively. Higher initial cost; however, in the long run there is an industry consensus that this is the most cost-effective method[176].	Low growing plant communities. Wildlife populations (birds, rodents, etc.) can also act as a biological control by eating seeds or shoots of incompatible plants.
Chemical[177]	Management of vegetation through the use of herbicides or growth regulators. Herbicides effect plants by interfering with specific physiological biochemical pathways.	Can be selective, cost-effective, and efficient. Over time, reduces the total amount of herbicide used and increases the amount of time between treatments (longer sustained cycles). When used correctly, has less overall environmental impacts than other management methods.	Misapplication of herbicides can carry environmental risks including drift, leaching, and volatilization. Selectivity is entirely based on the applicator.	Often utilized with manual and mechanical methods. High and low volume applications through cut-stump, basal application, foliar, methods etc.

[175] The suppression of growth of one plant species by another due to the release of toxic substances (black walnut is a good example in Wisconsin).
[176] Cieslewicz, S.R., Novembri, R.R., Gray Jr., W.S., and Wood, D. 2004. Utility vegetation management final report. Federal Energy Regulatory Commission United States Government. Commissioned to support the federal investigation of the August 14, 2003 Northeast blackout. 131 pp. Retrieved at http://www.ferc.gov/industries/electric/indus-act/reliability/blackout/uvm-final-report.pdf.
[177] Refer to Section 4.3.7.1 for more information on herbicides.

Management Method	Definition	Impact-Positive	Impact-Negative	Example (i.e. Tools)
Cultural	Control of vegetation through alternative use of the land within the ROW, precluding the growth of incompatible vegetation.	A compatible land use would not require any additional vegetation management by a utility.	Applies to pre-existing landscapes, which are at the discretion of the landowner.	ROW land uses include crops, paved areas, residential lawns, pastures, parks, or other managed landscapes.
Manual	Control of vegetation using hand-operated tools.	Can be very selective, less intrusive, and applied to areas where other methods cannot.	Can be inefficient and less safe.	Chainsaws, brushcutters, loppers, etc.
Mechanical	Control of vegetation using machines. Mechanical methods of tree removal alone will only temporarily clear the ROW of tree stems.	Can be efficient and cost-effective, particularly for large-scale operations such as initial ROW construction or reclamation.	Considered temporary. It can be nonselective and have a greater environmental impact.	Forestry mowers, aerial saws, lift trucks, wood chippers, etc.
Engineering Solutions	Utilizing engineering solutions to relieve vegetation-power line conflicts.	Minimizes conflict between vegetation and infrastructure, as well as landowner and utility.	Often unaffordable for property owners or not cost-effective for utilities.	Could include relocating, reconstructing, or burying transmission lines.
Wire Zone/Border Zone[178]	This concept delineates the portion of the ROW beneath the conductors (wire zone) from the portion on either side (border zone), and prescribes different management strategies for each area.	A proven IVM method that ensures the reliability of electric supply lines while promoting stable, compatible plant communities and improved wildlife habitat on suitable electric utility ROWs.	Higher initial cost; however, in the long run there is an industry consensus that as an IVM strategy, this is the most cost-effective method.[179] May not be applicable to certain (i.e. narrow) ROWs. Requires more qualified staff/contractors to implement correctly and effectively.	This method is an example of IVM.

[178] Ballard, B.D., McLoughlin, K.T., and Nowak, C.A. 2007. New diagrams and applications for the wire zone-border zone approach to vegetation management on electric transmission line rights-of-way. Arboriculture and Urban Forestry. 33(6), 435-439. Retrieved at: http://kittatinnyridge.org/wp-content/uploads/2016/10/p435-439-1.pdf.
[179] Cieslewicz, S.R., Novembri, R.R., Gray Jr., W.S., and Wood, D. 2004. Utility vegetation management final report. Federal Energy Regulatory Commission United States Government. Commissioned to support the federal investigation of the August 14, 2003 Northeast blackout. 131pp. Retrieved at http://www.ferc.gov/industries/electric/indus-act/reliability/blackout/uvm-final-report.pdf.

4.3.7.1. Herbicide use in utility ROWs

Herbicides are substances used to kill plants by interfering with specific physiological and biochemical pathways. Herbicides are often less expensive, less impactful, and have more absolute results than repeated mechanical cutting or removal methods. Mechanical cutting of woody species, without the appropriate application of herbicide, can lead to more impactful and costly management to maintain the same clearance between vegetation and electric facilities. Conifer species (e.g. red pine or white spruce) are often killed by cutting or mowing; while most deciduous species (e.g. buckthorn or maple) will grow more vigorously after cutting or mowing activities take place. Cut trees respond by regenerating quickly (i.e. stump sprouting or root suckering) from the energy reserves contained in their undisturbed root systems. This regenerative capacity is particularly pronounced in the sapling stage, resulting in the eventual production of many more stems than were originally cut. The selective use of herbicide can curtail the growth of incompatible vegetation and preserve compatible low-growing communities within the ROW that act as a biological deterrent to the future re-establishment of trees.

Depending on the label,[180] herbicides may be applied to the soil, to the foliage of emerged plants, or to cut stumps of woody species. Herbicides can be generally classified into two categories:

- **Non-selective herbicides** kill all plants regardless of species. Examples include paraquat ("Paraquat") and glyphosate ("Roundup").
- **Selective herbicides** kill only certain types of plants. Selective herbicides target specific physiological characteristics of certain plants and have little or no effect on others. Examples include 2,4-D or Triclopyr which kill broadleaf plants but not grasses.

Non-selective herbicides may be used selectively (i.e. to target certain species); however, the success and impact of this type of management is entirely up to the applicator[181] of the herbicide. It should also be noted that even if selective herbicides are used, herbicide selectivity again depends entirely on the applicator.[182] For example, when an applicator treats an entire ROW with a broadleaf-selective herbicide all broadleaf plant species within that ROW would be severely impacted, including compatible broadleaf herbaceous plants (i.e. forbs, ferns, etc.). In addition, only herbicides[183] approved for use in aquatic environments should be utilized near waterways and wetlands as herbicide drift and runoff could potentially enter adjacent waterways.

All herbicides that are registered with the EPA have been evaluated based on their effectiveness and potential adverse impacts. This information is publically available if the name of the herbicide is known. Landowners may request this information from the transmission owner or contractors onsite.

In addition, as ROWs traverse the agricultural landscape in Wisconsin they often run across pasture lands and croplands. Since pastures are used by grazing farm animals, impacts of herbicides on those grazing animals can be an issue. To avoid adverse impacts of herbicide on pasture animals, applicators must review the labels of their herbicides for specific information regarding animal tolerances or tolerances in the animals' meat, milk, or eggs. **Grazing tolerances** are identified in the label and the applicator must comply with the label. This includes clearly notifying the landowner regarding the chemical used and any restrictions for use of the pasture for livestock after treatment.

---

180 Pesticide labels describe which types of plants and situations their formulations are meant to control and both federal and state laws prohibit use inconsistent with label directions.
181 Data Response 1.54 (PSC REF#: 347534).
182 Wisconsin requires that all commercial pesticide applicators be certified through WDATCP.
183 Permits may be required for herbicide use in aquatic environments

Wisconsin landowners must provide written consent to transmission owners to apply herbicide within privately owned ROWs, as described in Wis. Stat. § 182.017(7)(d). This consent would be discussed during the initial easement negotiations between the transmission owner and the landowner. Concerns of landowners usually include the types of herbicides used, their chemistry, residual toxicity, the potential for spray drift (or non-target kill) of compatible plants, and the potential for volatilization[184]. There are also concerns among landowners, environmental organizations, and regulatory agencies about the potential collateral damage herbicides cause if they are inadvertently spread or drift into nearby wetlands, aquatic vegetation, or agricultural crops meant to be cultivated organically. Along with these concerns, it is important to understand that by disallowing the use of herbicides within electric transmission ROWs, it severely limits the types of vegetation management methods transmission owners are able use within the ROW. Herbicides are considered a critical component of an Integrated Vegetation Management (IVM) program.

4.3.7.2. Mitigation strategies

Implementation of an Integrated Vegetation Management (IVM) program, accredited by the ROW Stewardship Council,[185] could minimize the potential ecological impacts from the constant disturbance and removal of vegetation within the ROW throughout the life of the transmission facilities. IVM is an industry accepted and promulgated management strategy that minimizes the interaction between the pest (incompatible vegetation) and the management system (safe and reliable electric service) through the integrated use of cultural, biological, and chemical controls.[186] IVM is a complex adaptive management strategy that is used to understand, selectively apply, monitor, and manage for compatible vegetation communities within utility ROWs. The ultimate goal of a utility vegetation management program that utilizes IVM should be to create a ROW that effectively competes with the germination and growth of incompatible tree species. More information regarding the ecological concepts that IVM is based on is included in Section 4.6.5. A framework for applying integrated vegetation management on ROW is included in Appendix E.

4.3.7.3. Hazard trees

Hazard trees are generally identified as *those trees outside of the utility's ROW or easement that present an unacceptable risk to the electric facilities*. There may be some variation in how utilities define or identify hazard trees, danger trees, and tree risk assessments. The definitions for *danger tree* and *hazard tree* as identified in ANSI and ISA Standards are as follows:

- **Danger Tree**: On or off the ROW, those that could potentially come into contact with electric lines by growing into, falling into, swaying into, or due to line sagging. To be classified as a Hazard Tree, there must be some assessment of the tree that finds it may be likely to fail and cause an unacceptable degree of damage or disruption.[187]

---

184 Volatilization occurs when the liquid spray converts in the air from a liquid to a gas and then moves farther along air currents potentially causing damage further away from the target area.

185 Many transmission owners claim to be doing IVM, when in fact they are not. McLoughlin, K.T. 2014. Integrated vegetation management: from its roots in IPM to the present. p. 227-270. In Environmental Concerns in Rights-of-Way Management 10th International Symposium. Utility Arborist Association. In addition, refer to Data Request Response 1.51 (PSC REF#: 347534) and 4.20 (PSC REF#: 355945).

186 McLoughlin, K.T. 1997. Applications of integrated pest management to electric utility rights-of-way vegetation management in New York State. pp. 129-140. In National Grid. 2010. Transmission right-of-way management program. 252 pp. Retrieved at https://www.fws.gov/northeast/nyfo/es/NG%20HCP%20Appendices/HCP%20App%20D.Part%2084%20Full%20Document%20Final.pdf.

187 Smiley, E.T., Matheny, N., Lilly, S. 2011. Best Management Practices: Tree Risk Assessment. International Society of Arboriculture. Champaign, IL.

- **Hazard Tree**: A structurally unsound tree that could strike a target [here, the transmission lines or facilities] if it fails[188]. In arborist or forest management terminology, failure of a tree refers to the breakage of stem or branches, or the loss of mechanical support in the root system.[189]

Although any tree could fail if enough stress or force is applied to it, there are some recognized defects and conditions that increase the potential for failure. Items that utility foresters should be identifying to classify a tree as a hazard include:

- large dead parts,
- broken or hanging branches,
- cracks,
- missing or decayed wood,
- loss of root support, and
- unusual tree architecture such as significant leaning or differences in branch distribution.[190]

Hazard trees are often identified through visual inspections by contractors during work on the facilities. They may also be observed during aerial survey work, such as observing dead crowns of ash trees as a result of emerald ash borer. In addition to identifying any faults, there should also be an assessment by the forester for the likelihood of a tree striking the electric facilities if it fails. Trees leaning away from facilities would be classified as having a low likelihood of impacting the facilities and be less likely to qualify as hazard trees, while those leaning towards the ROW or with very uneven weight distribution or signs of root plate lifting would be classified as hazard trees.[191]

Hazard tree risk is often mitigated by either reducing the height (pruning/topping) [192] of the tree or felling the tree at ground level. This practice may be most acceptable in more remote or natural areas. Standing dead wood can be some of the most valuable habitat for a range of wildlife species. Decisions regarding when to leave an amount of standing dead wood may be made after discussing the option with a landowner, if they are available. If the landowner is not or available or if it is unsafe for forestry workers to prune the tree, it is likely to be felled to the ground. Typically, the remaining slash and stumps are left on-site for the owner to use as firewood or left to decay naturally. Refer to Section 4.3.7 for more information on vegetation maintenance in utility ROWs, and Section 4.3.7.3 for more information on land rights regarding hazard trees.

4.4. LANDOWNER RIGHTS

Property owner issues are often raised by individuals or communities along proposed transmission line routes. One concern relates to how some property owners bear the burden of having a transmission line

---

188 ANSI. 2012. ANSI A300: American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management-Standard Practices (Integrated Vegetation Management, Utility Rights-of-Way) Part 7. Tree Care Industry Association. Manchester, NH. 15 pp.

189 ANSI. 2011. ANSI A300: American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management-Standard Practices (Tree Risk Assessment) Part 9. Tree Care Industry Association. Manchester, NH. 14 pp.

190 Smiley, E.T., Matheny, N., Lilly, S. 2011. Best Management Practices: Tree Risk Assessment. International Society of Arboriculture. Champaign, IL.

191 Smiley, E.T., Matheny, N., Lilly, S. 2011. Best Management Practices: Tree Risk Assessment. International Society of Arboriculture. Champaign, IL.

192 Miller, R. 2014. Best Management Practices: Integrated Vegetation Management for Utility Rights-of-Way. International Society of Arboriculture. Champaign, IL.

ROW on their property so that everyone else can use the electricity, pitting property owner rights versus the public good. Another issue relates to who should be considered as affected by the new line.

There is often a feeling of unfairness between those that use electricity and those that bear the impacts of the facilities required to support that use. The money paid to landowners for ROW easements is meant to compensate them for having a transmission line cross their property. These easement payments are negotiated between the landowner and the utility. Some landowners do not regard the payments as sufficient to truly compensate for the aesthetic impacts and the loss of full rights to their own land. This is especially true if the landowner is not compensated for the "highest and best use" of the affected parcel.

The policy of corridor sharing favors the placement of new transmission lines within or next to existing infrastructure, causing some landowners to be burdened by multiple easements. These individual hardships must be balanced against the additional environmental or social impacts caused by the development of new transmission corridors.

Property owners that live near the line but not on the ROW might be affected but are not compensated. Subsequent owners of the property in the ROW, although they purchased the property knowing that the easement already existed, would not be compensated directly, because the easement payment is most commonly a one-time payment paid at the time of the easement acquisition.

Compensation is paid to towns, municipalities, and counties through which a 345 kV or higher voltage transmission line is constructed via payment of one-time environmental and/or annual impact fees as required by Wis. Stat. § 196.491(3g)(a). The amount can be considerable and is proportional to the percentage of the line constructed within a specific political subdivision and the cost of the project. No portion of these fees, however, are paid directly to the property owner.

4.4.1. Landowners' rights specified in Wisconsin statutes

Landowners whose property is directly affected by the construction of high-voltage transmission lines greater or equal to 100 kV, longer than one mile, and built after 1976, have rights which are specified in Wis. Stat. § 182.017(7)(c) through (h). Many of these rights relate to potential mitigation measures to reduce impacts and are expressed as utility requirements.

The applicable statute is as follows:

(c) In constructing and maintaining high-voltage transmission lines on the property covered by the easement, the utility shall:

1. If excavation is necessary, ensure that the topsoil is stripped, piled, and replaced upon completion of the operation.
2. Restore to its original condition any slope, terrace, or waterway which is disturbed by the construction or maintenance.
3. Insofar as is practicable and when the landowner requests, schedule any construction work in an area used for agricultural production at times when the ground is frozen in order to prevent or reduce soil compaction.
4. Clear all debris and remove all stones and rocks resulting from construction activity upon completion of construction.
5. Satisfactorily repair to its original condition any fence damaged as a result of construction or maintenance operations. If fence cutting is necessary, a temporary gate shall be installed. Any such gate shall be left in place at the landowner's request.
6. Repair any drainage tile line within the easement damaged by such construction or maintenance.
7. Pay for any crop damage caused by such construction or maintenance.

8. Supply and install any necessary grounding of a landowner's fences, machinery or buildings.
   - (d) The utility shall control weeds and brush around the transmission line facilities. No herbicidal chemicals may be used for weed and brush control without the express written consent of the landowner. If weed and brush control is undertaken by the landowner under an agreement with the utility, the landowner shall receive from the utility a reasonable amount for such services.
   - (e) The landowner shall be afforded a reasonable time prior to commencement of construction to harvest any trees located within the easement boundaries, and if the landowner fails to do so, the landowner shall nevertheless retain title to all trees cut by the utility.
   - (f) The landowner shall not be responsible for any injury to persons or property caused by the design, construction or upkeep of the high-voltage transmission lines.
   - (g) The utility shall employ all reasonable measures to ensure that the landowner's television and radio reception is not adversely affected by the high-voltage transmission lines.
   - (h) The utility may not use any lands beyond the boundaries of the easement for any purpose, including ingress to and egress from the right-of-way, without the written consent of the landowner.

4.4.2. Waiving landowner rights during easement negotiations

Easements are private contracts between the utility and the property owner and are written in legally precise language. The landowners' statutory rights listed in Section 4.4.1 from Wis. Stat. § 182.017(7)(c) through (h) are generally included by the utility as part of the offered contract and labeled as an "Exhibit." The offered contract may state that marked or crossed out rights are "waived." **When negotiating the easement contract, the applicants may propose to waive one or more of these rights but landowners are not required to do so.** All parts of the easement contract, except those required by law as mentioned in Section 4.4.3 and Wis. Stat. § 182.017(7)(a), are negotiable. The landowner may negotiate additional stipulations from the utility which may include specific clearing or remediation obligations, notifications, timing of activities, or payments.

4.4.3. Existing and new easements

Under Wis. Stat. § 182.017(7)(a), any easement for a high-voltage transmission line must include:

- The length and width of the ROW.
- The number, type, and maximum height of all structures to be placed on the property in the ROW.
- The minimum height of the transmission cables above the landscape.
- The number and maximum voltage(s) of the line(s).

If a new transmission project was to be built on a property that already included an existing transmission line, it is not likely that the existing easement for the property would include allowances for the new line being proposed. If a new line were approved, a new easement may need to be negotiated and obtained by the transmission owner. Details about the line would be specified in the easement contract as shown in the standard easement[193] ATC provided in Appendix I of this EIS.

[193] Response to Data Request 4.14 (PSC REF#: 355945).

For this project, the applicants state that they do not intend to change any existing easements where there are already existing facilities on a given property to accommodate the proposed project. In all cases where there are existing easements for electric transmission lines, new easements would be negotiated and acquired. The applicants state that the existing easements would be retained until after construction, at which time the applicants would evaluate whether any existing easement rights could be released. This means that existing easements would be in place while the transmission owners are negotiating for new easement rights, as well as the potential for landowners to have additional encumbrances on their properties if rights in the existing easements are not released.

The applicants state that the ownership of easements for this project would correspond to the ownership of project facilities. The easement acquisitions for this project would be the responsibility of the designated construction manager for the relative portion of the project. Ownership, construction manager, and easement acquisition have been identified in Table 4-5.

Table 4-5 Ownership, construction, and operation of proposed ROW

Routing Area	Easement Owner[194]	Construction Manager	Easement Acquisition[195]
Mississippi River	ITC (95.5%) and DPC (4.5%)	ITC	ITC
Western	ITC (95.5%) and DPC (4.5%)	ITC	ITC
Eastern	ATC (95.5%) and DPC (4.5%)	ATC	ATC
Dane County	ATC (95.5%) and DPC (4.5%)	ATC	ATC

4.4.4. Land rights and hazard trees

Most easements contain language that specifically grants the utility the rights to remove hazard trees outside of the easement, along with the permission to enter off-ROW areas in a reasonable manner in order to conduct removal activities. ATC has stated that this is standard in their easement contracts. Older easements may not clearly state these rights; however, utilities can identify and respond to potential power line natural hazards under PSC 113.0512(3). In a recent Commission docket(137-CE-186), ATC has expressed that they may acquire additional easements to secure the rights to remove hazard trees on properties not encumbered by a standard transmission line easement.

4.5. SOCIOECONOMIC IMPACTS ASSOCIATED WITH TRANSMISSION LINES

This section describes many of the common socioeconomic, landowner, and community impacts related to the construction and operation of high-voltage transmission lines. This section is meant to provide background information for the project-specific impacts described in later chapters of the EIS and may be referenced in some of those chapters.

4.5.1. Aesthetics

Construction of high-voltage transmission lines can affect the aesthetics of an area in several ways. The introduction of transmission lines and associated structures may change the character of an area, for example evoking an image of development in a previously natural or rural landscape. They may also negatively affect the aesthetics within developed landscapes, for instance in residential areas, where they may seem especially large when located near homes or other buildings. Scenic features such as historic

[194] Response to Data Request 1.37 (PSC REF#: 346685)
[195] Response to Data Request 4.13 (PSC REF#: 353712)

structures, scenic roads and rest areas, or scenic waterways may also be impacted or removed during construction, further affecting the aesthetics of an area.

These impacts can be difficult to measure, since aesthetics depend largely on personal perceptions and the relationship the viewer has with an environment. Different viewers may have varying levels of visual sensitivity. Aesthetic impacts may depend on:

- the physical relationship of the viewer and the transmission line (distance and sight line)
- the activity of the viewer (e.g., living in the area, commuting through, sightseeing)
- the contrast between the transmission structures and the surrounding environment, such as whether the line stands out or blends in

The transmission line can affect aesthetics by:

- removing a resource, such as clearing fencerows or forests
- degrading the surrounding environment (e.g., intruding on the view of a landscape)
- changing the context of the view shed (e.g., evoking an image of development in a previously rural area)

Since aesthetic impacts are so dependent on the viewer, it is important to ask for the opinion of those people who may be affected. Some people may feel a strong association to their existing environment and react negatively when new features are introduced. While other people may be less effected or may view transmission lines as part of the necessary infrastructure. Comments by the public during the EIS scoping period and hearings help the Commission understand local concerns about potential impacts to aesthetics. The applicants and interested members of the public should discuss and consider measures early in the planning and design process in order to identify areas of concern and propose ways to mitigate impacts.

4.5.1.1. Mitigation strategies

There are several measures available to the applicants that can reduce the aesthetic impacts of new high-voltage transmission lines. The applicants and interested members of the public should discuss and consider these early in the planning and design process of projects in order to identify areas of concern and propose ways to mitigate impacts. Comments by the public during the EIS scoping process and hearings can help the Commission understand local concerns about potential impacts to the existing aesthetics. Ultimately, aesthetics are to a great extent based on individual perceptions.

Some of the measures that could reduce the aesthetic impacts of new high-voltage transmission lines include:

- Route siting, structure design, construction materials, and ROW vegetation management can work to mitigate some adverse effects to aesthetics.
- Transmission lines can be routed to avoid scenic areas, and routes can pass through commercial or industrial areas instead of residential areas.
- The form, color, or texture of transmission lines can be modified to minimize aesthetic impacts.
- Structures constructed of wood or of rust brown oxidized steel may blend better with wooded landscapes, and stronger conductors can minimize line sag to provide a sleeker profile.
- Management of ROW to include planting vegetative screens can block views of the line.
- Leaving ROW in a natural state at road or river crossings can also reduce the amount of aesthetic altered by new construction.

4.5.1.2. Aesthetic impacts in the project area

The Driftless Area is broadly considered a scenic landscape that contains many unique natural features. Tourism is an important part of the regional economy, and is partly dependent on the perception of beauty that the Driftless Area is known for. Many parks and trails are located within the Driftless Area, which are used year round and for which visitors come from around the country. The region is generally less developed in infrastructure and urban settlement, which has helped to preserve a rural aesthetic that many who visit and live in the area enjoy.

During the EIS scoping period of the project review process, many comments received from the public strongly expressed that the proposed project would negatively affect aesthetics. These comments specifically mention the relationship of aesthetics to property value, tourism, and the rural or scenic character of the Driftless Area. Some comments requested that the new transmission lines be buried underground in order to reduce negative impacts to aesthetics, and many simply did not want the project to be constructed. Refer to Appendix E for more information on undergrounding electric transmission lines.

In the application for the proposed project, photo simulations were included that illustrate the potential visual impact to certain areas along the proposed routes. Areas with photo simulations include:

- the Upper Mississippi National Wildlife Refuge;[196]
- the Cross Plains Unit of the Ice Age National Scientific Reserve;[197] and
- Nelson Dewey State Park, the Great River Road, Belmont Prairie State Natural Area, and Governor Dodge and Blue Mound state parks.[198]

4.5.2. Agricultural lands

4.5.2.1. Potential impacts

Transmission line construction can affect farm operations in many ways including:

- interruption or damage to irrigation and drainage systems;
- temporary modifications to grazing areas, row crops, and existing fencing;
- field flooding; and
- non-compliance with organic practices.

After construction is completed, the project may continue to affect agricultural productivity for years afterwards. Yield reductions can be caused by inadequate protection of topsoil, changes to surface and subsurface drainage, construction debris left in fields, and opportunistic weed growth. Agricultural properties may also have issues working under and near operating electric lines such as induced voltage and problems with grounding. These and other problems can increase costs for the farm operators.

For new transmission lines 100 kV or greater and longer than 1.0 mile, state law requires the utility to repair much of the damage that can occur during construction and/or provide monetary compensation in addition to any easement compensation (Section 4.4).

The placement of transmission structures can cause the following agricultural impacts:

- Damage topsoil due to soil mixing and compaction;

---

[196] PSC REF#: 341397 and 341398
[197] PSC REF#: 341399, 341400, and 341401
[198] PSC REF#: 347477

- Increase soil erosion by damaging contour strips and other erosion-control practices or removing windbreaks;
- Alter water regimes in fields due to dewatering operations, damage to drain tiles, or preventing the proper operation of irrigation systems
- Create obstacles for farm machinery interrupting efficient fieldwork patterns;
- Create inaccessible areas around transmission structures promoting weed growth and reducing the yield capacity of the field;
- Cause the spread of weed seeds, insects, pathogens, and other unwanted pests due to the use of contaminated construction equipment;
- Hinder or prevent aerial spraying or seeding activities by planes or helicopters;
- Cause injury to livestock and damage to farm machinery when construction debris is not removed from the ROW after construction is completed;
- Require the grounding of fences and metal buildings paralleling the new line;
- Hinder future consolidations of farm fields or residential development of the farmland.

Cropland and pastures depend on the preservation of topsoil. The quality of agricultural soils are affected when construction activities allow topsoils to be mixed with underlying inorganic subsoils, the compaction of soils, or the removal of topsoils.

Soil mixing occurs during excavation activities or when soils are significantly rutted. Excavated subsoils should not be mixed with topsoils or spread on the surface of cropland or pasture. Significant rutting can mix soil layers and compact soils. The compaction of soils reduces soil productivity by reducing pore space resulting in reduced uptake of water and nutrients by crops, restricted rooting depth, and increased surface runoff. Heavy construction equipment can compact soils to a depth that cannot be removed by conventional tillage. The degree to which soils are compacted and damaged by heavy construction equipment depends mostly on the type of soil and its saturation level.

Construction activities can destabilize soil horizons and cause topsoil to erode and potentially migrate off of the ROW. Erosion can occur on construction sites wherever proper erosion controls are not maintained. This is especially true during wet conditions and in areas with steep slopes. Many agricultural fields have existing erosion control practices such as diversion terraces, grassed or lined waterways, outlet ditches, water and sediment control basins, vegetated filter strips, and terracing. Construction activities can damage these practices and lead to the loss of valuable topsoil. Additionally, manure and crop residue along with pesticides can be carried away from the field with eroded soil. Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed.

Windbreaks consisting of one or more rows of trees are another method to reduce soil erosion. The removal of windbreaks can result in a continuing loss of topsoil.

Proper field drainage is vital to a successful farm operation. Construction can cause the disruption to drainage tiles, grassed waterways, and drainage ditches that regulate the flow of water on farm fields. Crop health can be affected during construction and well after due to alterations to field contours, soil compaction, and drain tiles damage. Alterations to these facilities can cause water to pond, damaging crops and other vegetation. Additionally, transmission structure construction may require dewatering activities. Discharge of excessive water in cropland can also cause damage to crops.

Transmission structures located in fields or along the edges of fields often create obstacles for farmers. They may become hazards for farmers trying to maneuver equipment near foundations as farmers attempt to minimize unusable cropland. Farm machinery that accidently hits a transmission structure will most likely not damage the structure, but can cause significant damage to the farm equipment. This could impact farm operations by causing a delay in planting, harvesting, or other necessary fieldwork.

Transmission lines can also interfere with the movements of irrigation equipment. Many crop fields are irrigated with center-pivot or lateral-moving irrigation systems. If irrigation systems are disrupted by construction, crops outside of the proposed ROW could be negatively affected by a lack of water. Because cropland within a construction ROW is typically removed from production during a growing season, crop rotation patterns could be disrupted in some fields. This could require additional adjustments in crop production or livestock feeding.

Issues of biosecurity are a concern to many farm operators. Construction equipment that is not properly cleaned between farms can transport weed seeds, insects, pathogens, and other unwanted pests. Equipment brought from another region can introduce new pests not commonly found in the project area. For organic producers with limited options for pest management, this can be a significant concern.

In addition, areas surrounding transmission structures are typically inaccessible to farm equipment. These areas can become havens for opportunistic weeds, insects, and other pests. The spread of these pests into the adjacent cropland would then require additional pest management to prevent affecting crop productivity.

Another hazard of transmission line construction is the debris that is sometimes left in the field after construction is completed. This debris can include surveyor stakes and flags, broken pieces of timber mats, rocks that have been brought to the surface from lower levels, and trash from construction crews. If construction debris is not properly removed from fields and pastures, it can harm livestock as well as cause damage to farm machinery. Wires and other metal objects can be swallowed by livestock causing lethal injuries to the animal.

Occasionally, transmission lines may induce currents on parallel metal objects. To avoid these induced currents on wire fencing and metal buildings paralleling new transmission lines, fences and buildings would be need to be properly grounded.

Some agricultural operations depend on the use of aerial application of seed and chemicals. Transmission wires can become an obstacle for these low-flying helicopters and planes.

4.5.2.2. Agricultural Impact Statement

An AIS is required when the applicants for a public construction project have the power to condemn property (eminent domain) and will acquire an interest of more than 5 acres of land from at least one agricultural property. Wis. Stat. § 32.035 details what DATCP is required to include in an AIS, the AIS timeline, and the objectives for the program.

The AIS is prepared to help make sure farmers are well-informed of their rights and the potential range of impacts of the project, how to effectively mitigate these impacts to agricultural resources and farm operations, help farmers determine appropriate compensation for their losses, and to document for the public record the agricultural impacts of public projects. Easement contracts between farmers and utilities should include a discussion of anticipated damages and mutually agreed-upon reparation.

DATCP is preparing an AIS for the proposed Cardinal-Hickory Creek project.

4.5.2.3. Mitigation strategies

The utility should work with agricultural landowners well in advance of construction to help identify potential impacts and how best to minimize impacts to farm operations and farm facilities. Landowners and utilities may work out solutions that include minor changes in structure heights, specific structure locations, or construction timing. Alternatively, farmers provided with information on the construction activities that would occur, as well as where and when these activities would occur, would allow farmers to make adjustments to their operations to better accommodate the project activities. Protection of organic farm certifications requires critical communication with the farmer and a thorough understanding of his/her operations along the ROW. By incorporating these solutions in written agreements, agricultural impacts can be prevented, minimized, and mitigated.

In addition, independent agricultural monitors are sometimes retained to observe construction and restoration of an approved project. For more information about the use of agricultural or independent environmental monitors, see Section 4.2.5.

A utility working with landowners can:

- Avoid or minimize construction through sensitive farmland;
- Identify, address, and document concerns before construction begins;
- Find resolutions for anticipated impacts (e.g., payments to temporarily suspend farming activities or the installation of a temporary fence).

Problems with structure placement can be mitigated to some extent if the utility works with farmers to determine optimal structure locations. The following approaches might be useful:

- Using single-pole structures instead of H frame or other multiple pole structures so that there is less interference with farm machinery, less land impacted, and fewer weed encroachment issues.
- Locating the transmission line along fence lines, field edges, or roadsides to minimize impacts to fields, driveways, and buildings.
- Locating transmission lines and poles so as to minimize interference with farm operations such as the use of driveways, grain bins or other tall agricultural facilities and machinery, and irrigation systems.
- Using transmission structures with longer spans to clear fields;
- Orienting the structures with the field work pattern to reduce inaccessible areas around transmission poles.
- Minimizing pole heights and installing markers on the shield wires above the conductors in areas where aerial spraying and seeding are common.
- Using special transmission designs to span existing irrigation systems or, if necessary, reconfiguring the irrigation system at the utility's expense.

Problems with the spread of farm pests or diseases and contamination of soils can be reduced by:

- Thoroughly cleaning construction equipment or other vehicles at the beginning of their use on a project to avoid bringing in new pests from outside the construction zone.
- Thoroughly cleaning construction equipment or other vehicles before entering any organic farmland.
- Identifying farms that have written biosecurity plans and making sure construction crews are aware of those policies so they are followed where practicable.
- Following the direction of any posted biosecurity signs where practicable to avoid contamination.

- Having the farmer avoid spreading manure or pasturing livestock in the transmission line ROW prior to construction. (This is the most cost-effective method to prevent the spread of animal disease.)
- Avoiding access through or construction in areas that may contain manure.
- Learning about individual farm activities such as planting, tillage, and crop rotations so that construction methods and timing can be adapted to the timing of crop work.
- Installing exclusion fencing to keep livestock away from construction activities or installing markers to identify where construction is occurring, in consultation with the farmer, so that fieldwork and construction do not overlap.
- Putting barriers between equipment and manure or disease contaminated soil.
- Physically removing manure or contaminated soil from equipment in compliance with existing farm disease control efforts.
- Using mats to minimize direct contact between construction equipment and soil.

Mitigation of farm impacts includes prevention of mixing topsoils with subsoils and the underlying parent material. Wisconsin Stat. § 182.017(7)(c) requires utilities that construct transmission lines that are 100 kV or larger and longer than 1.0 mile to ensure that topsoil is stripped, piled, and replaced upon completion of the construction operation (Section 4.4).

One method to avoid rutting and minimize soil compaction is to use mats during construction. This allows crews to continue working in wet conditions while minimizing the potential for soil mixing and compaction. Matting also allows machinery to stay cleaner, reducing the potential for spreading pests.

If construction activity occurs during wet conditions and soils are rutted, repairing the ruts as soon as possible can reduce the potential for impacts. However, improperly timed repairs can further compact the soil column and cause more damage. Allowing time for the soil to begin drying and then smoothing, grading, and filling in the ruts is an acceptable mitigation approach. The Atterberg field test should be used to determine when the soil is friable enough to allow rutting to be remediated safely. Figures 4-25 through 4-27 illustrate how ruts made by heavy equipment can be repaired.

Figure 4-25 Minor soil rutting in pasture land.

Figure 4-26 Ruts being smoothed with blade. Soil is not waterlogged as shown in Figure 4-25.

Figure 4-27 Smoothing out ruts by backblading with a dozer

To minimize soil compaction during construction in low lying areas, on saturated soils, and/or on sensitive soils, low impact machinery with wide tracks can be used. DATCP has recommended that such machinery and tires also be used across agricultural land if it must be worked during wet conditions. Alternatively, easily compactable soils can be worked on during frozen conditions. Wisconsin Stat. § 182.017(7)(c) requires construction work across land used for agricultural production to be done at times when the ground is frozen, when practicable and when requested by the landowner.

Where construction equipment crosses cropland, the soils are likely to be compacted. Utilities can choose to decompact the soils themselves or pay the farmer to either restore the soils themselves or hire a contractor to do the work for them. Proper restoration of the compacted soil is necessary for crop yields to return to pre-construction levels. Even so, sometimes it may take several years for the soil health to return.

Problems with potential damage to soil productivity from the impacts of soil mixing, soil compaction, and soil erosion can be lessened by:

- Identifying site specific soil characteristics and concerns from the landowner and farm operator before construction begins.
- Avoiding areas where impacts might occur by altering access routes to the construction sites.
- Using existing roads or lanes utilized by the landowner.
- Using construction mats, ice roads, or low ground pressure or tracked equipment to minimize compaction, soil mixing, rutting, or damage to drainage systems.
- Segregating topsoil or soil horizons during excavation and construction to minimize soil mixing.

- De-compacting soils following construction with appropriate equipment and when moisture levels allow for successful restoration efforts until the degree of soil compaction levels in the ROW is similar to soils off the ROW.
- Avoiding construction and maintenance activities during times when soils are saturated.
- Avoiding the removal of critical windbreaks and replanting windbreaks with lower growing woody species to minimize soil erosion due to wind.

4.5.2.4. Wis. Stat. § 182.017(7)(c)

This statute describes a number of restoration practices that the utility must employ when building a high-voltage transmission line on private property (Section 4.4). This statute includes requirements, such as:

- removing rock and all construction debris;
- restoring all disturbed slopes, terraces, and waterways to their original condition;
- repairing drainage tile lines and fences damaged by construction; and
- paying for crop damage.

Unless landowners waive their rights in an easement agreement, the utility is required to implement these mitigation practices. If a route that passes primarily through agricultural land is selected, DATCP has recommended that, to aid enforcement of the statute requirements, detailed BMPs should be incorporated into the project construction manuals and agricultural specialists should be available to consult with the environmental monitors to oversee the contractors and ensure that these protections are implemented.

4.5.2.5. USDA Conservation Reserve Program lands

There are farmlands in Wisconsin enrolled in U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) programs established to preserve wetlands, grasslands, and farmlands, and to reduce erosion. Federal easements on these lands may have restrictive land uses not consistent with the construction of a transmission line. For example, a finding of incompatibility by the FSA could affect Conservation Reserve Program (CRP) payments to the landowner.

CRP is a federal voluntary program established to protect cropped lands that are vulnerable to erosion. CRP provides participants with an annual per-acre rent plus half the cost of establishing a permanent land cover (usually grass or trees). In exchange, the participant retires highly erodible or environmentally sensitive cropland from farm production for 10 to 15 years. Sensitive lands would also include land converted from crops to wildlife habitat or special shallow water areas, filter strips along surface waters, and grass covers for erosion control.

Federal funding for the program is limited. Offers for CRP contracts are ranked according to an index which includes the following factors:

- Wildlife habitat benefits resulting from covers on contract acreage;
- Water quality benefits from reduced erosion, runoff, and leaching;
- On farm benefits from reduced erosion;
- Benefits that will likely endure beyond the contract period;
- Air quality benefits from reduced wind erosion;
- Cost.

Each transmission structure located in CRP land could require that one tenth of an acre be removed from the contract. A repayment of past payments, damages, and interest on the removed area would need to be made by the landowner. If the transmission line requires the removal of trees and the CRP contract requires that the trees remain, the area where the trees would be removed would also need to be removed from the contract and previous CRP payments, damages, and interest repaid. If the CRP land is acquired through eminent domain, the repayment would not be required.

The landowners and locations of land enrolled in the CRP program are confidential. As such, the applicants would not know until after the CPCN is granted and individual easement negotiations begin whether any of the affected farmland is in CRP. Landowners can and do sometimes volunteer the information when they comment to the applicants during public meetings.

4.5.2.6. Conservation Reserve Enhancement Program lands

The Conservation Reserve Enhancement Program (CREP) is a resource to help farmers meet their conservation goals, particularly those who till or graze land along rivers and streams. CREP is a joint effort between the federal, state, and county governments.

CREP pays landowners to install filter strips along waterways or to return continually flooded fields to wetlands while leaving the remainder of the adjacent land in agricultural production. Some of the more common practices are filter strips, riparian buffers, and wetland restorations. Enrollment options are either a 15-year agreement or a perpetual easement. CREP financial incentives include cost sharing of conservation practice installation, upfront incentive payments, and annual soil rental payments.

The USDA Farm Service Agency (FSA) is responsible for deciding if transmission line construction affects CREP agreements. FSA may decide whether the entire agreement must be terminated, the agreement and/or the practice can be modified, or if there is no effect on the agreement. CREP land affected by transmission lines may have financial costs to landowners. Landowners should negotiate compensation for these costs during their easement negotiations.

4.5.2.7. Managed Forest Lands

The Managed Forest Law (MFL) program is another source of income for many farm owners/operators. Additional information can be found in Section 4.6.2.3 as well as throughout this EIS where MFL properties may be affected by the proposed project.

4.5.2.8. Applicants' review of agricultural practices and mitigation options in the project area

The applicants stated in their application that the agricultural practices review they conducted was based on field observations along accessible routes, aerial photograph review, database queries and review of public comments provided to the applicants in their open meeting process. Agricultural areas and practices that could be impacted by the proposed project area discussed in Sections 6.3.1, 7.3.1, 8.3.1, and 9.3.1.

Landowners with farmland that is located within an area zoned for farmland preservation can participate in the Farmland Preservation Program (FPP) or landowners located in other zoning districts may have existing FPP agreements with DATCP. DATCP has recently changed their policy and no longer releases a database that lists individual landowners who have voluntarily filed an FPP agreement. The applicants did not provide a list of parcels participating in FPP; however, they did provide a table listing the municipalities in the project area where landowners are be eligible to participate in the FPP (Table 4-6). The applicants state that electrical transmission lines are permitted on FPP lands and are considered compatible with agricultural use.

Table 4-6 Municipalities in the project area with Farmland Preservation Zoning

County	Municipality	Proposed Route Segments	Proposed Route Alternatives
Grant	Town of Clifton	Segments D and K	Western-North; Western-South
Grant	Town of Ellenboro	Segment D	Western-North
Grant	Town of Harrison	Segment E	Western-South
Grant	Town of Liberty	Segment D	Western-North
Grant	Town of Platteville	Segments E, F, and G	Western-South
Grant	Town of Potosi	Segment E	Western-South
Grant	Town of South Lancaster	Segment D	Western-North
Grant	Town of Wingville	Segments D, L, and N	Western-North; Western-South; Common subsegments

The applicants state that potential construction-related impacts on agriculture in the project area would generally be short term in nature, and would primarily consist of crop losses, soil mixing, and/or soil compaction along equipment access routes and around structure installation sites. Short-term impacts would be minimized by providing compensation to producers and by restoring agricultural lands to the extent practicable. Where appropriate, minimization techniques such as topsoil replacement and deep tilling may be utilized.

Long term impacts associated with constructing the transmission line across agricultural lands would be minimized through careful consideration of alignment and individual structure siting. Where possible, siting in agricultural areas would occur along fence lines, between fields, or along public road ROW, so the proposed structures are located along the edge of the land area used for agricultural purposes. These routing and siting practices minimize the loss of tillable land and associated interference with agricultural equipment operation. Property owners would be consulted during the real estate acquisition process to accommodate property owner needs to the extent practicable.

In the case of organic farms, landowners would be consulted to minimize potential impacts to their organic farming status due to the transmission line routing or construction. Methods to minimize impacts could include offsetting the transmission line structures from the property line so tree lines or other buffers are maintained. Additionally, construction vehicles should be cleaned prior to entering the organic farm parcels, based on input from the landowner. Further, to protect organic farms during vegetation management activities once the line is in operation, herbicide would not be applied within portions of the ROW on which the landowner wishes not to introduce it.

Each agricultural landowner would be consulted regarding farm operation (e.g. irrigation systems, drainage tiles), locations of farm animals and crops, current farm biological security practices, landowner concerns, and use of access routes. Potential impacts to each farm property along the route would be identified and where practicable, construction impact minimization measures may be implemented. Site-specific practices would vary according to the activities of the landowner/farm operator, the type of agricultural operation, the susceptibility of site-specific soils to compaction, the construction activities occurring on the parcel, and the ability to avoid areas of potential concern.

Drain tiles are common in portions of Wisconsin, and there is no consistent data source to identify them. During the final design process, landowner input would be obtained to place structures such that impacts to drain tiles are minimized, to the extent practicable. During construction, matting may be used to more evenly distribute the weight of heavy equipment and/or low ground impact construction equipment may be used. Post-construction, damaged drain tiles would be repaired to pre-construction conditions.

Where center-pivot irrigation systems are located along portions of the routes on shared ROW (e.g., along roads, transmission lines, and railroads), interference with the system should be minimal. The applicants would work with landowners to maintain their ability to irrigate their fields, should any transmission line structures be placed in conflict with an existing irrigation system.

4.5.3. Airports and airstrips

Transmission lines are a potential hazard to aircraft during takeoff and landing. To ensure safety, local ordinances and FAA guidelines limit the height of objects in the vicinity of the runways. To mitigate potential impacts of high-voltage transmission lines on nearby airports and airstrips utilities could:

- route transmission lines outside of the safety zone,
- use special low-profile structures,
- construct a portion of the line underground, or
- install lights or other attention-getting devices on the shield wire or OPGW.

Large brightly colored balls or markers may be installed on an overhead transmission line shield wire or OPGW to improve their visibility to pilots and lessen the risk of collision. These markers are often employed near airports or airstrips, in or near fields where aerial applications of pesticides or fertilizers occur, and in areas where tall machinery, such as cranes, are frequently operated. Specific impacts from the proposed project on airports and airstrips are discussed in Sections 6.3.6, 7.3.6, 8.3.6, and 9.3.6.

4.5.4. Archaeological and historic resources

Construction of high-voltage transmission lines may affect historic properties in multiple ways. Inadvertent disturbance or excavation may remove artifacts from their depositional context and therefore limit their potential use in the archaeological record. Construction of new structures may affect the character of a historic structure and consequently limit or remove its potential to be listed on the National Register of Historic Places (NRHP). Heavy construction equipment may compact soils and effect subsurface artifacts or sites. Use of or close proximity to human burials or traditional cultural properties during construction or for placement of new structures may negatively affect the sacredness of those places.

The applicants must identify any known historic properties within the proposed project area. Any historic properties that may be impacted by the project would be evaluated in accordance with the programmatic agreement between PSC and SHPO. The applicants may also survey for known and unknown historic properties and burial sites in accordance with Section 106 of the NHPA.

According to Wis. Stat. § 44.31(3), historic properties include any building, structure, object, district, area or site, whether on or beneath the surface of land or water, that is significant in the history, prehistory, architecture, archaeology, or culture of this state, its rural and urban communities, or the nation. Historic properties are also defined at the federal level by the Advisory Council on Historic Preservation as a prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the NRHP. This includes artifacts, records, and remains that are related to and located within such properties. It also includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria.

Wisconsin Stat. § 44.31(1) defines adverse effects to historic properties, many of which may result from construction activities or the placement of new structures. Adverse effects include: physical destruction, damage, or alteration of any part of a property; isolation of a property from or alteration of the character of the property's setting when that character contributes to the property's qualification as a listed property; introduction of visual, audible, or atmospheric elements that are out of character with a property or alter its setting; and neglect of a property resulting in its deterioration or destruction.

Under Wis. Stat. § 157.70, no person may intentionally cause or permit the disturbance of a human burial site. Burial sites are defined as any place where human remains are buried, which may be any part of the body of a deceased person in any stage of decomposition in a context indicating substantial evidence for burial. Burial sites are often indicated by stone monuments, spirit houses, wooden crosses, or Native American mounds. The statutes define disturbance as defacing, mutilating, injuring, exposing, removing, destroying, desecrating, or molesting in any way a burial site. The applicants must identify any known burial sites within their proposed project area. Any human burial sites that may be disturbed by the project must be avoided or a Permit to Disturb a Human Burial from WHS must be obtained.

The 2012 *Guide for Public Archeology in Wisconsin*, by Dudzik, et al., outlines the procedure that the applicants should use to identify any historic properties or human burials within the project area. The guide also identifies common mitigation methods to reduce adverse effects to historic properties. The preferred mitigation method is avoidance of the site by project rerouting. If this cannot be performed, then data recovery, such as through excavation, may occur. Monitoring of construction activities would also be used in any areas where disturbance of historic properties or human burials may be considered likely. Such mitigation activities may employ the use of historic preservation professionals including archaeologists, architecture historians, historians, and Native American tribal representatives. A consultation between PSC and SHPO is ongoing, which will discuss any potentially affected historic properties as well as any suggested mitigation that the applicants should perform. Commission staff have also contacted the Ho-Chunk Tribal Historic Preservation Officer for comment regarding potential impacts to Native American burial mounds.

4.5.4.1. Archaeological and historic resources in the project area

The application for the proposed project provides an overview of the historic properties and human burial sites in the project area.[199] The applicants have reviewed the Wisconsin Historic Preservation Database (WHPD) and completed surveys for historic properties and burial sites within the project area.[200] They have also completed surveys of federal lands at the Upper Mississippi National Wildlife Refuge.[201]

The applicants state that they would attempt to avoid or minimize construction access through areas with historic properties or human burials. If indicated by pre-construction surveys, the applicants state that they would employ an archaeological monitor to oversee ground disturbing construction activities. In any area where pre-construction surveys identify historic properties or burial sites, the applicants would first consider opportunities to avoid construction in those areas. If avoidance was unavailable, the applicants state that they would employ an archaeological monitor, use construction matting or bridging, alternative vehicles, or specialized tires/treads.

During the EIS scoping period of the PSC review process, several comments received from the public mention a concern about the negative impacts that the project would have to historic properties or human burial sites. These comments specifically mention the potential for negative impacts to Native American burial mounds and historic family farms.

4.5.5. Cultural concerns

Protection of archeological and historic resources is often discussed in terms of "cultural resource" impacts. However, there are other cultural factors that occasionally surface during a transmission project review. A cultural concern can occur when an identifiable group or community has practices or values

---

[199] PSC REF#: 352698, pp. 133-135
[200] PSC REF#: 341912, 341878, 341879, 341880, 345377, 345378, 345379, 345380, and 355953
[201] PSC REF#: 341426

that may conflict with a new transmission line. Cultural impacts may also be related to property impacts and general social concerns such as fairness.

Cultural concerns involve identifiable groups or communities who have distinctive traditional practices or religious beliefs that may conflict with a new transmission line or development in general. Cultural concerns that have affected past projects include the routing of transmission lines through Amish communities. Since some Amish do not use electric service, wish to remain non-confrontational, and tend not to become involved in government processes, concerted efforts should be made to avoid impacts on Amish communities. Another community whose cultural concerns may be addressed would be Native Americans, who may have special places on the landscape that are used ceremonially or otherwise be considered sacred as part of their traditional cultures.

4.5.5.1. Cultural concerns in the project area

Commission staff requested the applicants to identify any locations of Amish or similar communities within the proposed project area and to describe potential impacts from the proposed project facilities. The applicants stated that they were aware of Amish communities near the city of Fennimore in Grant County along the Western-North route alternative, and near the city of Platteville in Grant County along the Western-South route alternative.

The applicants stated that meetings with Amish were held. From the application and scoping comments received, it appears the Amish own land along both the Western-North and Western-South routes, and many or all of the parcels are already encumbered by existing easements and existing transmission lines. The applicants stated that they did not hear any concerns or objections to the proposed project based on cultural or religious beliefs. The applicants state that they would minimize potential impacts to land use, including farming and livestock[202].

Ten Old Order Amish are interveners in the proposed project[203]. This group may be impacted by the Western South Route. Some EIS scoping period comments from Amish have stated that the proposed project would affect their farms and are concerned about stray voltage.

Commission staff and the applicants have contacted the Tribal Historic Preservation Officer for the Ho-Chunk Nation regarding potential impacts to Native American burial mounds and archaeological sites along the proposed route. The representative did not have any comments at this time, but wished to remain as an interested party throughout the duration of the project.

4.5.6. Electric and magnetic fields

4.5.6.1. Sources of fields

Electricity produces two types of fields, electric and magnetic. These fields are related to each other and are often combined together in discussion and referred to as electromagnetic fields (EMF). Whereas common objects such as trees, fences, and walls can easily shield and cancel out electric fields, magnetic fields pass through many materials. Therefore, most scientific studies concentrate of magnetic fields and not electric fields. Magnetic fields are created whenever electric current flows through any line or wire, including household wiring, as well as when electric fields change in time. Sources of magnetic fields include electrical appliances such as power tools, vacuum cleaners, microwaves, computers, electric

---

202 Data Request 02.04 (PSC REF#: 348967)

203 PSC REF#: 357500.

blankets, fluorescent lights, and electric baseboard heat. Moreover, the Earth itself has a magnetic field that is constantly present as part of the environmental background, which is the reason that compasses work. Everyday magnetic fields are typically measured in units called either gauss (G) or milligauss (mG). One gauss is equal to 1,000 millgauss. For reference, the average magnetic field at the surface of the Earth is approximately 0.25 to 0.65 G (250 to 650 mG), with a value of 0.5 G (500 mG) typically cited. As a comparison, the largest estimated magnetic field along all the proposed routes at a distance of 25 feet away from the transmission line is 211 mG, about 40 percent of the Earth's field in which humans live every day. Because there are so many common sources of magnetic fields and simply by living on Earth, everyone is exposed to many magnetic fields every day.

4.5.6.2. Results of magnetic field research

Starting in the late 1970s, researchers began to investigate the possibility that exposure to magnetic fields might have an adverse effect on human health. Since then, scientists have conducted many studies designed to determine whether or not exposure to magnetic fields affects human health. Scientists have uncovered only weak and inconsistent epidemiological associations between exposure to transmission line magnetic fields and adverse health effects. Several epidemiological studies have shown a weak statistical association with the risk of childhood leukemia. However, other epidemiological studies have found no link to leukemia. Cellular studies and studies exposing test animals to magnetic fields have shown no link between magnetic fields and disease. Taken as a whole, the biological studies conducted to date have not been able to establish a cause-and-effect relationship between exposure to magnetic fields and human disease, nor have scientists been able to identify any plausible biological mechanism by which magnetic field exposure might cause human disease. For the past decade, there is a growing consensus within the scientific community that exposure to magnetic fields are not responsible for human disease.

A common method to reduce magnetic fields is to bring electric transmission lines (conductors) closer together. The magnetic fields caused by electric current flow can oftentimes interfere with each other and partially cancel out, producing a lower field value. The conductors can be brought closer together by using different types of structures or double-circuiting two lines on the same transmission structures. However, there are electrical safety limits to how close together conductors can be placed. Conductors must be far enough apart so that electrical arcing cannot occur and so that utility employees can safely work around them. Additionally, the closer conductors are to one another, the closer together transmission structures must be constructed. Increasing the number of transmission structures per mile increases private property land impacts and costs.

Another way to decrease magnetic fields is to increase the distance between the source (current carrying conductor) and a location of concern. A general rule of thumb for any single source of magnetism is that the magnetic field drops off by the cube of the distance. In other words, roughly speaking, doubling the distance to any single magnetic source should drop the magnetic field by approximately a factor of eight. With the fact of having multiple conductors on the same transmission structure and the complicated interactions of the fields at these structures, such large drop offs are not always realized. Regardless, it remains a general truth that moving transmission structures farther from locations of concern will reduce the magnetic fields at those locations.

A more detailed review of magnetic field research and human health can be found in Appendix E. Details about the expected magnetic field levels associated with the proposed transmission line project can be found in later, route-specific chapters of this EIS.

4.5.6.3. Pacemakers and implantable medical devices

Implantable magnetic devices are becoming increasingly common. Two such devices, pacemakers and implantable cardioverter defibrillators (ICD), have been associated with problems arising from interference caused by EMF. This issue is called electromagnetic interference (EMI).

EMI can cause inappropriate triggering of a device or inhibit the device from responding appropriately. Documented sources of EMI include radio-controlled model cars, slot machines, car engines, cell phones, anti-theft security systems, radiation therapy, and high-voltage electrical systems. It has been estimated that up to 20 percent of all firings of ICDs are inappropriate, but only a small percentage are caused by external EMI.

ICD manufacturers' recommended threshold for modulated magnetic fields is 1 gauss, twice the background magnetic field of the Earth. One gauss is five to ten times greater than the magnetic field likely to be produced by a high-voltage transmission line at a sufficiently short distance to the line. Research shows a wide variety of responses for the threshold at which ICDs and pacemakers respond to an external EMI source. The results for each unit depend on the make and model of the device, the patient height, build, and physical orientation with respect to the magnetic field.

Transmission lines are only one of a number of external EMI sources. Exposure to magnetic fields produced by the proposed power line generally will not affect pacemakers and implantable defibrillators. All pacemakers and ICD patients are informed of potential problems associated with exposure to EMI and must adjust their behavior accordingly. Moving away from a source is a standard response to the effects of exposure to EMI. Patients can shield themselves from EMI with a car, building, or the enclosed cab of a truck. Individuals concerned with potential issues associated with their implantable medical device should consult their physician.

4.5.7. Property value studies

The potential change in property values due to the proximity to a new transmission line has been studied since the 1950s by appraisers, utility consultants, and academic researchers. It is very difficult to predict how a specific transmission line will affect the value of a specific property. A power line may change an individual's perception of a property's worth. This perception is indicative of how much one is willing to pay for the property (the fair market value) when it is put up for sale. The marketability of a property includes the final sale price and the amount of time required to sell the property. Studies have been conducted mostly on residential or undeveloped properties and not commercial properties.

Initial property value studies were primarily surveys or attitudinal studies of small numbers of homeowners. However, substantial differences could exist between people's perceptions about how they would behave and their actual behavior when confronted with the purchase of property supporting a power line.

Due to this uncertainty, attitudinal studies were replaced by "valuation" or "appraiser" studies involving the comparison of sales prices for properties similar in most respects, except for proximity to a power line. There are two major shortcomings in conducting this type of study:

- the subjective nature of identifying a pair of properties that were considered "identical" for the purpose of the study; and
- the restrictive nature of finding "identical" property pairs, which results in a data set too small for meaningful statistical analysis.[204]

A third type of research, statistical hedonic analyses, involves large sample sizes, a high number of variables, and multiple regression analysis. These studies, which can better account for numerous variables that affect sales, provide the best information to-date on the effects of power lines on property values. Individuals buying property are likely to consider many factors including schools, community services, scenic beauty, recreational opportunities, or distance to work. The relative importance of each of these factors varies greatly among individuals. Likewise, the importance of a nearby power line varies greatly among individuals. The presence or potential presence of a transmission line could lead potential buyers to perceive a decrease in the value of the property or have no affect at all. The statistical analyses might help illustrate which factors best predict differences in marketability; however, the objectivity of the variables measured would significantly influence the results of these analyses.

The research regarding the potential for impacts to property value is ongoing, but there are trends from studies in the literature. Surveys or attitudinal research tends to show persistent adverse perceptions of the impact of transmission lines. Most respondents believe that the presence of a transmission line would result in lower property values, or respond that they would pay less for a property encumbered by or near to a transmission line.

However, the statistical research does not show a significant negative impact on property values, with a trend in the literature indicating a 10 percent or less reduction in property value. This decrease in property value diminishes as the further away the line is. More detailed analyses in some of these studies show higher levels of property value impact among more expensive residential properties, or those that are closer to pylons/towers than just the conductors. A recent literature review[205] on transmission lines and property values shows similar results to previous summaries, including one done by the Electric Power Research Institute (EPRI) in 2003.[206] The studies that cover this subject can be difficult to generalize and must be judged on the quality of the study design and analyses of the data. Again, the objectivity of the variables measured would significantly influence the results of these studies.

One of the scoping comments received in the DEIS scoping phase for this project cited a valuation guidance report by Appraisal Group One, which included a review of many empirical studies, including several from Wisconsin. The empirical studies cited generally show a negative effect in property values, with exceptions. Most of the empirical studies cited in the report don't appear to be easily available publicly. Two additional studies cited in the comment are available publicly and could help provide additional insight into the potential property value or valuation impacts associated with having transmission lines on private properties.

[204] Kinnard, W. Jr. and S. A. Dickey. 1995. A Primer on Proximity Impact Research: Residential Property Values Near High-Voltage Transmission Lines. Real Estate Issues 20(1):23-29.
[205] Anderson, et. al. 2017. The Effect of High-Voltage Overhead Transmission Lines on Property Values: A Review of the Literature Since 2010. The Appraisal Journal.
[206] Goodrich-Mahoney, J. 2003. Transmission Line and Property Values: State of the Science. EPRI.

4.5.8. Radio and television reception

Transmission lines do not usually interfere with normal television and radio reception. In some cases, interference is possible at a location close to the ROW due to weak broadcast signals or poor receiving equipment.

If interference occurs because of the transmission line, the electric utility is required to remedy problems so that reception is restored to its original quality as per Wis. Admin. Code § PSC 113.0707(3).

4.5.9. Recreation and tourism

Recreation areas include parks, trails, lakes, waterways, or other designated areas where public recreational activities occur. Transmission lines can affect recreation areas in several ways:

- Limiting the location of buildings;
- Repelling potential users of recreational areas whose activities depend on the aesthetics of natural surroundings (*e.g.,* backpackers, canoeists, hikers, birdwatchers);
- Altering the types of wildlife found in an area by creating more edge habitat or additional mortality risks to birds;
- Providing paths or better access to previously inaccessible areas for those who snowmobile, ski, bicycle, hike, or hunt;
- Posing potential safety risks by locating new poles or wires in the path of recreational vehicles such as snowmobiles and ATVs without adequate markings.

4.5.9.1. Mitigation strategies

Some of the impacts from high-voltage transmission lines on recreation areas can be mitigated by:

- locating transmission lines and structures along property edges,
- using structure designs that blend into the background and reduce aesthetic impacts, and/or
- designing recreation facilities to take advantage of already cleared ROWs.

Impacts to specific areas utilized for public recreation are discussed in greater detail in sections 6.3.5, 7.3.5, 8.3.5, and 9.3.5.

4.5.9.2. Tourism in the project area

The Commission received a significant number of public comments voicing concern that the proposed project would negatively impact tourism within the project area. Comments were received from a range of entities including municipalities, not-for-profit organizations, and private landowners, among others. Table 4-7 lists the most commonly referenced tourist attractions/tourism areas.

Table 4-7 Tourist attractions within the project area

Resource/Attraction	Owner/Manager	Route Alternative
Frank Lloyd Wright's Taliesin	Independent	Eastern-North
American Players Theatre	Independent	Eastern-North
Military Ridge State Trail	DNR	Eastern-South
Governor Dodge State Park	DNR	Eastern-North
Pecatonica State Trail	DNR	Western-South
Ice Age National Scenic Trail	NPS	Dane County Routing Area
Local Galleries and businesses focused on the Driftless Area	Various	All proposed route alternatives

Resource/Attraction	Owner/Manager	Route Alternative
Military Ridge Prairie Heritage Area	DNR, TNC, MVC, and others	Eastern-South

4.5.10. Safety

4.5.10.1. Safety standards

Transmission lines must meet the requirements of the Wisconsin State Electrical Code.[207] The code establishes design and operating standards, and sets minimum distances between wires, poles, the ground, and buildings. The Wisconsin State Electrical Code represents the minimum standards for safety.

The National Electrical Safety Code (NESC) specifies minimum horizontal clearances required between buildings and 345 kV conductors. Wisconsin Admin. Code § PSC 114.234(C)1c prohibits the construction of transmission lines over occupied residential dwellings or residential dwellings intended to be occupied. Although they may not be prohibited by code, building other structures within a transmission line ROW is strongly discouraged.

4.5.10.2. Contact with transmission lines

The most significant risk of injury from any power line is the danger of electrical contact between an object on the ground and an energized conductor. Generally, there is less risk of contact with higher voltage transmission lines as opposed to low-voltage lines due to the height of the conductors.

When working near transmission lines, electrical contact can occur, even if direct physical contact is not made, because the electricity can arc across an air gap. The most important safety practice is to avoid placing yourself or any object you may contact too close to a high-voltage overhead line. As a general precaution, no one should be on an object or in contact with an object that is taller than 15 to 17 feet while under a high-voltage electric line. Individuals with specific concerns about whether it is safe to operate their vehicles or farm equipment near an electric transmission line should contact their electric provider.

4.5.10.3. Fallen lines

Transmission lines are designed to automatically trip out of service (become de-energized) if they fall or contact trees. This is not necessarily true of distribution lines; however, transmission lines are not likely to fall unless hit by a tornado or a vehicle.

4.5.10.4. Lightning

New transmission lines are built with a grounded shield wire placed along the top of the poles, above the conductors. Typically, the shield wire is bonded to ground at each transmission structure. This protects the transmission line from lightning. Transmission structures, like trees or other tall objects, are more likely to intercept lightning strikes, but do not attract lightning. Lightning is not more likely to strike houses or cars near a transmission line. Shorter objects under or very near a line may actually receive some protection from lightning strikes.

4.5.10.5. Induced voltages

Landowners in both rural and urban settings often express concerns about shocks from metal objects in the immediate vicinity of an overhead transmission line. An ungrounded metal object (e.g. a tractor or a fence) under or very near an energized transmission line may become charged with low level voltage caused by an electrostatic induction process. When a person or animal touches the object, a shock may be

[207] Wisconsin adopts the most recent NESC with certain changes, deletions, and additions. Volume 1 of the Wisconsin State Electrical Code is found in Wis. Admin. Code ch. PSC 114, which is administered primarily by the Commission.

felt, similar to that felt after crossing a carpet and then touching a metal object. The voltage discharge can be a painful nuisance. Dissipation of such charges occurs when contact is made with the ground. This might happen when people, livestock, or some other conductive material makes an effective electrical contact between ground and the charged object. The magnitude and strength of the charge is directly related to the mass of the ungrounded metal object and its orientation to the line.

Concerns have most often been addressed by grounding the objects in question. For example, fences located directly under and parallel to transmission lines should be grounded to earth. This can be achieved through the use of a simple ground rod with an insulated lead and a wire clamp attached. Energized electric fences with a properly installed fence grounding electrode system should continue to function properly even when subjected to induced voltage. Energized electric fences directly under or parallel to a transmission line may also have filters installed to discharge the induced voltage to earth.

When it is necessary to move or work on such fences, the fences should remain solidly grounded while the work is being done. Additional protection may be obtained by installing an approved lightning protection system on the fence that also provides a means for the discharge of induced voltage.[208]

Tractors or other equipment operated under a transmission line can drag a short metal chain to "ground it" to earth. This is a very low-cost, effective mitigation technique. An equally low-cost alternative is to attach a chain to the metal frame of the equipment and drop that chain to the ground before getting off of the equipment. The chain can be pulled up while the vehicle is moving to reduce the risk of a broken chain causing damage to the equipment. The most direct mitigation measure is to avoid parking this type of equipment under high-voltage power lines.

Refueling vehicles directly under a high-voltage transmission line is not a good practice. A spark from a discharging metallic structure with induced voltages to earth could ignite the fuel. The risk of such ignition is higher with gasoline-powered vehicles than for diesel-powered vehicles.

DATCP's AIS for this project will provide additional information regarding safety issues when farming near transmission lines. DATCP AIS staff can provide general published information and references as well. Individuals with specific concerns regarding the operation of equipment or placement of fences under an electric transmission line should contact their electricity provider.

4.5.10.5.1 Railroad concerns

Where a transmission line shares a corridor parallel with an active railroad, the current running through the power lines can induce voltage onto the nearby railway or its communication equipment. High levels of induced voltage can interfere with the signal equipment that detects trains or the equipment used in railroad crossing warning detection circuits. Voltage from the transmission line that is induced to the rails at high enough levels can pose a risk of electrocution to those that come in contact with the rails. As a result, transmission lines that run parallel and near to railroads require more planning and longer consultation between the utility and the railroad than perpendicular crossings. There is often not a way to entirely eliminate the effect of these induced voltages, but engineers study the predicted levels of induced voltage and find ways of mitigating those levels to a point where the railroad is able to permit the transmission line corridor sharing.

---

[208] More information may be obtained from a Midwest Rural Energy Council publication, *"Installation and Operation of Electric Fences, Cow Trainers and Crowd Gates"* (http://www.mrec.org/pubs.html).

4.5.11. Stray voltage and dairy livestock

4.5.11.1. Causes of stray voltage

Stray voltage and its impacts on livestock and other confined animals have been studied in detail by state and federal agencies, universities, electric utilities, and numerous scientists since the late 1970s. The PSC has opened investigations, encouraged the upgrade of rural distribution systems, established measurement protocols, and compiled a stray voltage database to track investigations, all in order to develop successful strategies for minimizing stray voltage in farm operations.[209] Over the decades, significant resources have been allocated to understand this issue.

Electrical systems, including farm systems and utility distribution systems, are grounded to the earth to ensure safety and reliability, as required by the NESC and the National Electrical Code (NEC). Because of this, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops. This voltage is called neutral to earth voltage (NEV). When NEV is measured between two objects that are simultaneously contacted by an animal, a current will flow through the animal. Animals may then receive a mild electrical shock that can cause a behavioral response. At low voltages, an animal may flinch with no other noticeable effect. At higher levels, avoidance or other negative behaviors may result. Stray voltage may not be noticeable to humans.

Low levels of alternating current (AC) on the grounded electrical conductor is a normal and an unavoidable consequence of operating electrical equipment on farms. Animals may feel a small electric shock when they make contact with an energized metal water trough, if that trough is not properly grounded. Of major concern is the potential for stray voltage that occurs at a level that negatively affects an animal's behavior, or health.

Stray voltage, may be caused by a combination of on-farm and off-farm sources. One off-farm source that may contribute to stray voltage concerns is the operation of transmission lines in close proximity and parallel to distribution lines. Due to siting priorities, transmission and distribution electrical lines have sometimes been located in the same corridor or on the same structure. This configuration may contribute to stray voltage issues. To minimize the likelihood of stray voltage occurrences, utilities sometimes relocate these paralleling distribution lines further away from the transmission line and/or bury the distribution line underground. Additionally, the Commission requires the utility to conduct pre and post construction stray voltage testing of potentially impacted farms due to transmission construction.

4.5.11.2. Potential impacts of stray voltage

A dairy herd's health issues can be difficult to diagnose. There are many factors that may contribute to the herd's well-being such as the animal's environment, comfort level, diet, and access to water. Dairy cow behaviors that may indicate the presence of stray voltage include:

- nervousness at milking time,
- reluctance to enter the parlor or barn,
- hesitation in approaching watering stations or feeders, or
- an eagerness to leave, or avoid, a certain area in the barn or free-stall facility.

These same symptoms can be caused by other factors like social dominance by herd mates, poor lighting, water quality issues, cow comfort, or learned behavior. If stray voltage is thought to be the cause of herd problems, the farm should be tested.

---

[209] The Commission's stray voltage webpage can be accessed at: https://psc.wi.gov/Pages/Programs/StrayVoltageHomePage.aspx

In Wisconsin, the present "level of concern" is derived from the 1996, PSCW docket (PSC docket 5-EI-115). This level of concern is formally defined by the PSC as 2.0 milliamps, AC rms (root mean square), steady state or 1.0 volt, AC rms, steady state across a 500-ohm resistor in the cow contact area. The state of Wisconsin deems that this level of voltage/current is an amount of electricity where some form of mitigation is taken on the farmer's behalf, although only some small percentage of cows may actually perceive its presence. The "level of concern" is not a damage level. Instead, it is a very conservative, pre-injury level, below the point where moderate avoidance behavior is likely to occur and well below where a cow's behavior or milk production would be harmed. The "level of concern" is further broken down into two parts. The first part is a 1.0 milliAmp contribution from the utility, at which level mitigation must be taken by the utility to reduce its contribution to below the 1.0 milliAmp level. The second part is a 1.0 milliAmp contribution from the farm system, at which level some form of mitigation should be undertaken by the farmer.

4.5.11.3. Mitigation of stray voltage

When stray voltage is a concern, electrical measurements in confined livestock areas should be conducted using appropriate electrical testing equipment to follow established PSC procedures and protocols. These testing protocols have been developed to collect a reasonable set of data useful in the analysis of the level of stray voltage that may be present under a variety of conditions, and the source (including on-farm and off-farm sources) of the stray voltage.

Field research shows that cow contact current is often dependent on both on- and off-farm electrical power systems. A common on-farm source of stray voltage is the inappropriate interconnection of equipment grounding conductors with the neutral conductors of the farm wiring system. Mitigation of stray voltage can be achieved through a variety of proven and acceptable methods, such as additional grounding or the installation of an equipotential plane.

Farm operators may receive technical assistance from the Wisconsin Rural Electric Power Services (REPS) program (as defined and authorized by Wis. Stat. §§ 93.41 and 196.857). The REPS program is jointly managed by PSC and DATCP. DATCP provides veterinarian assistance with Herd-Based Diagnostic Program at no financial charge to the farmer. REPS staff provide information about stray voltage and power quality issues; work to answer regulatory questions; and assists with conducting on-farm and distribution system investigations. Staff members also assist farmers when they are working with their utilities and electricians in resolving power quality concerns. REPS staff also work with farmers, their veterinarians, and nutritionists to resolve herd health and production problems.

4.5.12. Highway impacts

Wisconsin Stat. §§ 86.07 and 86.16 allow utilities to locate their facilities along and across highway ROWs with the written consent of the highway maintaining jurisdiction, subject to any conditions that may be placed on the installation.

Wherever the line would need to share ROW or cross a state trunk highway, a permit must be obtained from WisDOT.[210] The line would need to comply with the WisDOT Utility Accommodation Policy.[211]

[210] State trunk highways include Interstate, U.S., and state numbered highways. Portions of state numbered highways through many municipalities are maintained by the municipality and are termed "Connecting Highways". These highways are not under the permitting jurisdiction of WisDOT.
[211] WisDOT Bureau of Highway Maintenance. Highway Maintenance Manual, current version. Chapter 9, "Right-of-Way Use and Permits." Section 15, "Utility Accommodation." See also Facilities Development Manual, Section 7-55-1, "Scenic Easements," and Real Estate Program Manual, Section 6.8, Scenic Easements. It can be accessed at: https://wisconsindot.gov/Pages/doing-bus/real-estate/permits/utility-uap.aspx.

The policy emphasizes that permitted use and occupancy of highway ROW for non-highway purposes like an electric transmission line is subordinate to the primary interests and safety of the traveling public. WisDOT could permit utility facilities on a state highway if the following three conditions are met:

1. Such use and occupancy would not adversely affect the primary functions of the highway or materially impair its safety, or operational or visual qualities.
2. There would be no conflict with the provisions of federal, state or local laws or regulations.
3. The occupancy would not significantly increase the difficulty or future cost of highway construction or maintenance.

A WisDOT utility permit is required for utility work within state highway ROWs. Utility work includes surveying, excavating, placement of fill material, grading, installation of the line, and traffic control for any new or upgraded utility line or to replace a significant portion of an existing line. WisDOT permits would also be needed if there would be deliveries of oversized loads or use of roads with weight limits.

The Federal Highway Administration allows transmission facilities to be located within interstate and freeway ROWs under state procedures, provided they do not adversely affect the safety, efficiency, and aesthetics of the highway, interfere with its present use or future expansion, or require access for future maintenance directly from the highway lanes or shoulder.

Potential WisDOT concerns may include:

- Highway maintenance, improvements, construction, and expansion plans;
- Impacts to road surfaces as a result of heavy equipment use and deliveries;
- Interference with current or future locations of traffic signals, ramp gates, and other traffic management devices;
- Potential induced voltages;
- Conflicts with existing buried utilities;
- Scenic easement and issues associated with aesthetics;
- Construction access and safety issues associated with construction activities.

4.5.13. Noise and light impacts

4.5.13.1. During construction

During each phase of construction of the proposed facilities, noise would be generated by the construction equipment and activities. Initially sources of noise would come from clearing vegetation in the ROW from whole tree processors, mowers, and/or chainsaws. Wood chippers may be used to dispose of some of the vegetation in the ROW. Noise would come from trucks are used to haul away material that cannot be stockpiled or disposed of on-site and to bring in necessary construction materials and off-ROW areas that may be constructed to allow movement of machinery and materials. Noise would come from typical construction vehicles such as bucket trucks, cranes or digger derricks, backhoes, pulling machines, pole trailers, dumpsters, or drill rigs.

Transmission structures are constructed by first using a standard drill rig to bore a hole to the required depth. If water is encountered, pumps will be used to move the water either to adjacent upland areas or to waiting tanker trucks for proper disposal. When bedrock is close to the surface or when subsoils primarily consist of large boulders and large cobbles, blasting may be required.

Concrete trucks would then carry concrete to the boreholes to construct the foundations of the transmission structures. Cranes would erect the towers on the foundations. Finally, the wire would be strung between the towers using large pulleys and trucks or helicopters. After the construction is completed, the ROW would be graded, agricultural soils de-compacted, and the ROW cleaned up.

Laydown yards and staging areas would require preparation of the ground and placement of aggregate materials and trailers. Construction workers and deliveries would access the site, increasing traffic noise in the area. Lights may be placed on the site for security and worker safety.

All of these operations produce noise that may impact adjacent landowners. Properties near laydown yards and staging areas may have increased light impacts. Normal work schedules and local ordinances usually restrict noise-producing activities to daytime hours.

4.5.13.2. During operation

Vibrations or humming noise can be noticeable and is most often associated with older transmission lines. These vibrations are usually caused by conductor mounting hardware that loosened slightly over the years. When known, this maintenance issue can be identified and repaired by the utility. The other types of sounds caused by transmission lines include sizzles, crackles, or hissing noises that occur during periods of high humidity. These sounds are usually associated with high-voltage transmission lines and are very weather dependent. They are caused by the ionization of the moist air near the wires. This noise would be audible to those close to the transmission lines, but quickly dissipates with distance and would be drowned out by typical background noises. On windy days, the wind may be heard blowing through the wires, but other ambient noise may keep this from being overly intrusive.

Ionization of transmission lines in foggy conditions can also cause a **corona.** Corona is a luminous blue discharge of light, usually where the wires connect to the insulators. A corona indicates the loss of power where it occurs, which indicates inefficiency and economic loss. Power transmission equipment is designed to minimize the formation of corona discharge to maintain efficient operation and reduce power loss. Corona emissions can cause small amounts of radio-frequency interference (RFI), primarily to AM radio signals. However, this effect is low, even in proximity to the ROW, and meets reception guidelines of the Federal Communications Commission (FCC).

Corona could also indicate areas of wear and damage on the transmission line, again a good reason for utilities to identify, examine, and repair any damage if observed. In other situations, the attachment of bird deflectors can sometimes increase the angular edges on the transmission lines and in turn increase corona emissions. Birds might also be deterred from landing on lines that are experiencing corona emissions because of the resulting noise and ultraviolet light.

Substation noise and light may impact residential properties located in close proximity to those facilities.

4.5.14. Communication facilities

Although it is unlikely for transmission lines to interfere with normal television and radio reception, there is the potential for transmission lines to interfere with broadcast communications. These impacts could occur with broadcast facilities within 10 kilometers (km)—6.2 miles—of the transmission line.

Different types of communication facilities can be affected by different types of interference. Radio broadcasts can be impacted by audible noise interference and radio frequency interference. Radio frequency interference can be caused by spark gap emissions created by calcium deposits that build up on conductors over time, an unlikely impact on new lines. Audible noise interference can be caused by improperly installed facilities that generate corona discharge. Microwave radio antennas emit a narrow signal and can be obstructed if a transmission structure is within a microwave radio signal line-of-sight path. Transmission lines within 500 feet of communication facilities can induce voltages to communication equipment. At high enough levels this induced voltage can interfere with communications equipment. AM facilities can be affected by distortion of the AM antenna radiation pattern (reradiation). Other types of communication such as FM facilities, cellular services and wireless internet services are not susceptible to impacts from transmission line structures.

As part of CPCN applications, studies are conducted by the applicants to determine the location and the potential for communication signal interference. Additional studies are often necessary after final engineering of an approved transmission line to determine if mitigation is necessary. Additional information regarding potential impacts to communication facilities within the project area from the proposed project can be found in Sections 6.3.7, 7.3.7, 8.3.7, and 9.3.7.

4.6. ECOLOGICAL IMPACTS ASSOCIATED WITH TRANSMISSION LINES

This section describes many of the common ecological impacts related to the construction and operation of transmission lines. This section is meant to provide background information for the project-specific impacts described in later chapters of the EIS and may be referenced in some of those chapters.

4.6.1. Endangered resources

4.6.1.1. Wisconsin's Endangered Species Law

Endangered resources include rare or declining species, high quality or rare natural communities, and unique or significant natural features. For the purposes of this EIS, rare species are defined as federal- or state-listed threatened and endangered species, federal candidate and proposed species, and state special concern species.

- **Endangered** species are any species whose continued existence is in jeopardy.
- **Threatened** species are those that are likely to become endangered.
- **Special concern** species are those about which some problem of abundance or distribution is suspected but not yet proved. The purpose of this category is to focus attention on certain species before they become threatened or endangered. Special concern species are not covered by Wisconsin's Endangered Species Law, but they may be protected by other state and federal laws.

The state's Endangered Species Law, Wis. Stat. § 29.604, makes it illegal to take, transport, possess, process, or sell any wild animal that is included on the Wisconsin Endangered and Threatened Species List. In addition, it is illegal to remove, transport, carry away, cut, root up, sever, injure or destroy a wild plant on the Wisconsin Endangered and Threatened Species List on public lands. However, forestry, agricultural, utility (including electric), and bulk sampling practices are exempted from the taking prohibitions of listed plant species.

The Wisconsin Endangered Species law allows DNR to authorize the taking of a threatened or endangered species if the taking is incidental to the carrying out of an otherwise lawful activity and the taking meets the requirements outlined in Wis. Stat. § 29.604. Authorization generally occurs through an Incidental Take Permit. If the activity is conducted by DNR itself or if another state agency (including the Commission) conducts, funds, or approves the activity, authorization would occur through an Incidental Take Authorization. The Incidental Take Permit/Authorization would include minimization and mitigation measures for the specific impacted species.

The DNR Bureau of Natural Heritage Conservation manages the Natural Heritage Inventory (NHI) database, which lists known occurrences of rare plants, animals, and natural communities. The database includes the location and status of these resources. However, most areas of the state have not been surveyed extensively or recently, especially on privately-owned lands, so the NHI database should not be relied upon as a sole information source for rare species. Therefore, potential impacts on endangered resources along segments dominated by private properties may be incomplete.

4.6.1.1.1 Incidental Take

Utilities can apply for an Incidental Take Authorization (ITA) if it is possible that construction activities could result in the harm or "take" of a threatened or endangered species. If granted, the permit would allow the applicants to take certain actions that may be harmful to a threatened or endangered species, within the conditions and limitations of the permit.

Utilities should consult with DNR so that the appropriate methods to avoid impacts to rare species are incorporated into an avoidance plan and properly conducted during construction. If impacts to a species cannot be avoided using construction practices or timing, the applicants may be required to undergo additional consultation to minimize impacts as part of the Incidental Take Authorization process.

4.6.1.2. Federal Migratory Bird Treaty Act

Almost all bird species are protected by the Migratory Bird Treaty Act (MBTA). Under the MBTA, it is unlawful to take, capture, kill, or possess migratory birds, their nests, eggs, and young. This may apply to birds nesting in or adjacent to the ROW if construction disturbance results in nest abandonment. Avoidance of impacts to nesting birds can be achieved if construction activities are scheduled in habitat areas outside the breeding and nesting season from approximately March through August. A recent legal opinion issued by the Federal Department of the Interior on December 22, 2017, provides clarification on its opinion of "take" as it relates to intentional vs. unintentional take.

4.6.1.2.1 Migratory Bird Concentration Sites

Migratory Bird Concentration Sites are important resting and feeding areas for birds as they fly between their breeding and wintering grounds. These areas can also be locations where large numbers of migrating birds often become concentrated due to prevailing winds and/or water barriers. Sites are used by many different species, both rare and non-rare. During seasonal migrations, birds can collide with transmission lines and lines can present barriers to their use of stopover habitat. The risk increases when the lines are vertically arrayed, when they reach above other visible barriers like tree lines, or when they are placed in areas of abundant bird use such as migration corridors, colonial nesting areas, water crossings, or stopover habitat.

4.6.1.2.2 Important Bird Areas

Also noted along various proposed route alternatives are Important Bird Areas (IBA). IBAs are recognized as important refuges for congregations of large numbers of birds and bird species, for providing critical habitat during different phases of birds' life cycles and are especially important for the protection of rare bird species. These are sites that provide essential habitat to one or more species of breeding or non-breeding birds. Sites may vary in size, but are usually discrete and distinguishable in character, habitat, or ornithological importance from surrounding areas. They may include public or private land. Site boundaries may be either natural (rivers, watersheds) or human-made (roads, property boundaries). IBAs are identified using objective, standardized, science-based criteria. To qualify as an IBA, a site must support:

- species of conservation concern (e.g., endangered or threatened species);
- species that are vulnerable because they are not widely distributed;
- species that are vulnerable because their populations are concentrated in one general habitat type;
- species that are vulnerable because they congregate together for breeding, feeding, or migration.

These criteria are applied hierarchically and defined at different levels. An IBA might, therefore, be important at the global level, at a continental or regional level (the U.S., Mexico, and Canada), at the national level, or at the state level. A site at any one of these levels is a valid component of the IBA program. Depending on the type of the IBA and potential impacts, minimization and mitigation measures are recommended as necessary. In the chapters of this EIS where proposed route segments cross IBAs, there is additional detailed discussion of the potential impacts to bird species and the range of alternatives that could mitigate this impact. Refer to Section 4.6.8.1 for additional information on avian risk.

4.6.1.3. Pre-construction surveys

If preliminary research and field assessments indicate that rare species or natural communities may be present in the project area, specific, appropriately-timed surveys should be conducted prior to construction. Pre-construction surveys may be used to assess the nature and magnitude of potential impacts to rare species along the project routes. They may also be used to identify whether a particular species is present in the affected area or to what extent suitable habitat for a species is present along a route. If a threatened or endangered species is observed during the surveys, measures may be employed to avoid or minimize impacts to the species and its habitat.

4.6.1.4. Potential impacts

Construction and maintenance of transmission lines might destroy individual plants and animals or might negatively alter their habitat so that it becomes unsuitable. Potential impacts may include:

- Destroying individual plants or animals, or their habitat, by crushing or digging with heavy equipment, blasting for construction of foundations, surface disturbance of soil and vegetation during clearing, drilling, or from traffic;
- Degrading water quality through soil erosion and siltation into rivers and wetlands that provide habitat for rare plants or animals;
- Introducing and encouraging the growth of invasive or common species resulting in a reduction in species diversity;
- Clearing trees used as perching or nesting sites by rare birds and creating an open area out of a closed canopy that allows more predation;
- Disturbing habitats during the active nesting or spawning period of protected species;
- Degrading forest or wetland quality through removal of trees and brush and increasing edge effects, making the area unsuitable for rare plants or animals.

4.6.1.5. Mitigation strategies

In some limited cases, when managed correctly transmission line ROWs may improve habitat for some rare species, communities, or pollinators that prefer open herbaceous habitats. For example, appropriate ROW management that facilitates growth of native plants and maintains an open herbaceous habitat can provide long-term benefits to many pollinator species. Close cooperation between utilities and DNR is necessary to protect listed species and their habitat.

When negative impacts are expected, the Commission has the authority to order applicants to conduct mitigation measures to avoid or minimize the potential impact of an approved project to endangered resources. Impacts to rare and protected species can also be avoided or minimized by doing the following:

- Conducting pre-construction surveys and subsequently avoid or minimizing activity in these areas.
- Requiring an environmental monitor to be present during construction activities.
- Implementing DNR required and recommended actions.
- Modifying the project route.

- Changing the design of the transmission line.
- Altering the construction schedule to avoid critical life cycle events.
- Reducing the workspace at a particular location.
- Employing special construction techniques.
- Utilizing exclusionary devices.

This list is not all-inclusive, and will vary based on the species, location, habitat, and planned scope of work. Consultation with species experts at DNR would provide information on what other mitigation measures may decrease the risk to rare and protected species.

An example of a common mitigation measure is herp exclusion fencing in areas where habitat is likely to support rare turtles, snakes, or salamanders. During times when the animal may be present or enter into the construction zone, fencing is installed to exclude these animals. The fencing prevents the animal from entering into harm's way. Immediately before work begins in suitable turtle habitat, a ground survey is conducted and any turtles found in the area are relocated to a nearby suitable habitat. When the area is known to be clear of turtles, the fencing is placed around the work area to keep turtles out. Figures 4-28 and 4-29 on the following pages shows an area fenced to keep turtles away from the construction zone. This fencing is removed when construction and restoration in the area is completed.

Figure 4-28 Turtle exclusion fence diagram

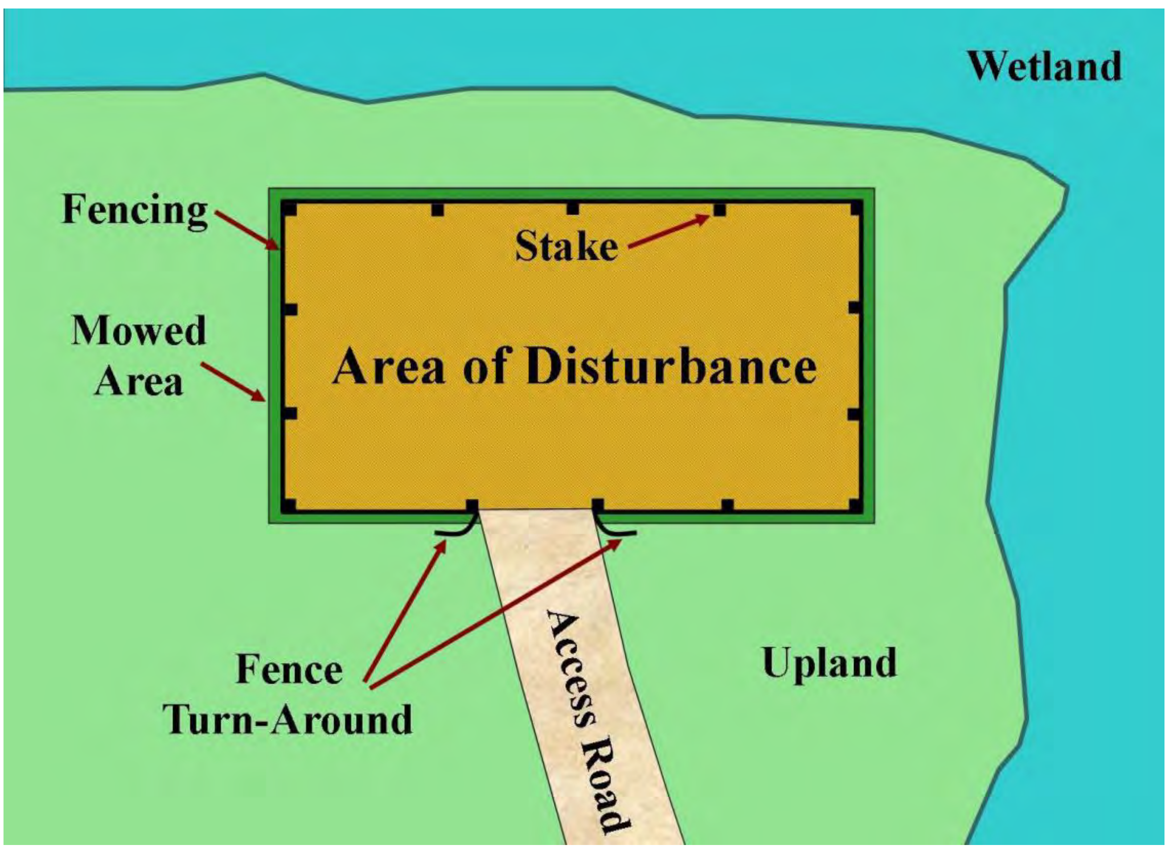
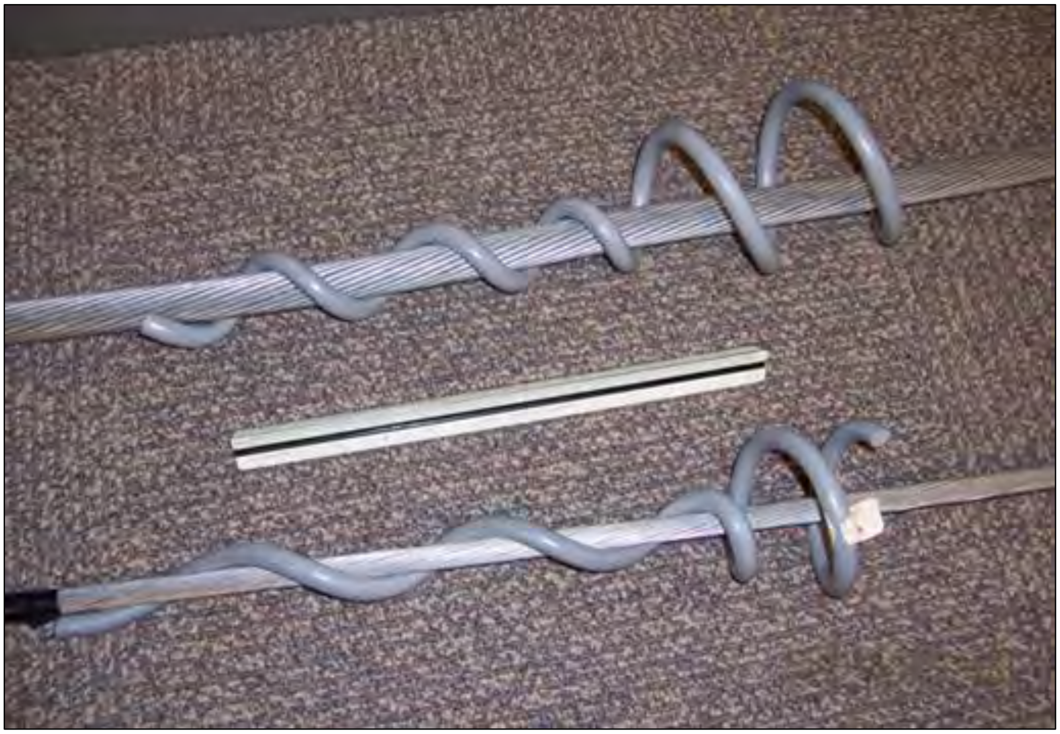


Figure 4-29 Turtle exclusion fence

Another example includes the installation of bird flight diverters (BFD). BFDs may be installed on shield wires when overhead transmission lines are built in areas heavily used by rare and/or common birds or in specific areas within known migratory flyways. The purpose of BFDs is to make the line more visible, so birds can see it and fly around or over the conductors to avoid colliding with them. Several designs of BFDs are available. They are typically attached to either the conductors or the static wire (see Figure 4-30). Ideally, BFDs should be noticeable by birds, but should not draw unwanted attention by people. Installed BFDs need to be inspected periodically and replaced when necessary. For transmission construction authorization projects, USFWS, and DNR should be consulted to determine where bird diverters would be necessary to help birds recognize and avoid the lines.

Figure 4-30 Close-up of bird flight diverters that can be placed on conductors or shield wires of a transmission line



4.6.2. Forest resources

For the purposes of this EIS, forested lands are defined as areas where mature trees are present, forming mostly closed canopies (greater than 20 percent canopy cover) of trees with diameter at breast height (dbh) of 6.0 inches or more. Narrow tree lines (*e.g.*, fence rows) and windbreaks are not included in total forest cover. The following terms were used to describe forest resources throughout this draft EIS:

- "Saplings" refer to live trees from 1.0 to 5.0 inches dbh
- "Structure timber" ranges from 5.0 to 9.0 inches dbh for softwoods and from 5 to 11 inches dbh for hardwoods.
- "Saw timber" is greater than 9.0 inches dbh for softwoods, and greater than 11 inches dbh for hardwoods.

Different machines and techniques are used to remove trees from the transmission ROW depending on whether the forest contained mature trees, have large quantities of understory trees, or are in sensitive environments such as a forested wetland. These can range from large whole tree processors which can cause rutting and compaction of the forest floor, to hand clearing with chainsaws in more sensitive environments.

Wisconsin statutes (Wis. Stat. § 182.017(7)(e)) require that all timber removed for construction of a high-voltage transmission line remains the property of the landowner. Thus, the landowner should discuss with the ROW agent, at the time of easement negotiations, the disposition of all timber to be cut. Larger timber might be stacked on the edge of the ROW for the owner. Smaller diameter limbs and branches may be chipped or burned. According to the landowner's wishes, wood chips may be spread on the ROW, piled to allow transport by the landowner to specific locations, or chipped directly into a truck and hauled off the ROW.

Wisconsin forests provide recreational opportunities, habitat for wildlife, diverse plant communities, and merchantable timber for commercial and private uses. Many of the tree species mentioned in this EIS would be considered incompatible vegetation by transmission owners and therefore would be actively eliminated within the proposed ROW during initial construction as well as throughout the life of the facilities. This would significantly alter, and permanently affect, the existing and future ecological communities within the proposed ROW. This would result in a significant alteration (conversion) of the existing forested community into a more open, disturbed grassland community subject to quick colonization by pioneer species (including invasive species and tree seedlings) and continued impacts through cyclic vegetation management practices.

One mile of 150-foot ROW (the average ROW width of the proposed project) through a forested area results in the loss of approximately 18 acres of trees. The potential impacts of a new transmission ROW on forested land includes, but are not limited to:

- forest fragmentation,
- the loss and degradation of forested habitat,
- loss of merchantable timber,
- decreased carbon sequestration,
- a reduction of aesthetic enjoyment of the resource,
- loss of income,
- creation of a movement barrier or corridor, and
- opportunities for invasive species and disease organisms to spread.

More specifically, the construction activities associated with clearing trees and installing a high-voltage transmission line through, or along the edge, of forested areas can destroy and degrade forest habitat by introducing seeds and other propagating parts of non-native plants that are carried [inadvertently] to the interior of the forest by construction equipment. Disturbance caused by construction can then encourage aggressive growth of these invasive species (Section 4.6.4). Habitat providing food and cover for local wildlife may be altered or lost if these invasive species out-compete existing native plants, resulting in a loss of plant and animal diversity.

In addition, numerous observations of the trees remaining along the outer edges of recently cleared ROWs have shown that they are more prone to falling (i.e. creation of hazard trees) the first few years after clearing, due to the loss of support from the surrounding trees. After a number of years (sometimes a decade or more) these trees may eventually become conditioned to the empty space and less prone to failure.

Cleared ROWs can also create a barrier to movement, or a new corridor for movement, for certain species. This could eventually lead to a decrease in genetic variability, leaving the remaining species and populations more susceptible to disease and less adaptable to change. Several pests and diseases are worth noting here, including the fungi that cause oak wilt and heterobasidion root disease, the emerald ash borer, and gypsy moth:

- Red oak (*Quercus rubra*), black oak (*Quercus velutina*), and northern pin oak (*Quercus ellipsoidalis)* are especially susceptible to oak wilt and will often die within one year of infection. The cause of the disease is a fungus that is carried by sap-feeding beetles or spread through common root systems. In the upper Midwest, pruning or removal of oaks should be avoided from late spring to midsummer, when the fungus most commonly produces spores.

- Heterobasidion root disease occurs in red and white pine (*Pinus resinosa* and *P. strobus*) plantations. It is considered among the most important and destructive diseases affecting conifers in the north temperate regions of the world. The infection is caused by the fungus, *Heterobasidion irregular* and spreads easily both above ground and through root contact transmission. Its spores can be carried by the wind over many miles. Cut stumps offer a surface for the spores to land and grow. Symptoms typically appear in nearby trees two to three years after the stumps are infected. The best method of control is prevention by treating stumps of cut pines with recommended fungicides on the day the tree is cut. Recent research indicates that higher numbers of viable spores are in the air in spring and fall.
- The emerald ash borer (EAB) is an insect (*Agrilus planipennis*) that has origins in Russia, China, Japan and Korea. It is not certain how it arrived in the United States, but the transport of wood or wood products on ships may have been a primary cause. In North America, so far, the borer has been found only in ash trees. The canopies of trees that are infested begin to thin above infested portions of the trunk and major branches because the borer destroys the water and nutrient conducting tissues under the bark. One third to one half of the branches can die within one year. Most of the tree's canopy can be dead within two years of when symptoms are first observed. The EAB spreads primarily through the transport of infested wood from infested areas to non-infested areas. EAB adults can fly at least 0.5 mile from the tree where they emerge. All counties in Wisconsin are now under quarantine for emerald ash borers. An EAB quarantine is intended to help prevent the spread of EAB and rules have been established to prevent the transport of wood from quarantined areas to non-quarantined areas.
- The gypsy moth (*Lymantria dispar dispar*) is an invasive, leaf-eating insect that can feed on most types of trees and shrubs in North America. When their populations are high, gypsy moth caterpillars can strip an entire neighborhood or forest of leaves in May and June. The moth was brought to North America in the 1800's and reached Wisconsin in the late 1980s. It is native to Europe, Asia, and North Africa. The caterpillars are very hardy and have been found feeding on over 300 species of trees and shrubs. They spread naturally and mainly when small, young larvae spin silken threads and hang from them, waiting for the wind to blow. The light larvae have long hairs that increase their surface area and allow them to be pulled from their threads and transported by the wind. As with the emerald ash borer, any type of cut wood that contains moth eggs can be a vector for transport. The entire project area for this docket is located within the gypsy moth quarantine area. Standard practices to avoid the spread of the gypsy moth damage include inspections and avoidance of movement of wood products (logs, posts, pulpwood, bark and bark products, firewood, slash and chipped wood from tree clearing) from quarantine areas to non-quarantine areas as per Wis. Admin. Code § ATCP 21.10.

4.6.2.1. Forest fragmentation

Forest fragmentation occurs when large blocks of forested ecosystems are divided into increasingly smaller sections of forest. Forested areas may be cleared to create corridors for infrastructure such as highways, pipelines, and power lines. Forested parcels are increasingly cut into smaller pieces and converted to agricultural, urban, and commercial uses. Forest fragmentation results in the increase of forest edge habitat relative to the area of forest interior habitat. Edge effects include changes in vegetation structure, light conditions, and moisture conditions that are common along forest edge habitat would now encroach into the interior of these forests. As fragmentation continues, a forest can suffer a permanent reduction in its vegetative and wildlife diversity and its ability to function as an ecological unit.

Fragmentation makes interior forest species more vulnerable to predators, parasites, competition from edge species, and catastrophic events. It also causes a permanent reduction in species diversity and suitable habitat for some species which require large undisturbed blocks of interior forest habitat for necessary activities such as nesting or breeding. Since large blocks of undisturbed forested ecosystems are becoming increasingly rare, many of the species that depend on these ecosystems are also becoming increasingly rare. Further loss of interior habitat and creation of increasingly smaller patches of suitable habitat can greatly affect the long-term survival of some species. For example, in Wisconsin, the pileated woodpecker (*Dryocopus pileatus*) will not breed in woodlands smaller than 250 acres and the cerulean warbler (*Setophaga cerulean*) has been shown to avoid forest blocks smaller than 340 acres.[212] [213] Species that require forest interior for long-term survival include fishers (*Martes pennanti*), pine martens (*Martes americana*), timber wolves (*Canis lupus*), red-shouldered hawks (*Buteo lineatus*), many passerine birds, such as warblers and flycatchers, and a number of woodland plants.

New clearings alter the vegetation and animal life both within the ROW and up to several hundred feet outside of the ROW. Studies of transmission ROW in forested habitat show a decrease in the density of interior forest species with increasing proximity to the ROW, while the density of edge species increased along the forest-edge interface.[214] Increased sunlight and wind penetrate the forest edge and create conditions that favor plant species more tolerant of light and drier conditions. Many of the plants and the animals that prefer edge habitat are very common species that can readily out-compete native plants and animals because of their opportunistic behaviors and greater tolerance to a wide range of environmental conditions. In bird populations, the increase in forest edge has been correlated with increases in nest predators such as blue jays (*Cyanocitta cristata*), raccoons (*Procyon lotor*), and skunks (*Family Mephitidae*) and an increased nest parasitism from brown-headed cowbirds (*Molothrus ater*). Examples of species which proliferate in edge habitat include raccoons, skunks, cowbirds, blue jays, crows (*Corvus* spp.), white-tail deer (*Odocoileus virginianus*), garlic mustard (*Alliaria petiolata*), buckthorn, and boxelder (*Acer negundo*).

As mentioned previously, cleared corridors may also create a barrier to movement for some species. This eventually leads to a decrease in genetic variability, leaving the remaining species and populations more susceptible to disease and less able to respond to change.

4.6.2.2. Merchantable timber loss

The production of trees for pulp and timber use is an important commercial and private industry, occurring mostly on land owned by corporations associated with the pulp and paper industry and also on privately held lands. Since transmission owners often keep transmission line ROWs free of merchantable timber, the area within a ROW is permanently lost as a site for pulp and timber production.

4.6.2.3. Managed Forest Program Lands

The Managed Forest Law (MFL) program is a landowner incentive program that encourages sustainable forestry management on private woodlots. In exchange for following sound forest management, the landowner pays reduced property taxes. It was enacted in 1985 and replaced the Woodland Tax Law and the Forest Crop Law. MFL is the only forest tax law that is currently open to enrollment. The MFL program encourages healthy and productive management of forest properties through a written management plan which incorporates landowner objectives, timber management, wildlife management, water quality, and the environment as a whole.

---

[212] Ambuel, B. and S. A. Temple. 1983. Area-Dependent Changes in the Bird Communities and Vegetation of Southern Wisconsin Forests. Ecology 64:1057-1068.
[213] Robbins, C. S., and B. A. Dowell. 1989. Habitat Area Requirements of Breeding Forest Birds of the Middle Atlantic States. Wildlife. Monographs No. 103. 34 pp.
[214] Kroodsma, R.L. 1982. Edge Effect on Breeding Forest Birds along a Power-line Corridor. Journal of Applied Ecology 19:361-370.

Enrollment into the MFL program is open to all private owners of forested land. To be eligible for the MFL program, a landowner must have a minimum of 20 acres of contiguous land and at least 80 percent of that land must be managed as productive forest land.

When a transmission line is constructed through a forest, the utility would likely remove all trees within that ROW at the time of construction, as well as during maintenance cycles for the life of that line. If the amount of productive forest falls below 80 percent (in MFL enrolled lands), the property could be dropped from the MFL program when the contract expires and the property owner may suffer a monetary loss. Participants in these forest programs along a transmission route would therefore be permanently affected by the line. Loss of MFL eligibility could also have a long-term adverse effect on recreation, since landowners that receive the largest property tax deferrals must also open their land to hunting, fishing, hiking, and cross-country skiing.

Properties in the project area that are enrolled in the MFL program that could be impacted by the proposed project are discussed in Sections 6.2.2, 7.2.2, 8.2.2, and 9.2.2.

4.6.2.4. Mitigation strategies

Impacts to forests can be minimized by a variety of strategies, including:

- avoid siting a new transmission line that fragments large, or significant, forest blocks;
- adjusting pole placement and span length to minimize the need for tree removal and trimming along forest edges;
- allowing compatible tree and shrub species to grow within the ROW, particularly along the edge of a forest;
- implementing an IVM program accredited by the ROWSC during vegetation maintenance cycles[215]; and
- following DNR guidelines for preventing the spread of exotic invasive plant species, diseases such as oak wilt, and insect pests.

4.6.3. Grassland resources

Grassland resources are defined in the PSC application filing requirements as any undeveloped landscape dominated by herbaceous (non-woody) vegetation. The applicants were asked to describe the grasslands that would be impacted by the proposed project for each proposed route segment, including the type of grassland (prairie, pasture, old field, etc.), dominant species, ownership (private versus public), and use (agricultural, non-productive agricultural, recreation, natural area, etc.). The applicants were also requested to provide specific details for mitigating or minimizing construction impacts in and around grasslands.

One of the most important types of grasslands that may be impacted by construction of the proposed project are prairies. Remnant prairie habitat may exist within and adjacent to the project area. These areas can be vital habitat for local and rare pollinator and plant species. In recent years, due to the measured decline of pollinator populations worldwide local and national strategies to promote the health of honeybees and other pollinators have been created. Significant losses of these pollinators could threaten agricultural production and native plant communities. Utility ROW has been identified as a potentially key component in the successful implementation of strategies to promote pollinators. The ROW within this project corridor may contain many native prairie species that are vital to local pollinator populations. Refer to Section 4.6.8.3 for more information on pollinators. If managed and restored appropriately, early successional landscapes and linear corridors that are created and maintained through utility vegetation

[215] Refer to Section 4.3.7.2 and Appendix E for more information on IVM.

management activities could have a strong, positive effect on native pollinator diversity and local abundance. Refer to Sections 4.3.7 and 4.6.5 for more information on vegetation management and early successional communities.

Construction has the potential to affect grasslands in numerous ways. Permanent impacts may result from the placement of transmission structures. Permanent changes could also occur to soil characteristics and plant communities resulting from construction activities. Temporary impacts may result from disturbance around the structure or guy-wires during construction, maintenance, and vegetation management activities within the ROW.

4.6.3.1. Mitigation strategies

Several measures can be taken by the applicants to avoid or mitigate impacts to grassland resources. Disturbance in prairie areas should be minimized or avoided. Prairie areas that are disturbed should be restored with appropriate native seed mixes and monitored to ensure successful establishment. The applicants' revegetation plan is introduced in Section 4.3.6.1.

The applicants can avoid the spread of invasive species by following the appropriate BMPs, as discussed in Section 4.6.4.2. Botanists and ecologists should be available to monitor prairie areas during construction work to ensure rare and sensitive species are avoided and impacts are minimized. In order to reduce impacts to areas that may host prairie communities, the applicants should avoid placing structures and spoils where sensitive plant species are present. They should also utilize low-pressure tires on construction equipment to minimize ground disturbance in prairie areas. Another method the applicants can use to avoid impacts to grassland resources involves time of year restrictions. Since ROW clearing during the growing season is extremely impactful to grassland resources, this impact could be mitigated by clearing during the winter months when vegetation is dormant.

4.6.3.2. Grasslands in the project area

The application for the proposed project states that grassland resources identified within the project area include prairies, roadsides, as well as pastures and fallow fields associated with farm operations. The applicants state that most of these resources occur in the cleared areas of the existing transmission line corridors. These are generally along roadside areas and embankments, pastures and fallow fields associated with farm operations, and some native or restored prairies. Within the project area, they note the presence of the Southwest Wisconsin Grassland and Stream Conservation Area (SWGSCA), which is a joint project of DNR and other partners whose goal is to conserve and enhance functioning grassland, savanna, and stream ecosystems.[216]

Grasslands along the routes were quantified as part of the applicants' impact analysis. Acreages for grasslands were provided in the land cover table in their application, Appendix B, Table 2[217] and their response to Data Request 3.1.[218] Grasslands areas were described in Table 2A and 2B of the DNR Environmental Inventory Table in Appendix F.[219]

During the EIS scoping phase of the Commission's review process, several comments received from the public mention a concern about the negative impacts that the project would have to grasslands. These comments specifically mention the potential for negative impacts to threatened plant species and

[216] Feasibility Study, Master Plan and Environmental Impact Statement for the Southwest Wisconsin Grassland and Stream Conservation Area. Accessed at: https://dnr.wi.gov/topic/Lands/Grasslands/documents/SWGFeasStudy.pdf
[217] PSC REF#s: 341451, 341452, 341453
[218] PSC REF#: 349960
[219] PSC REF#: 341436

grasslands as important habitats for animals. Impacts to grasslands on each of the proposed route alternatives are described in greater detail in the Sections 6.2.3, 7.2.3, 8.2.3 and 9.2.3.

4.6.4. Invasive species

Non-native plants, animals and microorganisms found outside of their natural range can become invasive. Many non-native species are harmless because they do not reproduce or spread abundantly in their new surroundings. Some non-native species have been introduced intentionally, such as Norway maple for landscaping and ring-necked pheasants for hunting. However, a small percentage of non-native species are able to quickly establish, are highly tolerant of a wide range of conditions, and become widely dispersed. The diseases, predators, and parasites that kept their populations in check in their native range may not be present in their new locations. Over time, non-native invasive species can overwhelm and eliminate native species subsequently reducing biodiversity and negatively affecting ecological communities.

Human actions are the primary means of invasive species introductions. Transmission line construction causes disturbance of ROW soils and vegetation through the constant movement of people and vehicles along the ROW, access roads, and laydown areas. These activities can contribute to the spread of invasive species. Parts of plants, seeds, and roots can contaminate construction equipment and essentially "seed" invasive species wherever the vehicle travels. Infestation of invasive species can also occur during periodic transmission ROW maintenance activities, especially if these activities include mowing and clearing of vegetation. Once introduced, invasive species will likely spread and impact adjacent properties along the ROW.

Construction of a transmission line could have the potential to introduce or spread aquatic invasive species if work or access were to occur in streams or lakes below the ordinary high water mark (OHWM). Wetlands and waterways can host invasive species that can be more difficult to observe than many invasive plants. If any equipment, boats, or tools that would be used for the project contained aquatic invasive species, including eggs, the species could be spread into a waterbody that is currently free from the pest. Avoiding placing equipment into water resources or equipment inspection and disinfection can be used to control the spread of these species and can be more effective than attempting to eradicate a species once it has established.

4.6.4.1. Wis. Admin. Code ch. NR 40

In September, 2009, Wis. Admin. Code ch. NR 40[220] established a classification system for invasive species as either restricted or prohibited.

- **Restricted**: invasive species that DNR, at the time of listing, has determined is already established in the state (or in that region of the state where the species is listed) that causes or has the potential to cause economic or environmental harm or harm to human health. Statewide or regional eradication or containment may not be feasible.
- **Prohibited**: invasive species that DNR, at the time of listing, has determined is likely to survive and spread if introduced into the state, potentially causing economic or environmental harm to human health. Currently, this species is not found in the state (or in that region of the state where the species is listed), with the exception of isolated individuals, small populations, or small pioneer stands of terrestrial species; or in the case of aquatic species, that are isolated to a specific watershed in the state or the Great Lakes. Statewide or regional eradication or containment may be feasible.

[220] Retrieved at https://dnr.wi.gov/files/pdf/pubs/ss/ss1160.pdf.

NR 40 prohibits certain activities that result in the spread of invasive species and establishes preventive measures to assist in minimizing the spread of invasive species. In 2015, NR40 was updated to include new species and current information on what species are restricted or prohibited in the state.[221] The applicants are required to comply with the regulations in Wis. Admin. Code ch. NR40 and are encouraged to follow preventative actions to limit the spread of invasive species throughout approved ROWs.

4.6.4.2. Best Management Practices

To better address the control of invasive species an Advisory Committee for the Wisconsin Council on Forestry (Council) was formed and involved representatives from public and private organizations including highway departments, electric and gas utilities and pipelines, and state technical staff. In 2010, the Council produced the "Invasive Species Best Management Practices (BMP) for Transportation and Utility Rights-of-Way."[222] This manual identifies effective and realistic voluntary practices that can be integrated into ROW construction and maintenance (i.e. post-construction) activities.

4.6.4.2.1 Construction BMPs

The BMP manual identifies many methods that can be used during construction to limit the introduction and spread of invasive species. These measures include:

- Prior to the start of construction, survey and mark locations of invasive species so they can be avoided during construction.
- Prior to the start of construction, remove or control isolated populations of invasive species.
- Schedule construction activities during periods of the year when invasive species are less likely to be encountered or spread.
- Choose construction access points and staging areas so that ground disturbances are minimized.
- Properly dispose of woody material from ROW clearing to avoid and/or minimize the spread of invasive species.
- Clean equipment that may have come in contact with invasive species so they are not spread.
- Properly dispose of soils, seeds, plant parts, or invertebrates found during inspection and cleaning.
- Use soil and aggregate material from sources free of invasive species.
- Use effective erosion control and stormwater management practices to stabilize exposed soils, as soon as possible.
- Use non-invasive or native seed cover crops for the re-vegetation of areas disturbed by construction activities.

4.6.4.2.2 Post-construction BMPs

If construction measures are not effective in controlling the introduction and spread of invasive species, post-construction (i.e. maintenance) activities might be required, with the permission of the landowner. Sensitive areas such as wetlands and high-quality forests and prairies should be surveyed for invasive species following construction and site re-vegetation. If new infestations of invasive species are discovered, then measures should be taken to control the infestation. Each exotic or invasive species requires its own protocol for control or elimination. Techniques to control exotic/invasive species include the use of pesticides, biological agents, hand pulling, controlled burning, and cutting or mowing. When necessary, DNR should be consulted to determine the best methods for control or elimination of

[221] Retrieved at https://dnr.wi.gov/topic/Invasives/documents/NR40plantlist.pdf.
[222] Retrieved at https://councilonforestry.wi.gov/Pages/InvasiveSpecies/RightsOfWay.aspx.

encountered invasive species. Refer to Section 4.3.7.1 regarding information on herbicides that could be used to effectively control invasive plant species within utility ROWs.

4.6.4.3. Invasive species in the project area

ATC had access to some, but not all areas of the proposed project during the planning stage. Where ATC had access to proposed routes during the growing season of 2017, observations of invasive plant species were noted. The general location and species observed were added to an overall evaluation of the risk of spreading invasive species, pests, or diseases as a result of project construction activities. Wetland delineations and vegetation mapping tasks were the source of most of these observations. A targeted survey of project routes to identify invasive species was not done.

It is helpful to know what species have been observed in a project area prior to starting construction work to plan appropriate BMPs. The applicants state in the application that additional evaluation of invasive species in the project ROW would be done if the project is approved and a route selected.

Most invasive plants observed in the proposed project area fall into the "Restricted" category under Wis. Admin. Code ch. NR 40 with only one "Prohibited" invasive plant species was observed. The application states that the following "Restricted" invasive plant species were identified across the whole project area:

- Autumn olive (*Elaeagnus umbellata*)
- Black Locust (*Robinia pseudoacacia*)
- Canada thistle (*Cirsium arvense*)
- Cattail (*Typha angustifolia, T. X glauca*)
- Common buckthorn (*Rhamnus cathartica*)
- Crown vetch (*Coronilla varia*)
- Curly-leaf pondweed (*Potamogeton crispus*)
- Dame's rocket (*Hesperis matronalis*)
- Garlic mustard (*Alliaria petiolata*)
- Honeysuckle (*Lonicera maackii, L. morrowii, L. tatarica*)
- Japanese barberry (*Berberis thunbergii*)
- Japanese hedgeparsley (*Torilis japonica*)
- Leafy spurge (*Euphorbia esula*)
- Multiflora rose (*Rosa multiflora*)
- Oriental bittersweet (*Celastrus orbiculatus*)
- Poison hemlock (*Conium maculatum*)
- Russian olive (*Elaeagnus angustifolia*)
- Spiny plumeless thistle (*Carduus acanthoides*)
- Spotted knapweed (*Centaurea biebersteinii*)
- Tansy (*Tanacetum vulgare*)
- Teasel (*Dipsacus fullonum, D. laciniatus*)
- White mulberry (*Morus alba*)
- Wild parsnip (*Pastinaca sativa*)

In addition, the "Prohibited" species, Eurasian manna grass (*Glyceria maxima*), was observed in wetlands and waterways on the Eastern-South route, more specifically on Segment Q.

The restricted species observed are commonly found in road ROWs, brownfield sites, agricultural edges, and other areas that have development pressures or access corridors for plant dispersal.

ATC states that it would comply with Wis. Admin. Code ch. NR 40 and Commission requirements by implementing BMPs when encountering listed invasive species. The DNR and other stakeholders developed this list of standard BMPs to avoid and minimize the spread of listed species. The BMPs would vary throughout the ROW based on the degree of invasiveness, severity of the current infestation, and susceptibility of non-infested areas to invasion.

BMPs stated in the application include:

- Avoidance through construction timing and alternate access;
- Proper management of construction vehicles and materials, including construction matting (i.e., storage, cleaning);
- Minimizing ground disturbance;
- Placing a barrier between construction vehicles and plants (i.e., construction matting);
- Proper storage and disposal of plant materials;
- Promoting native regeneration;
- Leaving cut vegetation on site where it is cut.

Additional evaluation would be conducted to further identify where site specific BMPs are appropriate based on vegetation observed and construction activities. Any work that would use herbicides to treat an invasive plant infestation would use certified pesticide applicators and herbicides registered and labeled by the US EPA according to product label requirements.

The project area is also home to a range of plant pests that could affect trees and forestry operations such as Oak wilt, Emerald ash borer, and gypsy moths. See Section 4.6.2 for more discussion on these potential impacts to forests. ATC states that standard BMPs to reduce the spread of these plant pests would be used during tree clearing operations. These BMPs include avoiding impacts to oak trees from April 1-July 15, and following guidelines to avoid spreading emerald ash borer and gypsy moths by leaving cut vegetation on site when possible.

4.6.5. Vegetation assets and early successional communities in utility ROWs

Once established, electric utility ROWs are considered permanent features within the landscape. The vegetative communities found within electric utility ROWs should be considered assets to transmission owners, as the quality of these vegetative communities can substantially affect the cost, effort, and impact of vegetation management practices conducted throughout the life of the transmission facilities.

The type and quality of the ecological communities found within electric utility ROWs are influenced by a multitude of variables, driven and reset by disturbance (e.g. vegetation management). Due to the cyclic and potentially substantial disturbances caused by vegetation clearing and management practices in utility ROWs, these areas are commonly dominated by early successional communities.

Communities in early stages of succession are dominated by fast-growing, opportunistic, pioneer species that include weeds[223] and non-native invasive species. As succession continues, these species are replaced

[223] The most common definition of a weed is a plant growing where it is not wanted. Weed scientists have more recently recognized weeds as plants that are especially successful at colonizing and maintaining their abundance under conditions of repeated disturbance. Accessed at: http://ipm.montana.edu/cropweeds/documents_cropweeds/extension/Integrated%20strategies%20for%20managing%20agricultural%20weeds-%20MT200601AG.pdf

by those that are longer lived, produce fewer offspring, and require a unique association of variables to survive (i.e. vulnerable to ecological change driven by disturbance). This process ultimately leads to a more stable association of species, often characterized as a climax (stable) community that requires little maintenance. In the Midwest, if early successional plant communities are not actively managed, burned, mowed, or grazed, woody species will invade and eventually become the dominant vegetation type.[224]

Early successional habitats have received an increasing amount of attention in the past few decades. Many studies have been conducted to increase our understanding of the unique ecological benefits of this declining resource. Early successional habitats are naturally occurring and are typically considered a temporary phase of ecosystem development. These habitats/communities occur immediately following a disturbance where the vegetation is attempting to recover and recolonize. These post-disturbance ecosystems are rich in biological legacies that provide resources that attract and sustain high species diversity. Early successional communities have highly productive plant species, complex food webs, large nutrient fluxes, and high structural and spatial complexity[225]. Different disturbances influence the resultant physical and biological conditions of the ecological community, thus affecting subsequent successional pathways.

An example of this can be seen in electric utility ROWs that were previously forested, or are adjacent to forested areas. It is common for adventitious tree seedlings to exploit and quickly colonize a newly disturbed area, especially following a mast-year[226]. Large-scale nonselective vegetation management practices clear large areas in the ROW providing an optimal environment for tree seedling colonization. After a few years, if managed poorly or left unmanaged, this community could become a dense thicket of seedlings/saplings that require a significant amount of effort to remove. This often results in another round of large-scale nonselective management that sets the community back to where it started, exposing the soil again for the next wave of colonization by incompatible species.

When managed correctly, early successional communities harbor a diverse set of species that are compatible with the high-voltage transmission lines and can require minimum effort (cost) to maintain. However, if managed through suboptimal practices early successional communities can easily and quickly become dominated by incompatible species that require a significant amount of expense and effort to maintain. Every time the vegetative community in a ROW is significantly disturbed (i.e. reclaimed), the amount of time it takes to create a ROW dominated by compatible species increases.

In addition to providing an economic benefit to transmission owners, early successional habitats within ROWs provide a variety of ecological benefits such as food, cover, nesting, and breeding grounds for birds, mammals, amphibians, and insects. Early successional habitats are highly productive biological systems. The high level of reproduction among the plant species competing to recolonize the area results in an abundant source of food for wildlife in the form of pollen, seeds, fruits, nuts, and berries.[227] This is

[224] Kettle et al. 2006. Land-use history in ecosystem restoration: a 40-year study in the prairie-forest ecotone . Restoration Ecology, 8(3), 307-317. Accessed at: https://s3.amazonaws.com/academia.edu.documents/46601523/j.1526-100x.2000.80043.x20160618-12541-boeeq5.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3AandExpires=1549575118andSignature=uJTVF3XSL8%2BGGpEp3E5kxUzg7ME%3Dandresponse-content-disposition=inline%3B%20filename%3DLand-Use_History_in_Ecosystem_Restoratio.pdf.

[225] Swanson, M.E., Franklin, J.F., Beschta, R.L., Crisafulli, C.M., DellaSala, D.A., Hutto, R.L. Lindenmayer, D.B., and Swanson, F.J. 2011. The forgotten stage of forest succession: early-successional ecosystems on forest sites. Frontiers in Ecology and the Environment. 9(2), 117-125.

[226] A phenomenon when the fruit (mast) produced by trees in a given year is exponentially higher than average. This event often occurs on a cyclic scale; for example red oaks can have mast years every 2-5 years.

[227] NRCS Wildlife Habitat Council. 2007. Early Successional Habitat. Fish and Wildlife Habitat Management Leaflet No.41, NRCS.

particularly important for pollinator species, such as the honey bee and the monarch butterfly, which are both experiencing significant population declines and are of national concern.[228]

In addition to providing early successional habitat, ROW corridors connect essential and sometimes distant resources. The following list provides an overview of the various uses and benefits of early successional habitat within electric utility ROW corridors:

- Increased mobility between isolated populations.
- Linkage between spatially separated populations can result in increased genetic variability (i.e. access to a wider gene pool).
- Brushy areas and thickets, when allowed to remain in the ROW, provide escape cover from predators.
- Access to nesting and feeding areas.
- Some moths and butterflies (such as the federally endangered Karner Blue Butterfly), depend on specific host or forage plants predominately found in early successional habitats to complete their life cycle.
- The lack of a forest canopy allows sunlight to penetrate to the ground, benefiting reptiles that depend on external heat sources
- Provides a valuable pollen source for pollinating insects such as the honey bee and monarch butterfly.

Often categorized a business asset, utility vegetation management programs are commonly driven by engineering and economic principles, limitations, and motivations that do not directly account for the ecological processes in utility ROWs, including but not limited to, succession, competition, species interaction, non-human disturbance events, and edge effects. Utility vegetation managers are expected to manage an asset (biological system) that is predictably unpredictable. The potential quality and the time it takes to achieve a vegetative community dominated by compatible species in an electric utility ROW that effectively competes with the germination and growth of incompatible tree species largely reflects the vegetation management practices employed by the transmission owner.[229] Additional information on vegetation management practices, including integrated vegetation management, can be found in Section 4.3.7.2 and Appendix E.

4.6.6. Waterways

Waterways in the form of creeks, streams, rivers, and lakes are abundant throughout Wisconsin. Many of the rivers have been designated as special resources that have state, regional, or national significance.

Certain waters of the state possess significant scientific value and are identified by DNR as Areas of Special Natural Resource Interest (ASNRI) for their protection (Wis. Admin. Code § NR 1.05). ASNRI-identified waters include:

---

[228] The status of the monarch butterfly is currently under review by the USFWS for proposed species listing (Federally Threatened) under the Endangered Species Act. Honey bees, monarchs, and other pollinators are included as species of concern under the National Strategy to Promote the Health of Honey Bees and Other Pollinators (Presidential Policy Initiative 2015).

[229] VanDruff, L.W. 2002. Site-specific and landscape-level effects of ROW vegetation management on songbird communities. Volney-Marcy electric transmission line vegetation management project: Study No. 6. p. 170. In National Grid. 2010. Transmission right-of-way management program. 252 pp. Retrieved at http://www.fws.gov/northeast/nyfo/es/NG%20HCP%20Appendices/HCP%20App%20D.Part%2084%20Full%20Document%20Final.pdf.

- State natural areas (Wis. Stat. §§ 23.27 through 23.29);
- Trout streams (Wis. Admin. Code § NR 1.02(7));
- Outstanding resource waters (ORW) or exceptional resource waters (ERW) (Wis. Stat. § 281.15);
- Waters or portions of waters inhabited by an endangered, threatened, special concern species or unique ecological communities identified in the NHI;
- Wild rice waters as identified by DNR and the Great Lakes Indian Fish and Wildlife Commission;
- Waters in areas identified as special area management plan or special wetland inventory study (Wis. Admin. Code § NR 103.04);
- Waters in ecological significant coastal wetlands along lakes Michigan and Superior as identified in the coastal Wetlands of Wisconsin;
- Federal or state waters designated as wild or scenic rivers (Wis. Stat. §§ 30.26 and 30.27).

There are approximately 10,000 miles of trout streams in Wisconsin categorized as Class 1, 2, or 3 trout streams. A description of these trout streams are included in Table 4-8.

Table 4-8 Classification of trout streams in Wisconsin

Trout Stream Classification	Description
Class 1	High-quality trout streams (Class 1) have sufficient natural reproduction to sustain populations of wild trout, at or near carrying capacity. These streams are often small and may contain small or slow-growing trout, especially in the headwaters. Approximately 40 percent of the trout streams are Class 1 trout streams.
Class 2	Class 2 trout streams may have some natural reproduction but not enough to utilize available food and space, and stocking is required to maintain a desirable sport fishery. However, these streams have good survival and carryover of adult trout, often producing some fish larger than average size. Class 2 trout streams comprise about 45 percent of Wisconsin's total trout stream mileage.
Class 3	Class 3 waters are marginal trout habitat with no natural reproduction occurring. They require annual stocking of trout to provide trout fishing. Generally, there is no carryover of trout from one year to the next. Class 3 trout streams comprise 15 percent of Wisconsin's total trout stream mileage.

Degradation of trout habitat can be caused by siltation from erosion, decreased groundwater flow from irrigation, drained wetlands, and poor watershed management. High oxygen demand from organic pollution, channelization, cattle grazing, and increased temperatures from both man-made (*i.e.* stormwater discharges) and natural sources are other common causes of trout habitat deterioration. State laws protect trout streams from pollution and other harmful effects.

ORWs and ERWs are characterized as being valuable or unique for various features including fisheries, hydrology, geology, and recreation. Regulations require that these shall not be lowered in quality without good justification. By assigning these classifications to specific streams, high quality waters receive additional protection from point source pollution. Of some 42,000 stream/river miles in the state, over 3,000 stream miles or approximately 8 percent have been designated as ORW and more than 4,500 stream miles or approximately 11 percent have been designated as ERW. Of Wisconsin's 15,000 lakes and impoundments, 103 are designated as ORW.

Construction and operation of transmission lines across waterways may have both short-term and long-term impacts. The type and significance of the impact is dependent on the characteristics of the waterway and the overall design of the transmission facilities. Physical features of the waterway are considered when assessing potential impacts to water quality, water quantity, habitat, recreational use, and the scenic quality of the waterway.

Water quality can be impacted not only by work within a waterway, but also by nearby construction activities such as grading and vegetation clearing. The removal of adjacent vegetation can cause water temperatures to rise and negatively affect aquatic habitats, especially cold-water systems. It can also increase erosion of adjacent soils, causing sediment to be deposited into the waterway. Construction often requires the building of temporary bridges that can impact navigation and, if improperly installed, may damage banks and cause erosion, or be overtopped or dislodged, and back up water. Structures placed within the waterway can also obstruct navigation and impact water flow. Overhead transmission lines may also have an aesthetic impact on the natural scenic beauty of the waterway. Transmission facilities may also pose a potential collision hazard for waterfowl and other large birds, especially when located in a migratory corridor. Recreational use such as sight-seeing, boating, fishing, or bird watching could be adversely affected by new transmission facilities.

4.6.6.1. Mitigation strategies

Techniques for minimizing adverse effects of constructing transmission lines in or near waterways include:

- Siting, or rerouting the existing line, away from the waterway;
- Adjusting overhead structure placements to completely span the waterway;
- Using alternative access for vehicles and equipment to avoid needing to cross the waterway;
- Using DNR-approved sediment and erosion control BMPs;[230]
- Using alternative construction methods such as a helicopter construction;
- Landscaping to screen the structures from the view of river users;
- Maintaining shaded stream cover; and
- Avoiding the use of herbicides near waterways, or utilizing herbicides approved for use in aquatic environments.

The use of properly designed temporary bridges avoids the necessity of driving construction equipment on the bed of waterways. An example of a temporary bridge is provided in Figure 4-29. Temporary bridges typically consist of timber mats placed across the waterway to allow equipment traffic to cross waterways. Temporary bridges should be located to avoid unique or sensitive portions of these waterways, (*e.g.*, riffles, pools, spawning beds, etc.). They span from top-of-bank to top-of-bank and may include a support structure under the bridge, if needed, which is placed on the bed of the waterway, to support heavy vehicle use on the bridge. Bare soils within the riparian zone (within 100 feet of the stream channel) should be seeded and mulched immediately after disturbance.

[230] DNR Storm Water Construction Technical Standards retrieved at: https://dnr.wi.gov/topic/stormwater/standards/const_standards.html

Figure 4-29 Example temporary bridge at a stream crossing

Proper DNR-approved sediment and erosion control BMPs[231] are necessary for all construction activities, especially those that may affect water resources. BMPs should be employed before, during, and after construction of the project to reduce the risk of excess siltation into streams. This includes using appropriate BMPs during the installation, use, and removal of temporary bridges. BMPs must be regularly inspected and maintained throughout the construction phase of a project until exposed soil has been permanently stabilized.

Any in-water work and placement and removal of temporary bridges cannot occur during the fish spawning timing restriction period (March 1 to June 15 for non-trout streams and September 15 to May 15 for trout streams), unless the local DNR Fisheries Biologist reviews the proposal and determines that these timing restrictions can be waived.

Forested and shrub areas along waterways provide a valuable buffer between adjacent land uses, such as agricultural activities, as well as natural corridors for wildlife movement. The vegetation in the riparian zone maintains soil moisture levels in waterway banks, helps stabilize the banks, filters nutrient-laden sediments and other runoff, maintains cooler water temperatures, and encourages a diversity of vegetation and wildlife habitats. The removal of vegetative buffers from riparian zones can raise the water temperature, which can be harmful to cold water systems. Existing vegetative buffers should be left undisturbed whenever possible, or vegetation clearing should be kept to a minimum in riparian zones. For areas where construction impacts cannot be avoided, low-growing native tree and shrub species should be allowed to regrow and/or should be replanted so as to maintain the pre-construction condition of the banks and to minimize impacts to water quality. The removal of trees along waterways release the canopy

231 DNR Storm Water Construction Technical Standards retrieved at: https://dnr.wi.gov/topic/stormwater/standards/const_standards.html

and may encourage the growth of early successional species like box elder and willow or invasive plant species. These species can attract beavers to that reach of the waterway, as they prefer early successional trees and shrubs for food. Active management of vegetation should occur to avoid attracting beaver. Vegetation disturbance along the waterway can also lead to the infestation by invasive and nuisance species.

4.6.6.2. Permitting

DNR is responsible for regulating impacts to navigable waterways and waterbodies under Chapter 30, Wisconsin Statutes, and Wisconsin Administrative Code. Some of the state legal protections and permitting requirements for activities affecting public waterways include, but are not limited to:

- Wis. Stat. § 30.12 and NR 329, Wis. Admin. Code, requires permits for structures placed on the bed of navigable waters;
- Wis. Stat. § 30.123 and NR 320, Wis. Admin, Code, requires permits for bridges placed over public waters and culverts placed within navigable waters;
- Wis. Stat. § 30.20 and NR 345, Wis. Admin. Code, requires permits for removing material from the bed of navigable waters;
- Wis. Stat. § 30.29 prohibits the operation of motor vehicles in navigable waters unless it qualifies under one of the exemptions or is approved through a permit authorization.

Wisconsin Stat. § 30.025 describes DNR process for reviewing and permitting utility projects that require authorization from the Commission and DNR. DNR participates in the joint review process with the Commission, as detailed in Wis. Stat. § 30.025, with respect to wetlands, navigable waterways, and stormwater management.

The U.S. Army Corps of Engineers (USACE) and/or U.S. Fish and Wildlife Service (USFWS) might also require additional permits and approvals. Some of the federal legal protections and permitting requirements for activities affecting waters include, but are not limited to:

- 33 USC § 403 Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any navigable waters of the U.S.
- 16 USC §§ 1271-1287 prohibit federal agencies from authorizing a water resources project that would have a direct and adverse effect on the values for which a river protected by the Wild and Scenic Rivers Act was established.

CPCNs granted by the Commission are often contingent upon an applicant's ability to secure all necessary permits from state and federal agencies. Likewise, any permit granted by DNR or USACE could be contingent on the implementation of all mitigation procedures ordered by the Commission in its CPCN authorization.

4.6.7. Wetland resources

Wetlands provide vital functions that benefit society. Wetlands detain storm water runoff, enabling the slow recharge of groundwater resources and lowering downstream peak flood levels. Wetlands filter sediments and pollutants from the air, precipitation, and upstream sources which results in higher water quality downstream. Wetlands provide food, cover, and nesting habitat for many species of fish and wildlife. It is estimated that between one-quarter and one-third of all rare species in Wisconsin are found in wetlands.

Wisconsin has lost almost 50 percent of its original 10 million acres of wetlands. Avoidance and minimization of impacts to wetlands followed by proper mitigation is necessary to preserve the remaining 5.3 million acres of Wisconsin wetlands.

There are many different types of wetlands, typically characterized by the type of vegetation and amount of soil saturation or surface water found within them. Some example wetland types are identified in Table 4-9 below.

Table 4-9 Types and descriptions of wetlands often found in Wisconsin. This is not a complete list of all wetland habitats found in Wisconsin.

Type of Wetland	Description
Wetland meadows	Consist primarily of grasses and sedges and are typically only saturated for only a portion of the year.
Marshes	Consist primarily of reeds and cattails and typically contain areas of permanent open water that can vary in depth.
Shrub-carr	Support a dominance of shrubs, such as willows, alders, or dogwood, and may or may not have any open water.
Coniferous swamps and bogs	Consists primarily of tree species such as tamarack, cedar, and black spruce and occur in many isolated low-lying areas in northern Wisconsin. These swamps are particularly sensitive to disturbance because conditions do not support rapid growth or recruitment.
Hardwood swamps	Consist primarily of tree species such as black ash, black willow, elm, silver maple, and red maple and tend to occur along creeks, rivers, and streams throughout southern Wisconsin. They are also highly sensitive to disturbance because they take significant time to grow and mature.
Calcareous fens	These wetlands are one of the rarest wetland plant communities in Wisconsin. They are directly fed by calcium-rich groundwater and often have a disproportionate number of rare, threatened, and endangered plant species that can tolerate alkaline soil conditions.

Certain wetlands are considered particularly sensitive if they are within the boundary of an ASNRI waterway or have a direct hydrologic connection to an ASNRI waterway (Wis. Admin. Code § NR 103.04). Sensitive wetlands include wetlands that are part of:

- Cold water communities including all trout streams and their tributaries and trout lakes;
- Lakes Michigan and Superior and the Mississippi River;
- State- and federally-designated wild and scenic rivers, designated state riverways, and state designated scenic urban waterways;
- Environmentally sensitive areas or environmental corridors identified in an area-wide water quality management plan, special area management plan, special wetland inventory study, or an advanced delineation and identification study;
- Calcareous fens;
- Habitats used by state- or federally-designated threatened or endangered species;
- State parks, forests, trails, and recreation areas;
- State and federal fish and wildlife refuges and fish and wildlife management areas;
- State- and federal-designated wilderness areas;
- State natural areas;
- Wild rice waters;
- ORW's and ERW's.

Construction and maintenance of transmission lines can impact wetland functional values, or can cause wetlands to be converted into another wetland type. The degree and nature of impacts to wetlands depend on factors such as the type of wetland, quality of the wetland, ground conditions at the time of construction, and the type and duration of construction activities. Short-term wetland impacts can become long-term impacts if the construction phase is not well managed, or if restoration techniques are not properly applied.

Examples of long-term impacts include the loss of wetland acres due to the placement of transmission structures in wetlands, the unintended spread of invasive species due to inadequate cleaning of construction equipment, the conversion of forested wetland complexes to herbaceous dominated wetland complexes, and the fragmentation of wetland types.

Certain wetland types are more susceptible to long-term impacts due to transmission line construction. They can have a more fragile habitat (such as a calcareous fen) that is difficult to re-create, or the requirements of the ROW prevent full mitigation efforts. Forested wetlands are an example of a type of wetland that can never fully recover from the construction process. Line construction and future maintenance operations require that transmission ROWs be maintained free of trees. Following construction of the line, the forested wetlands would be remediated as wet meadows with full sun. This permanently changes the vegetation and species diversity of the wetland in the ROW.

More in-kind recovery is probable for deciduous shrub-scrub wetlands (supporting willows, alders, and sedges) and wet meadows.[232] In a 10-year study of three wetland types following construction of a transmission line in Massachusetts, species diversity and richness were similar to pre-construction levels within one year in a cattail marsh but damage was still apparent after ten years in a bog dominated by leatherleaf shrubs and sphagnum moss.[233]

Heavy machinery used for construction can crush wetland vegetation and damage wetland soils, causing soil compaction, rutting, and soil mixing. Soil compaction reduces the water-holding capacity of the soil and may result in increased runoff. Wetland soils consist of primarily organic matter (decomposed plant material) which forms very slowly. If disturbed by digging, filling, and compaction, these soils do not readily recover and are not easily repaired.

Changes in hydrology (the vertical and horizontal movement of water through the soil) caused by trenching, drilling holes, de-watering soils, installing foundations, and compacting soils can alter the vegetation, reduce plant diversity, and promote the growth of invasive species. Driving equipment in wetlands can stir up sediments, endangering amphibians and other aquatic life. Hydrologic function can be further affected if fill is deposited in the wetland from clearing activities or for the construction of roads, bridges, and structures.

Large open water areas or wetlands with extensive organic matter emit methane, and may not fully freeze during winter months (a result of thermal loading). Construction during winter months in these environments can be dangerous and cause significant damage to the resource and the equipment. Ice and snow that may be used to construct roads may thaw from underneath, leading to equipment getting stuck, delays in construction sequencing, and the need to relocate access roads.

Another secondary effect is the potential spread of invasive species such as reed canary grass. These invasive species provide little food and habitat for wildlife and can outcompete native vegetation. Additional information on potential impacts from the spread of invasive species as a result of utility construction has been included in Section 4.6.4.

[232] Grigal, D. F. 1985. Impact of Right-of-Way Construction on Vegetation in the Red Lake Peatland, Northern Minnesota. Journal of Environmental Management. 9(5): pp. 449-454.
[233] Nickerson, N. H., R.A. Dobberteen, and N.M. Jarman, 1989. Effects of Power-Line Construction on Wetland Vegetation in Massachusetts, USA. Journal of Environmental Management. 13(4): pp. 477-483.

4.6.7.1. Mitigation strategies

All attempts should first be made by the applicants to avoid impacting wetlands. For example, impacts to wetlands can be avoided by:

- Routing the transmission line away from wetlands or the edges of wetlands;
- Adjusting structure placements to span wetlands or limit equipment access in wetlands, wherever possible;
- Using DNR-approved erosion control methods on adjacent lands;
- Siting off-ROW access roads, laydown yards, and staging areas outside of wetlands.

Where complete wetland avoidance is not possible due to engineering constraints, existing infrastructure, or other factors, wetland impacts should be minimized as much as possible.

Construction methods that can reduce impacts to wetlands include:

- Conducting construction activities when wetland soils and water are frozen or stable and vegetation is dormant;
- Using construction matting and wide-track vehicles to spread the distribution of equipment weight when crossing wetlands during the growing season or when wetlands are not frozen;
- Using alternative construction methods and equipment such as helicopters, marsh buggies, and vibratory caisson foundations;
- Careful cleaning of construction equipment and mats after working in areas infested by invasive species;
- Using vibratory caisson foundations that eliminate the need for concrete or other fill.

Construction matting (see Figures 4-30 and 4-31) can provide a safe, stable work surface and travel lane for equipment during transmission line construction. Mats provide protection by spreading the weight of the equipment over a broader area to reduce compaction and prevent deep ruts from forming. While the mats may cause some depression of the underlying soils and crushing of the perennial vegetation, this impact is typically less than if matting is not used. Matting generally preserves native plant rootstocks so that the pre-construction vegetation can reestablish more quickly after construction is completed.

Figure 4-30 Timber construction mats in a wet meadow wetland

Figure 4-31 Timber mats being placed in a forested wetland. Tracked vehicles and high flotation tires can be used in some instances in lieu of mats.

Alternative construction equipment such as marsh buggies and helicopters and alternative foundations can be used to further reduce the impact of construction in wetlands. Helicopters have been successfully used for the construction of the foundations, the erection of the towers, and for wire stringing as discussed in earlier in this chapter.

Ice roads can provide some of the same benefits as matting when used in wetlands. Ice roads are intended to create a stable surface for driving heavy equipment. They are usually created by clearing the initial layer of snow. This allows for frost to accumulate deep into the soil. A track vehicle (bombardier, bulldozer, etc.) is repeatedly driven across the ROW to drive the frost deeper into the soil. Sometimes the ROW can be flooded with water to provide an additional ice layer to the surface. Snow that falls on an ice road is usually cleared. However, compressing snow on top of the road can serve as insulation to keep the frost in the soil.

For construction projects which include the replacement and or removal of existing transmission structures in wetlands, structure types, construction timing, construction methods, and the wetland types are reviewed to determine the least impact to the resource. While the holes left in wetland soils normally close as the existing transmission structure is removed, it is sometimes more appropriate to cut the pole off at, or just below the ground surface. The utility may need permission from the landowner before leaving a pole stub in the ground. If a steel structure on a concrete foundation needs to be removed from a wetland, the concrete would be removed to a depth of about two feet and wetland soils from adjacent new foundation locations would be used to backfill the old foundation holes. The wetland soils would then be graded to approximate the original wetland contours.

4.6.7.2. Permitting

Local, state, and federal laws regulate certain activities in wetlands. When fill material is proposed to be placed in a wetland, a permit may be required from the USACE under Section 404 of the Clean Water Act (CWA).

Wis. Stat. § 30.025 describes DNR process for reviewing and permitting utility projects that require authorization from the Commission and DNR. DNR participates in the joint review process with the Commission, as detailed in Wis. Stat. § 30.025, with respect to wetlands, navigable waterways, and stormwater management. DNR must determine if the proposed activity is in compliance with applicable state water quality standards (Wis. Admin. Code Ch. NR 103 and 299). If the proposal is found to be in compliance with state standards, DNR issues a wetland fill permit and a water quality certification to the applicant.

The general process for obtaining a permit from the USACE is:

- The applicant submits a permit application to USACE.
- USACE determines its jurisdiction and reviews the project proposal according to federal guidelines, including consideration of potential impacts on wetlands, endangered species, cultural resources, and tribal trust concerns.
- If the proposed activity is in compliance with applicable federal standards, USACE issues a permit decision contingent on DNR providing water quality certification.

The DNR and USACE permit authorizations may allow for legal challenge of the decisions. The permit authorizations may include specific conditions requiring certain practices to be followed during project construction, as well as post-construction, in order to avoid and/or minimize potential impacts from the proposed project, as well as a compensatory wetland mitigation requirement for unavoidable wetland impacts resulting from project construction. Compensatory wetland mitigation involves the restoration, enhancement, creation, or preservation of wetlands. There are three avenues for satisfying compensatory mitigation requirements: wetland mitigation banking; the in-lieu fee program; or permittee-responsible mitigation. Before wetland permit authorizations are issued, DNR and USACE would determine if compensatory wetland mitigation is required. This process requires the applicants to submit a mitigation proposal that meets both state and federal requirements, which DNR and USACE review and make the final determination regarding the type and amount of compensatory mitigation credits required.

In addition to the protections for water resources provided by law that are described above, the Commission has the authority, in its final order, to require avoidance of specific streams or wetlands, mitigation procedures for specific streams or wetlands, and independent monitoring of construction in all or specific streams and wetlands.

4.6.7.3. Wetlands Reserve Program lands

Some properties in Wisconsin are enrolled in the Wetlands Reserve Program (WRP), a voluntary program overseen by the Natural Resource Conservation Service (NRCS) of USDA. Farmers are provided the opportunity to retire marginal agricultural lands and reap the economic and social benefits of having wetlands on their property. The program offers a landowner payment for restoring, protecting, or enhancing wetlands on the property in consultation with NRCS, USFWS, DNR, and local conservation districts.

The law allows the purchase of permanent easements, 30-year easements, or 10-year cost-share agreements (without an easement). The landowner maintains ownership of the land and is responsible for taxes on easement lands. Public access is not allowed unless desired by the landowner. Eligibility for enrollment into the program is granted according to: 1) duration of the easement offer; 2) hydrology restoration potential; 3) habitat value for migratory birds and other wildlife; 4) wetland functions and values; 5) location significance; 6) wetland management requirements; 7) physical site condition; and 8) overall cost. Applications with the most environmental benefits and least cost are selected.

After WRP easements are established, use of the land is limited to those uses that would not diminish or degrade the wetland values. WRP easements have significant restrictions. Acceptable uses may include hunting, fishing, timber harvesting, haying, or grazing, depending upon the situation. Cropping or other alterations that would harm the wetlands are not allowed. WRP easements or cost-share agreements do not necessarily prohibit the construction of a transmission line across a wetland. A biologist or the central NRCS office in Washington would likely decide if a proposed line or access road were a “compatible” land use. Landowners can make “compatible use” requests throughout the life of the easement or agreement.

4.6.8. Wildlife

4.6.8.1. Avian risk

If approved by the Commission, the Cardinal-Hickory Creek Project would be constructed through areas of known high bird use. It is thus warranted to review the reasonable range of transmission line configurations and structure types that affect the likelihood of bird collisions with transmission lines and the appropriate methods to proactively mitigate those impacts along specific segments of this project.

Bird collisions with electric lines can have significant ecological impacts because of bird injuries and death, particularly to protected species. Besides the state and federal protection afforded to rare bird species (Section 4.6.1.1), all migratory birds in North America are federally protected under the Migratory Bird Treaty Act of 1918 as amended because of their important role in global-scale ecology (Section 4.6.1.2). In a recent study, it is estimated that between eight million and 57 million birds are killed annually in the U.S.

by collisions with power lines.[234] These annual mortality rate estimates are second only to those of collisions with buildings (estimated at 365 to 988 million)[235] and exceed those for collisions with communication towers (estimated at 6.6 million)[236] and wind turbines (estimated at 573,000).[237]

Post-construction studies could be used to determine the risk of bird collisions with the new wires and whether additional preventive measures are warranted. In Chapters 6 to 9 of this EIS where proposed route alternatives could potentially cross IBAs, there is additional information regarding potential impacts to bird species and the range of alternatives that could mitigate this impact. IBAs are recognized as important refuges for congregations of large numbers of birds and bird species, for providing critical habitat during different phases of birds' life cycles, and are especially important for the protection of rare bird species (Section 4.6.1.2.2).

4.6.7.1.1. Mitigation strategies

Since the formation of the Avian Power Line Interaction Committee (APLIC) in 1989, the electric utility industry and USFWS have worked together to reduce avian mortality from electric lines. Over the years and as a result of much reseach, it has been determined that bird collisions with transmission lines cannot be eliminated but they can be reduced. APLIC has become a clearinghouse for the study of the causes of bird mortality as it relates to electric lines and the methods available to minimize the impact.

APLIC has identified specific biological factors that increase the risk for some birds to collide with transmission lines including, body size, weight, maneuverability, flight behavior, vision, age, sex, health, habitat, and habitat use. A critical factor in determining the level of transmission line collision risk is the frequency with which birds in flight typically cross a transmission line during commutes between their daily use areas. Environmental conditions such as inclement weather and visibility can also increase the risk of bird collisions.

According to APLIC, the following transmission line factors affect the potential for bird collisions with transmission lines:

- Structure height and line height and length
- Line configuration (the number of wire planes and their arrangement – horizontally or vertically)
- Line placement and orientation
- Visibility of lines

Thus, minimizing the risks to birds in known areas of high bird use, such as migratory bird concentration sites and IBAs, should include the following considerations as they relate to this project. Of primary importance is determining if the height of the proposed lines can be located at or below nearby trees; as birds typically gain height to avoid tree lines and would consequently avoid the transmission lines. Secondly, the structure types chosen for these areas should minimize as much as possible the vertical wire exposure zone. Transmission structures (i.e. H-frames) not only can be used to lower the height of the conductors but typically have only two wire planes, the conductors and the shield wire; whereas, delta-

[234] Loss, S.R., Will, T., Marra, P.P. 2014. Refining estimates of bird collision and electrocution mortality at power lines in the United States. PLoS ONE. 9(7): 1-10.
[235] Loss, S.r., Will, T., Marra, P.P. 2014. Bird-building collisions in the United States: estimates of annual mortality and species vulnerability. The Condor 116(1):8-23.
[236] Longcore, T., Rich, C., Mineau, P., MacDonald, B., Bert, D.G. et al. 2012. An estimate of mortality at communication towers in the United States and Canada. PLoS ONE. 7(4):1-17.
[237] Smallwood, K.S. 2013. Comparing bird and bat fatality-rate estimates among North American wind-energy projects. Wildlife Society Bulletin. 37:19-33.

configured structures can have four wire planes. The vertical distance of these wire planes is also significantly greater for delta-configured structures than H-frames. As to the issue of line placement and orientation, anticipated bird impacts vary based on the proposed route alternatives. And finally, line visibility can be enhanced through the installation of line marking devices such as bird flight diverters (BFDs), as mentioned in Section 4.6.1.5.

4.6.7.1.2. Avian risk in the project area

The applicants' provided a commissioned third-party review of avian risk along route segments proposed in the Cardinal-Hickory Creek project in Wisconsin[238]. This report is provided in Appendix F of this EIS. The report draws upon current knowledge of avian and transmission line interactions, as well as an analysis of the biological and environmental features within and adjacent to the project's proposed route segments that may influence avian risk. Results of the report were intended to be used by the applicants for project planning and considerations for risk mitigation strategies. The impacts evaluated in the report address avian electrocution and collision risk from the proposed Cardinal-Hickory Creek Project.

In the report provided by the applicants, all proposed route segments were reviewed and considered for their potential to pose an increased avian collision risk. As identified in Section 2.5.6, portions of four IBAs are crossed by one or more of the proposed route alternatives and another IBA occurs immediately adjacent to one of the proposed route alternatives. Each of the five IBAs were reviewed as a part of the Avian Risk Review commissioned by the applicants for the proposed project.

A total of ten distinct locations representing approximately 48,933 feet (approximately 9.3 miles) of proposed ROW were identified as potential avian collision risk areas in the Cardinal-Hickory Creek project (Figure 6, Appendix A). In addition, the Avian Risk Review identified the subsegments that cross the Mississippi River, the Refuge, and the Upper Mississippi NWR IBA to have increased risks of avian collisions. Additional information regarding the avian risk areas found throughout the project area can be found in Sections 6.1.3.2, 7.1.3.2, 8.1.3.2, and 9.1.3.2.

4.6.8.2. Habitat loss and fragmentation

Habitat fragmentation is the process by which habitat loss results in the division of large, contiguous habitats into smaller, more isolated remnants.[239] These isolated remnants are separated from each other by a matrix of dissimilar habitats. Habitat loss and fragmentation can lead to declines in population density, species richness, species interactions, and ecosystem functioning. Habitat fragmentation also increases the likelihood of species invasions, significant alterations to community composition, and land-use intensification.

Habitat fragmentation is very similar to forest fragmentation, with the distinction that habitat fragmentation describes the fragmentation of an organisms preferred habitat instead of describing the fragmentation of forested environments. Refer to Section 4.6.2.1 for more information on forest fragmentation.

Habitat loss and fragmentation are common impacts from the construction of high-voltage transmission ROWs. The main way to mitigate this impact would be during the initial routing and siting process of a proposed project. Applicants should propose routes that avoid areas with contiguous ecological communities and site new transmission facilities within existing infrastructure corridors and stated in Wis. Stat. § 1.12(6)

---

[238] In response to Data Request 4.18 (PSC REF#: 353728, 353730, and 353734).
[239] Didham, R.K. 2010. Ecological consequences of habitat fragmentation. Retrieved at: http://www.els.net/WileyCDA/ElsArticle/refId-a0021904.html.

4.6.8.3. Pollinators

Many pollinators (such as bees, butterflies, bats, and other animals) are in serious decline in the U.S. and worldwide. Pollinators are responsible for one in every three bites of food we take, and increase our nation's crop values each year by more than 15 billion dollars[240]. Significant losses of these pollinators threaten worldwide agricultural production and the sustainability of native plant communities. In response, the National Strategy to Promote the Health of Honey Bees and Other Pollinators[241] was established to provide policy support for reversing pollinator losses and restoring populations to healthy levels. This federal initiative has identified and described utility ROWs as a key component to the success of widespread pollinator habitat development. In addition, electric ROWs present a potentially healthier habitat for pollinators as compared to roadside ROW.

Utility ROWs closely align with ideal pollinator habitat. If managed and restored appropriately (using native vegetation[242]), utility ROWs could have a strong positive effect on native pollinator diversity and local abundance[243]. Early successional landscapes and linear corridors, created and maintained through vegetation management practices, are increasingly being viewed as crucial areas for pollinator conservation. Although landscape conversion is a leading cause of pollinator decline, correctly managed green spaces within anthropogenic systems can provide a full range of habitat requirements and can act as refuges for pollinators[244]. Slight modifications to existing management practices within electrical utility ROWs could save financial resources as well as benefit natural systems, especially when encouraging the proliferation of native flora that bloom throughout the growing season. The existing network of managed road and utility ROWs mirrors many migratory pathways for pollinators, and could facilitate migration of these imperiled pollinator species, if managed appropriately. Successful implementation of landscape management within these systems could be invaluable, creating thousands of acres of pollinator landscape in Wisconsin alone.

In addition, much of the proposed project ROW either bisects or runs adjacent to agricultural lands. Pollinator populations present in utility ROWs could benefit adjacent agricultural landscapes. If planting hedgerows near crops increases yields and if farms that are situated within more "natural" areas produce more crops, then it is likely that nearness to appropriately managed ROWs could have a similar benefit to agricultural productivity.[245] The impact of utility ROWs on agricultural productivity[246] and pollinator habitat (especially the monarch butterfly) is an interesting area of future research, both regionally and globally.

4.6.7.3.1 Pollinators in the project area

As mentioned in Section 4.3.6.2, the applicants state that the implementation of pollinator-enhanced seed options within an approved ROW would occur if the cost of the pollinator-enhanced option seems

[240] National Strategy to Promote the Health of Honey Bees and Other Pollinators 2015; https://www.whitehouse.gov/sites/default/files/microsites/ostp/Pollinator%20Health%20Strategy%202015.pdf

[241] Retrieved at: https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/Pollinator%20Health%20Strategy%202015.pdf

[242] The local floral community plays a vital role in determining pollinator community structure. Wojcik, V.A. and Buchmann, S. 2012. Pollinator conservation and management on electrical transmission and roadside rights-of-way: a review. Journal of Pollination Ecology 7(3): pp. 16-26.

[243] Wojcik, V.A. and Buchmann, S. 2012. Pollinator conservation and management on electrical transmission and roadside rights-of-way: a review. Journal of Pollination Ecology 7(3): pp. 16-26.

[244] Wojcik, V.A. and Buchmann, S. 2012. Pollinator conservation and management on electrical transmission and roadside rights-of-way: a review. Journal of Pollination Ecology 7(3): pp. 16-26.

[245] Wojcik, V.A. and Buchmann, S. 2012. Pollinator conservation and management on electrical transmission and roadside rights-of-way: a review. Journal of Pollination Ecology 7(3): pp. 16-26.

[246] FirstEnergy and Davey Resource Group are working with Ohio State agricultural campus to study the idea further and develop data-based research. Fredmonsky, M. 2015. Pollinator-friendly rights-of-way benefit utilities, communities. Utility Arborist Association Utility Arborist Newsline. 6(1), 1-3.

reasonable.[247] The applicants also state that the costs of these seed mixes have been accounted for in the proposed project cost.[248]

The Cardinal-Hickory Creek project area is located in a unique area of the state and if restored properly, with seed mixes enhanced for pollinators (e.g. utilization of native flora that blooms throughout the growing season), could have a positive effect on pollinators in the state.

[247] Response to Data Request 1.125 (PSC REF#: 347534).
[248] Response to Data Requests 4.25 and 4.47 (PSC REF#: 353712).

CHAPTER

5

5. Substations

The proposed project includes the construction of a new 345/138 kV substation near Montfort, Wisconsin and modifications at several existing substations throughout the project area. The construction activities and associated environmental and socioeconomic impacts for each substation are discussed in this chapter, from west to east. The design and engineering modifications for each of these substations are discussed in greater detail in Section 2.3. A map identifying all of the locations of the substations included in the proposed project is included in Figure 2, Appendix A.

As identified in Table 1-2, ATC would be the construction manager for the new Hill Valley Substation, as well as for any modifications approved at the Cardinal, Eden, Nelson Dewey, and Wyoming Valley Substations. DPC would construct any approved modifications at the Stoneman Substation.

5.1. HICKORY CREEK SUBSTATION

The existing Hickory Creek 161 kV Substation is located east of New Vienna in Dubuque County, Iowa. The new 345 kV transmission line would begin at this substation. A new 345 kV terminal is proposed within the existing Hickory Creek 345/161 kV Substation. The existing footprint of the Hickory Creek Substation is not proposed to change.

5.2. TURKEY RIVER SUBSTATION

The existing Turkey River 345/161 kV Substation is located east of Millville just across the Mississippi River in Clayton, Iowa. The Turkey River Substation would be rebuilt to reconfigure the substation with a four terminal, four-breaker 161 kV ring bus by adding three additional 161 kV breakers. The applicants also propose to construct a 69 kV split bus with a bus-tie dividing the 69 kV bus into two segments. Each 69 kV bus segment would connect to a breakered 161/69 kV transformer terminal and a breakered 69 kV line terminal. This would require four new 69 kV breakers. Finally, the applicants propose to add an additional 75 MVA, 161/69 kV transformer to the Turkey River Substation. The existing footprint of the Turkey River Substation is not proposed to change.

5.3. STONEMAN SUBSTATION

The existing Stoneman Substation is located near Cassville in Grant County, Wisconsin and is currently connected to the existing 161/69kV transmission lines that cross the Mississippi River. If a new Mississippi River crossing is approved as a part of the proposed project (Nelson Dewey–North or Nelson Dewey–South route alternatives), all proposed modifications at the Stoneman Substation would occur within the existing fenced area. The Stoneman Substation would have the existing 69 kV and 161 kV terminal equipment removed and retired. This includes circuit breakers, relays, buswork, and communications equipment. No new foundations would be installed; therefore, no soil disturbance would be anticipated. The applicants have provided diagrams for the Stoneman Substations in Figures 24-25, Appendix C of the application.[249]

If the existing high-voltage transmission crossing of the Mississippi River remains at the Stoneman Substation (Stoneman-North or Stoneman-South route alternatives), all of the proposed modifications at the Stoneman Substation would still occur within the fenced area. The Stoneman Substation would have existing 69 kV terminal equipment related to the existing river crossing removed and retired. This includes the 69 kV circuit breakers, relays, and buswork associated with this 69 kV terminal equipment. A relay upgrade at the Stoneman Substation would be completed for the Stoneman terminal of the rebuilt Stoneman–Turkey River 161 kV transmission line.

5.4. NELSON DEWEY SUBSTATION

The existing Nelson Dewey Substation is located near Cassville in Grant County, Wisconsin. If a new Mississippi River crossing is approved at the Nelson Dewey Substation (Nelson Dewey–North or Nelson Dewey–South), all of the proposed modifications at the existing Nelson Dewey Substation would be within the existing fenced area. Construction within the substation would include drilled pier foundations ranging in size from three to 5 feet in diameter and 10 to 25 feet deep. The foundations would support transmission line dead-end structures, and bus and equipment support structures. Slabs-on-grade that are 8 feet square and up to 2 feet thick would be used for circuit breakers. Spoils from the excavation would be removed from the site. Where there is disturbance associated with installing underground conduit for control and communication cables, soils removed would be returned to the trench, and crushed rock surfacing would be added as needed. The applicants have provided one-line diagrams for the Nelson Dewey Substation in Figures 22-23, Appendix C of the application.[250]

If the existing high-voltage transmission crossing of the Mississippi River remains at the Stoneman Substation (Stoneman–North or Stoneman–South route alternatives), no modifications at the Nelson Dewey Substation would be required.

5.5. HILL VALLEY SUBSTATION

The applicants propose to construct a new intermediate Hill Valley 345/138 kV Substation just south of the village of Montfort in Grant County, Wisconsin.

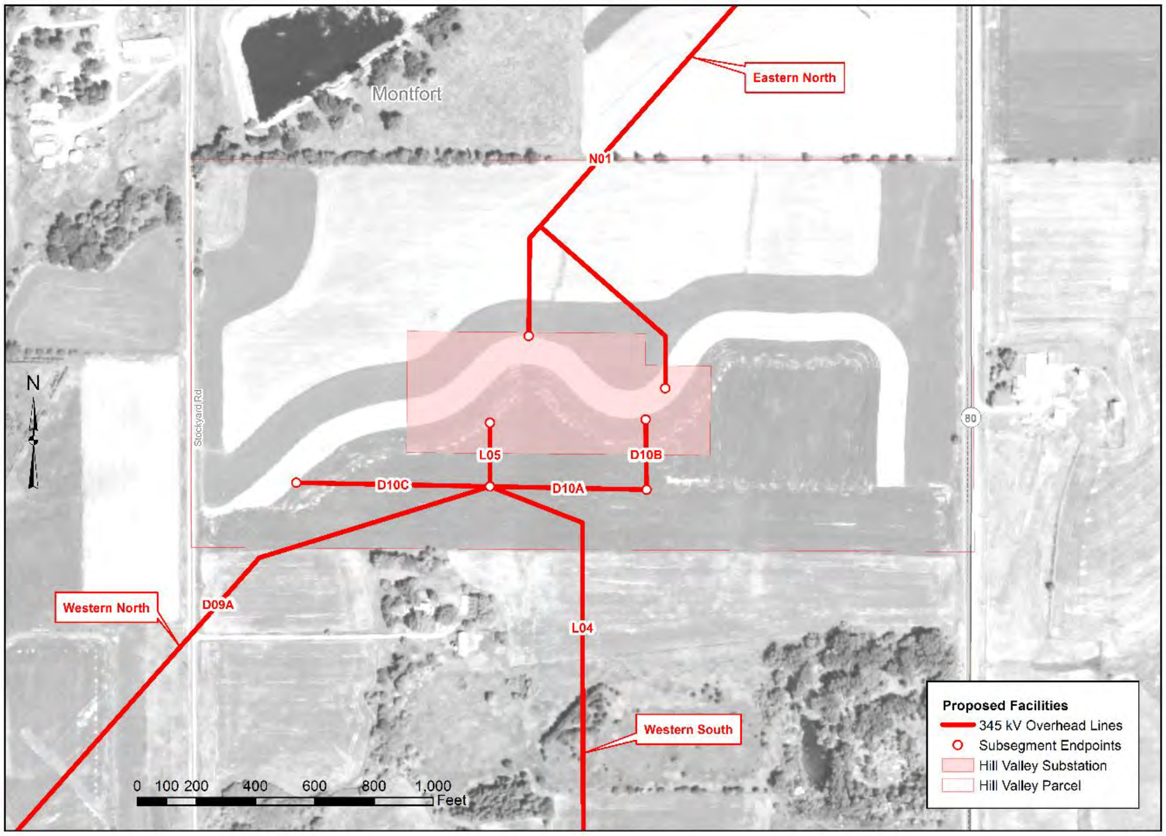
5.5.1. Construction activities and impacts

The new substation is proposed to be constructed on roughly 80 acres of land in Montfort, Wisconsin (Figure 5-1). ATC purchased the 80-acre parcel where they are proposing to locate the new Hill Valley Substation prior to submitting the CPCN application for the proposed project. The applicants have provided an additional substation site location in Montfort, Wisconsin just east of the proposed location that is currently under consideration by RUS. Information about this alternate substation site is included in Appendix C. As stated in Section 2.1.2, the location of the new Hill Valley Substation significantly impacted the applicants' proposed route options for the new 345 kV transmission line that traverses southwestern Wisconsin. The applicants have not yet identified why they did not consider siting the new

[249] PSC REF#: 341447
[250] PSC REF#: 341447

substation at the Hillman Substation in Platteville, and Commission staff are waiting on responses from the applicants regarding additional locations that were considered for the proposed Hill Valley Substation.

Figure 5-1 Proposed footprint of the Hill Valley Substation in Montfort, Wisconsin



The proposed substation area just south of the village of Montfort is presently farmed for corn, soybeans, and alfalfa. The site has moderately rolling topography with topographic highs along the northeastern extent of the site and topographic lows in the northwestern area. The property generally slopes to the south and northwest. Soils mapped onsite are mostly moderately well or well drained. Based on the applicants' field review of the site during June 2017, no wetlands or waterways were identified on the property. Approximately 22 acres of the site would be used for the substation, access drive, and stormwater drainage features.

Site preparation of this area would include installing erosion control BMPs, stripping topsoil, and hauling in structural fill to build up the subgrade for the substation pad. Soils excavated from other areas of the project could be used to build up the grade if necessary. Sand and gravel would be used to complete the grading and ground preparation of the new substation. Once the substation pad is built to the subgrade, all areas would be restored and the site would be ready for use. A diagram of the proposed grading plan for the Hill Valley Substation is in included in Figure 10 (Appendix A) of the application. Typical machinery that would be used to construct this substation includes cranes, drill rigs, dozers, backhoes, trucks, and a smooth drum compactor. The perimeter of a substation would likely be fenced off to prevent unauthorized access.

Construction within the newly created substation pad would consist of drilled pier foundations ranging in size from three to seven feet in diameter and 10 to 25 feet deep. The foundations would be installed to support transmission line dead-end structures, static masts, and bus and equipment support structures. Slabs-on-grade nine feet by 32 feet and up to three feet thick would be used for 345 kV circuit breakers, and eight-foot square by two feet thick would be used for 138 kV circuit breakers. The control building would be supported by a perimeter wall up to five feet deep set on a spread footer with pier supports. Transformer and reactor secondary oil containment would be a concrete-lined pot filled with stone. Conduit for control and communication cables and grounding conductor would be installed prior to the placement of the final layer of crushed rock surfacing. The ground grid would be installed 18 inches below the subgrade surface throughout the substation pad and extend five feet outside the substation security wall.

The applicants state that a detailed restoration plan for the substation site would be developed after the Commission's decision, and the plan would be submitted to DNR as part of the WPDES stormwater discharge permit application. This plan would include the overall site design, including graveled areas, vegetated areas, swales and stormwater ponds.

Additional diagrams for the Hill Valley Substation are included in Figures 15-17, Appendix C of the application.[251]

5.5.2. Environmental impacts

The proposed Hill Valley Substation site is currently in agricultural production. As stated previously, since ATC already purchased this property it is possible that this 80-acre site would be permanently removed from agricultural production regardless of the decision in this docket. No forested lands, wetlands, or waterways are present on the proposed site. In addition, the applicants stated that there are no recorded rare species or historic resources such as structures, archaeological sites, or burials located on or adjacent to the proposed substation site.

5.5.3. Community impacts

The proposed substation site is located in a relatively rural, agricultural setting in southwestern Wisconsin. There are buildings and/or dwellings located immediately south and east of the proposed site. One of these buildings and/or dwellings is approximately 1,000 feet east of the proposed site, directly across STH 80. The other is directly south of the proposed site, roughly 500 feet from the proposed substation fence.

Although there are existing high-voltage transmission lines in the area, a new electric substation in this rural, agricultural setting would affect the visual aspect of the rural community of Montfort. During construction, the substation site would likely look chaotic and highly disturbed. Those in the area would experience noise, dust, and vibrations due to construction activities. Air pollutants due to vehicle and machinery use would be expected in the immediate area during construction. Fugitive dust would need to be controlled, and equipment noise would need to be limited to avoid disturbance at the nearby dwellings and buildings. These impacts would be temporary in nature and cease after construction in an area was complete.

After construction, there would be some noise associated with the operation of the substations. Some individuals may find this noise annoying if homes or recreation areas are located near enough to the

[251] PSC REF#: 341447

substation for this noise to be audible. Substations typically have a gravel driveway to allow for ongoing vehicular access, and may include other landscaping such as screening vegetation.

5.6. EDEN SUBSTATION

The existing Eden Substation is located just east of Montfort in Grant County, Wisconsin. All of the modifications at the Eden Substation that have been proposed for this project would occur within the existing fenced area. No new foundations would be installed; therefore, no soil disturbance would be anticipated. The applicants have provided diagrams for the Eden Substation in Figures 20-21, Appendix C of the application.[252]

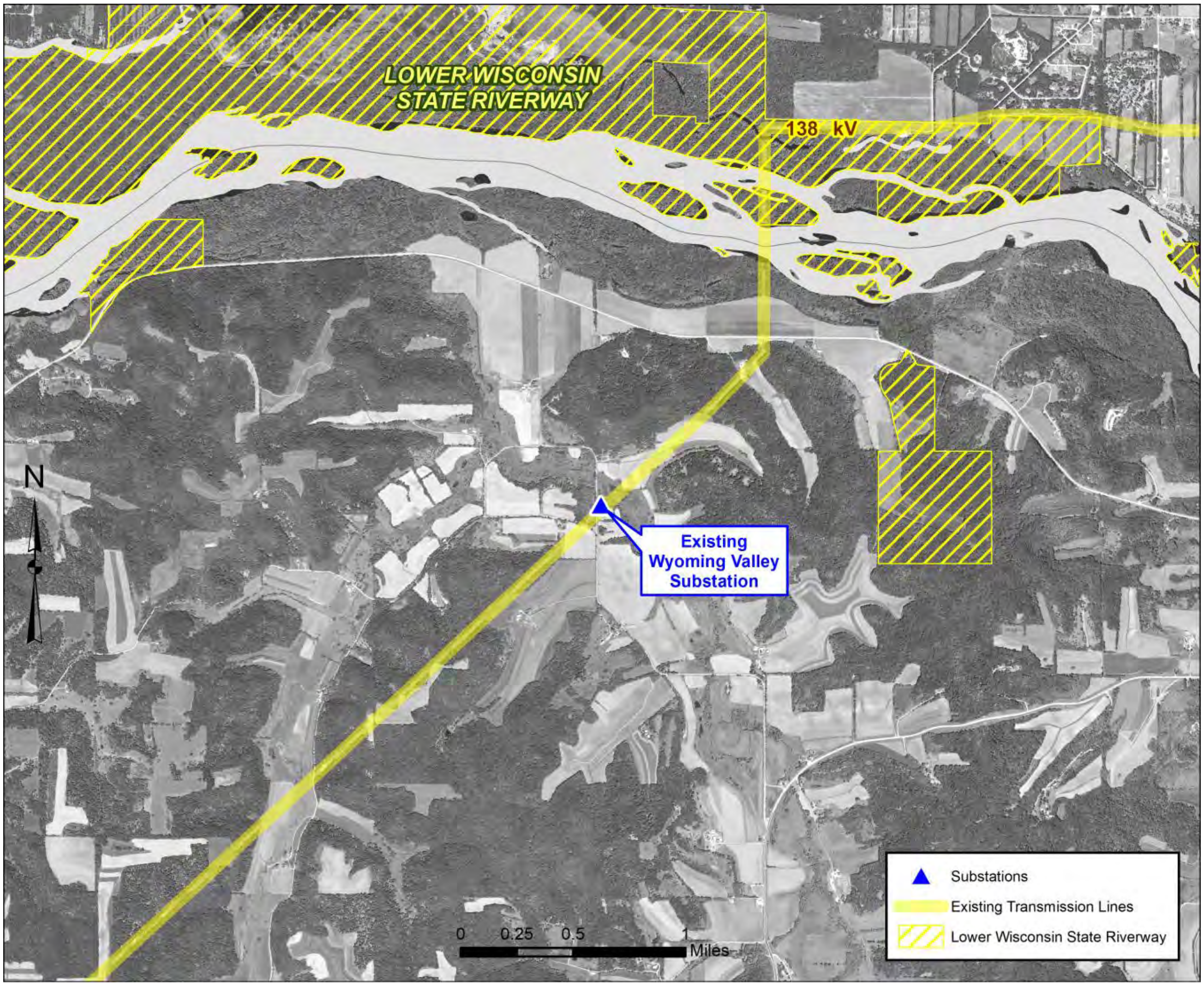
In addition to the proposed project, there are several other utility infrastructure projects planned for the Montfort area (past, present, and future). Depending upon the projects that are approved and constructed in the near future in the Montfort area, the modifications that are proposed in this docket for the Eden Substation may change. Therefore, the potential impacts from modifications at the Eden Substation on the existing residential development west, the public trail immediately north and east, and the commercial development immediately east of the existing Eden Substation are highly dependent upon the additional projects mentioned later on in Section 5.9.

5.7. WYOMING VALLEY SUBSTATION

The existing Wyoming Valley Substation is located approximately 1.28 miles south of the Wisconsin River in the town of Wyoming in Iowa County, Wisconsin. This substation is not located within Lower Wisconsin State Riverway (Figure 5-2). At the Wyoming Valley Substation, all modifications would be within the existing fenced area. No new foundations would be installed; therefore, no soil disturbance would be anticipated.

[252] PSC REF#: 341447

Figure 5-2 Location of Wyoming Valley Substation near the Lower Wisconsin State Riverway.



5.8. CARDINAL SUBSTATION

The existing Cardinal Substation is located west of Middleton in Dane County, Wisconsin. The new 345kV transmission line would end at this substation. At the Cardinal Substation, modifications would occur within the existing fenced area. Construction within the substation would include drilled pier foundations ranging in size from three to seven feet in diameter and ten to 25 feet deep. The foundations would support transmission line dead-end structures, static masts, and bus and equipment support structures. Slabs-on-grade that are nine by 32 feet and up to three feet thick would be used for circuit breakers. Spoils from the excavation would be removed from the site. Where there would be disturbance associated with installing underground conduit for control and communication cables, soil removed would be returned to the trench, and crushed rock surfacing would be added as needed. The applicants have provided one-line diagrams for the Cardinal Substations in Figures 18-19, Appendix C of the application.[253]

5.9. CUMULATIVE IMPACTS OF UTILITY INFRASTRUCTURE NEAR MONTFORT, WISCONSIN

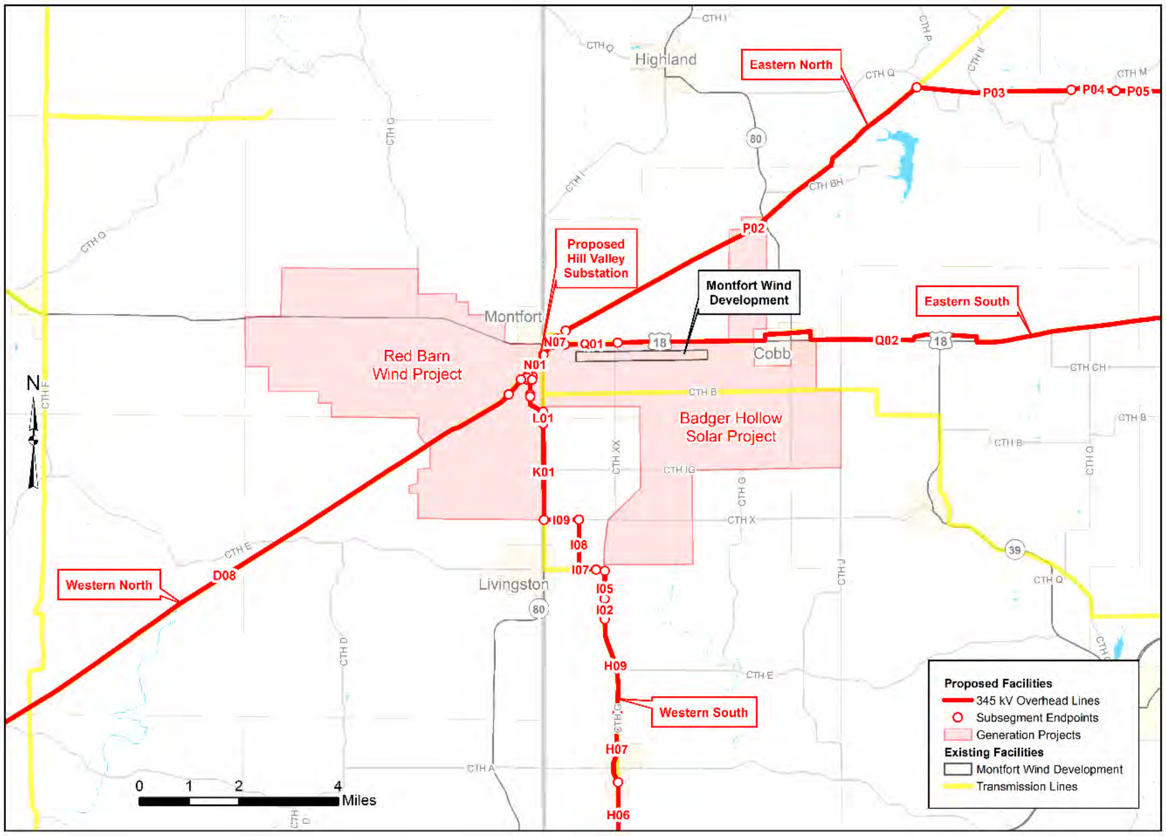
Cumulative impacts include changes to the existing environment caused by an action in combination with other past, present, and future human actions. In addition to the proposed Cardinal-Hickory Creek project, several other electric facilities exist and are proposed to be constructed in or near Montfort, Wisconsin (Figure 5-3). These facilities include:

- wind electric generation facilities (Montfort Wind Farm and Red Barn Wind Farm),
- a new utility-scale solar generating facility (Badger Hollow Solar Farm),
- high-voltage electric transmission lines,
- substations, and
- electric distribution lines.

The following discussion includes a brief description of existing and known proposed electric infrastructure that are in various stages of development in areas adjacent to the proposed Hill Valley Substation, followed by general descriptions of associated impacts. Cumulative impacts of existing and proposed electric facilities can be characterized by combining any or all impacts corresponding with those facilities that are eventually constructed.

[253] PSC REF#: 341447

Figure 5-3 Energy infrastructure projects near Montfort, Wisconsin



5.9.1. Existing electric facilities

5.9.1.1. Montfort Wind Farm

The existing Montfort Wind Farm is located in the town of Eden, Iowa County and is a 30 MW wind electric generation facility comprised of twenty GE 1.5 MW Model S wind turbines. The facility was constructed in 2001 with energy production beginning in June of the same year. Each turbine has a hub height of 213 feet with a rotor diameter of 231 feet, for a total blade tip height of approximately 329 feet. The turbines are located in agricultural fields owned by several different landowners. The twenty turbines are serviced from an operations building which is leased from one of the participating landowners and is located immediately adjacent to the turbines.

5.9.1.2. Electric transmission facilities

Several 138 kV and 69 kV electric transmission lines also exist in the area. Electric transmission lines typically occupy a ROW of 150 feet in width or more, depending on a number of factors including operating voltage and line configuration. Structures typically range from 60 to 120 feet tall with span lengths of up to 1,000 feet, depending on terrain and other variables.

5.9.1.3. Electric substations

Electric substations typically include fenced-in areas containing electrical transformers for converting voltage from one level to another, electrical switching and circuit protection equipment, and buswork to electrically connect the various circuits and equipment. Substations typically occupy parcels which range in size from under an acre to 10 or more acres.

5.9.1.4. Electric distribution facilities

Electric distribution facilities typically connect substations to customer load, and are comprised of primary- and secondary-voltage electric distribution lines. Other electric distribution equipment includes switches, capacitors, transformers, lightning protection devices, and fusing, among other less common elements. Electric distribution lines can be constructed using either overhead or underground configurations.

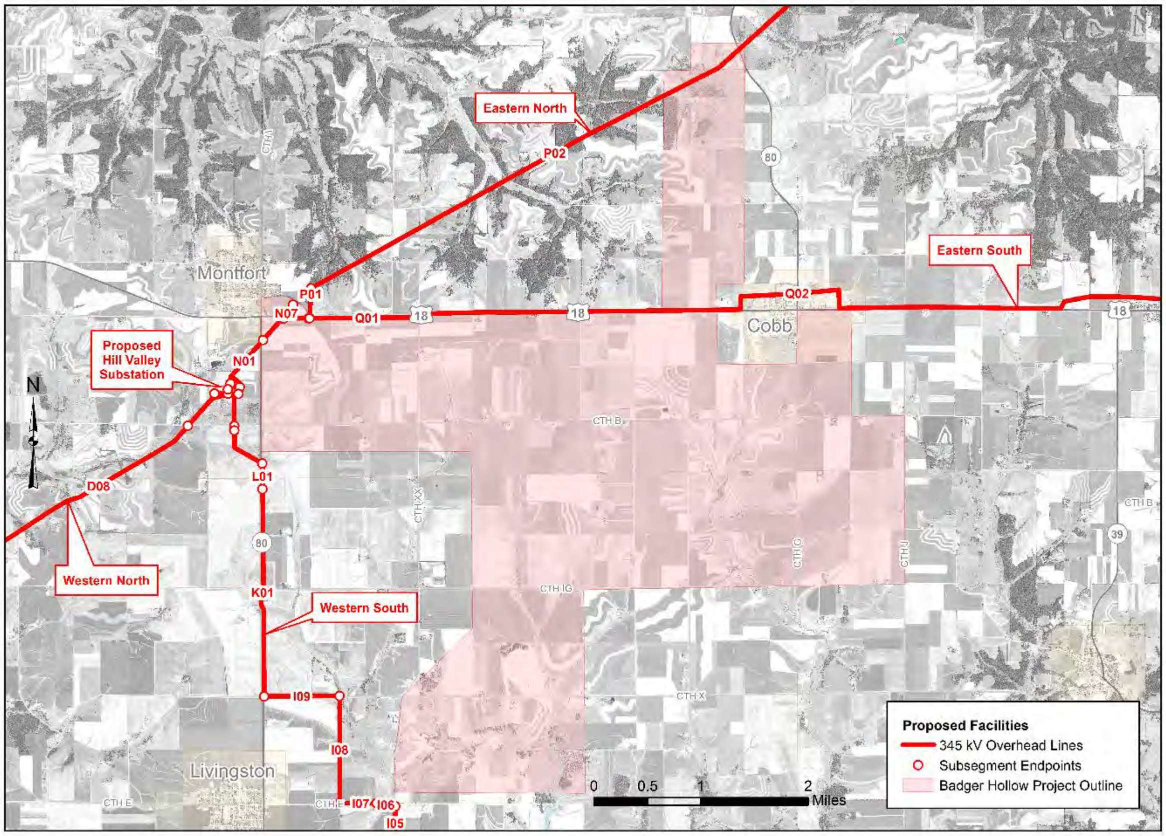
5.9.2. Proposed Electric Facilities

5.9.2.1. Badger Hollow Solar Farm

The Badger Hollow Solar Farm[254] (Badger Hollow) is a proposed solar electric generating facility that would be located generally to the southwest of the village of Cobb, Iowa County. Badger Hollow would have a generating capacity of 300 megawatts (MW), and is currently proposed to be constructed in two 150 MW halves, the first of which is being offered for sale to MGE and WPSC. The Commission is reviewing the purchases by MGE and WPSC in docket 5-BS-228. The second half is proposed to be developed later. The proposed project would utilize equipment such as solar photovoltaic (PV) panels, inverters, and underground connector lines, among others. Total project area would encompass approximately 3,500 acres of leased land within a 10,700-acre project area (Figure 5-4). Coincident with this project would be the development of an approximately 5-mile long 138 kV generator tie-line to interconnect the project with the existing electric transmission system, either at the existing Eden Substation or at a new substation that would be located directly north of the project area, adjacent to the existing Eden to Spring Green 138 kV transmission line. CPCN applications were filed with the Commission in the two dockets on June 5, and June 19, 2018, respectively. The Commission prepared an environmental assessment (EA) regarding the Badger Hollow Solar Farm.

[254] Currently under Commission review in dockets 9697-CE-100 and 9697-CE-101.

Figure 5-4 Proposed footprint of the Badger Hollow Solar Farm near Montfort, Wisconsin



5.9.2.2. Red Barn Wind Project

The Red Barn Wind Project[255] is a wind electric generating facility that would be located generally to the west of the proposed Hill Valley Substation site in Grant County. The applicants have not yet filed an application with the Commission for authorization to construct the project. It is uncertain if or when this may occur. The Commission currently understands that the project would have a generating capacity of under 100 MW and would consist of approximately 25 turbines with capacities of between 2.0 to 4.2 MW each. The proposed project would utilize equipment such as wind turbines, access roads, and underground connector lines, among others. The proposed wind turbines would be between 459 and 656 feet tall, and could be taller than any other existing wind turbines in Wisconsin. The project would be developed in a project area of over 10,000 acres, and would interconnect at a new substation tap located adjacent to the existing Lancaster to Eden 138 kV transmission line.[256]

---

255 PSC REF#: 352402

256 The existing Nelson Dewey–Eden 138 kV transmission line is electrically comprised of the Nelson Dewey–Lancaster 138 kV and Lancaster–Eden 138 kV transmission lines. The proposed Cardinal Hickory Creek project would keep that electrical configuration of the rebuilt line the same.

5.9.3. Impacts associated with new and existing electric transmission and distribution facilities

Electric transmission and distribution lines are constructed and operated across all types of landscapes and land uses in Wisconsin.

In agricultural areas, transmission and distribution ROWs cross agricultural properties commonly utilized for row crops, dairy farming, pastures, orchards, and specialty crops. During the maintenance of transmission lines, impacts to farmland may include reduced crop productivity, herbicide applications near organic farms, removal of windbreaks, and reduced acceptance of specialty crops. Refer to Section 4.5.2 for more information on impacts to agricultural lands.

In developed areas, transmission and distribution lines commonly cross business districts, residential neighborhoods, parks, and undeveloped parcels. ROWs can be substantially wider in certain areas because of multiple lines and utilities siting facilities adjacent to each other. Electric transmission and distribution lines in such areas may impact dense residential and commercial developments, a landowner’s aesthetic enjoyment of their property, and land use planning. Refer to Section 4.5 for more information on socioeconomic impacts associated with transmission lines.

In forested areas, transmission owners may clear all vegetation from the ROW during the construction phase, which results in a significant alteration to the existing forested communities. Impacts would also include loss and degradation of forested habitat, the loss of merchantable timber, decreased carbon sequestration, an increase in danger and hazard trees along the edges of the ROW, and the spread of invasive plant species in and around transmission corridors. Distribution lines generally require less significant vegetation clearing, and narrower ROW. Many utilities in Wisconsin use directional pruning techniques on primary-voltage distribution lines, rather than removing all vegetation within the ROW. Few electric utilities in Wisconsin remove any vegetation around secondary-voltage distribution lines. Refer to Sections 4.3.7, 4.6.2, and 4.6.5 for more information on impacts to forested lands and vegetation management practices in utility ROWs.

Impacts to wetlands by electric transmission and distribution facilities vary greatly depending on the existing wetland type. Wetland impacts may include habitat fragmentation and conversion, removing or compacting organic wetland soils which can impair or limit soil function and hydrology, and disruption of wetland soils which is not easily repaired. Refer to Section 4.6.7 for more information on impacts to wetlands.

Similar to wetlands, waterways may also be impacted by transmission and distribution lines through decreased water quality, nearby vegetation clearing (which also affects wetland function and habitat), and increased erosion that could cause sediment deposition into the waterbody. Refer to Section 4.6.6 for more information on impacts to waterways.

As discussed previously, electric transmission and distribution ROWs can be a vector for the introduction of non-native, invasive species. Such introductions can occur when the ROW is first constructed, as well as during each inspection or vegetation management cycle. Invasive species in Wisconsin are regulated by Wis. Admin. Code ch. NR 40. Refer to Section 4.6.4 for more information on impacts to and from invasive species.

5.9.4. Impacts associated with new and existing electric generation facilities

5.9.4.1. Badger Hollow Solar Farm

The following is a summary of the anticipated impacts of the proposed Badger Hollow project, as presented in the Commission's December 12, 2018, preliminary determination that no significant impacts on the human or natural environment are likely to occur as a result of the construction and operation of the proposed project.[257]

The Badger Hollow project would cause environmental impacts based on the surrounding land use, habitats, and features such as wetlands, waterways, and presence of rare species.

During construction activities, there would be increased noise, dust and vibration in the construction areas. There would be increased traffic in the project area as employees and deliveries arrive at and leave the project work areas. Loose or disturbed soils could be susceptible to erosion. Badger Hollow has developed a proposed vegetation management plan that would address erosion and stormwater risks, and provide information on restoration activities, including habitat enhancements.

Animals and vegetation in the project area could be displaced or damaged as a result of construction activities. There would be temporary and permanent impacts to wetlands, although if constructed as described in the application, these would be minor. Solar PV projects of this scale have not been constructed in Wisconsin, and are relatively new to the upper Midwest, so there is some uncertainty as to how wildlife will interact with different parts of the facility.

A visual change in the project area from open agricultural fields to a more industrial landscape would affect likely viewers differently. All of the sub-arrays would be fenced off, with Badger Hollow proposing to use a barbed-wire approximately eight-foot chain link or wire configuration. Some landowners that do not receive direct benefits from the project may react more negatively to the proposed project. Site-specific landscaping plans might limit the impacts to adjacent landowners.

Construction in and through agricultural fields would result in both temporary and long-term impacts. Some areas, such as laydown yards and temporary access roads would only be taken out of production during the construction phase of the project. The solar PV arrays, new collector substation, and operations and maintenance building would be out of agricultural production for the operational life of the project, potentially 50 years. Soil compaction or topsoil loss in agricultural fields are serious concerns and can impact future productivity. If drainage tiles are broken or damaged, the drainage on a field could be impacted, although some impacts might not be immediately known. The use of best management practices and post-construction soil restoration could reduce many direct impacts to agricultural operations. It is not well known whether decommissioning the project site can allow for a return of impacted properties to agricultural use. It is likely that thorough decommissioning, including decompacting soils and repairing any damaged drainage tiles, would allow for a return to agricultural use.

5.9.4.1.1 Potential impacts to the Cardinal-Hickory Creek project

In response to Data Request 5.11,[258] the applicants state that the generator tie-line for the Badger Hollow Solar Farm may impact the routing, siting, and design of the proposed Cardinal-Hickory Creek project. More specifically, Segments M, P, Q, R, and N of the proposed project may need to be redesigned to accommodate the generator-tie line, if approved, for the Badger Hollow Solar Farm. These redesigns

257 PSC REF#: 355117
258 PSC REF#: 354918

would likely include increased structure heights and increased costs for the proposed Cardinal-Hickory Creek project. The applicants also stated that Subsegments Q01 and Q02 of the proposed Cardinal-Hickory Creek project directly conflict with solar panel locations proposed for the Bader Hollow Solar Farm. The applicants state that since the Badger Hollow solar array panels must be designed and placed to accommodate the existing transmission lines, little to no impact would be expected on the proposed Cardinal-Hickory Creek transmission line from the solar array panels. Due to the proposed construction schedules for each project, if both are approved, it is unclear which facility would be built first; therefore, it is unknown at this time if the applicants' assumptions about the impact of the solar arrays on the Cardinal-Hickory Creek line are accurate.

The Commission's decisions regarding the Badger Hollow Solar Farm are expected to occur prior to its decisions on the Cardinal-Hickory Creek project. The potential for these projects to impact each other are dependent upon the decisions the Commission makes regarding both of these projects.

5.9.4.2. Montfort Wind Farm and Red Barn Wind Project

As mentioned previously, the applicants have not yet filed an application with the Commission for authorization to construct the Red Barn Wind Project and it is uncertain if or when this may occur. As such, the following discussion addresses typical impacts associated with existing wind electric generation projects, both during construction and then during operation.

Constructing turbines requires building access roads to the proposed turbine sites, excavating and pouring concrete foundations, erecting the tubular towers, blades and nacelles, and installing the underground electric cable collection system. These construction activities would result in the loss of some trees, some temporary and permanent loss of currently farmed land, and potential adverse effects on waterways crossed by the cables and access roads. Clean-up and restoration practices following construction, including soil decompaction, removal of excess gravel on access paths and at turbine sites, and replacement of the topsoil would reduce the amount of agricultural land permanently affected. Implementation of best construction and stormwater management practices would reduce or avoid adverse impacts on streams and waterbodies. Repairing local roadways to pre-construction condition would avoid placing this economic burden on local townships. Other minor construction impacts could include temporary traffic congestion, construction noise, and short electrical outages due to the need to lower electric distribution lines to enable the movement of large cranes. The local economy could also have short-term benefits, if local construction workers, materials, and suppliers are used.

When construction is complete and the wind development is operating, other more permanent environmental effects would occur. The visual appearance of the landscape in the project area is substantially changed by the presence of the turbines. Lighting required by the FAA to reduce the potential for aviation hazards would likely include some flashing red or white lights during turbine operation. These lights would alter the view of the night sky.

There is also potential for noise and shadow flicker to occur when the turbine blades were turning. With respect to noise, perceived impacts largely depend on turbine design, wind speed and direction, the distance to and number of nearby turbines, the sensitivity of the receptors, time of year, and the type of structures or vegetation present between the turbine and the receptor. Applicants proposing new developments typically evaluate noise impacts by modeling all wind electric generation facilities within the project area. Computer models are used to predict the incremental increase in noise, considering the existing ambient noise environment.

Shadow flicker, which consists of rapid changes in light intensity, is caused by wind turbine blades rotating and casting a shadow upon the ground and objects below. Applicants typically evaluate the potential for shadow flicker for a representative turbine and for the entire project area using models. Generally, residences to the south of a turbine would not be impacted and houses farther way from a turbine would have fewer hours of impact. Also, with the exception of short midday impacts in the winter due to low sun angles, impacts due to shadow flicker on houses 1,000 feet or more away from a turbine would be limited to early and late in the day, when the sun angle is low and shadows tend to be more diffuse.

To address landowner concerns, as part of any authorization of the Red Barn Wind Energy Project, the Commission could require the applicants to comply with the requirements of Wis. Admin. Code ch. PSC 128, commonly known as the Wind Siting Rules.

Potential impacts to birds include bird mortality, habitat loss and fragmentation, barrier effects, and bird displacement. To minimize impacts to birds in the project area, an applicant could follow siting recommendations, curtailment practices, and turbine design recommendations identified by the USFWS. It could also conduct literature reviews and field studies, which could indicate whether the project area contains any high-quality habitats that would attract either large quantities of birds, important breeding areas or migratory flyways, or significant populations of rare bird species.

Bat mortality associated with wind turbines may be higher than with other tall structures, such as towers or buildings and bat mortality has exceeded bird mortality at most wind farms. Bat numbers and behavior in relation to wind turbines are not well understood. The most reliable method of determining the potential impacts of wind facilities on bats is to study bat presence, abundance, and behavior in the project area. Avoiding placing turbines in or adjacent forested areas or wetlands, which may provide bat habitat and feeding areas, could mitigate bat impacts.

Cumulative mortality to bats in southwestern Wisconsin would increase as the construction and operation of wind generation increases in Wisconsin. If bat mortality appears excessive, if it occurs in the upper ranges of expected mortality rates, or if it disproportionately affects rare bat species, mitigation strategies should be employed. Mitigation strategies could include:

- stopping the rotation of specific turbines during periods when wind speeds are low and electricity is not produced;
- conducting studies designed to correlate weather events with bat mortality; and
- employment of acoustic-based deterrents.

Wind electric generation facilities may also have impacts on aviation. Pilots could have difficulty using any small airstrips if they are located in the midst of or near the proposed wind turbines. Concerns related to private airstrips and the pilots that would use them include the potential for collisions with turbines and the air turbulence created by the rotating blades. These potential impacts could affect flight patterns, landing and take-off safety, and the need for the airstrips to be modified or redirected for safety reasons. Many private airstrips are used for recreational flying; others are used for business purposes or by aerial applicators who apply materials to agricultural crops. Potential impacts could be reduced or avoided by maintaining appropriate clearance distances between proposed turbines and the existing airstrips. For existing public use airports, FAA Part 77 clearances include distance and height limitations.

CHAPTER

6

6. Environmental Analysis: Mississippi River Routing Area

6.1. ROUTE ALTERNATIVE COMPARISONS

6.1.1. Detailed Route Descriptions

The Mississippi River Routing Area is located near Cassville, Wisconsin, and lies entirely within Grant County. The Mississippi River Routing Area is comprised of four separate route alternatives, two from each proposed river crossing that would connect to either Western–North or Western–South. The applicants have proposed to construct the 345kV transmission facilities across the Mississippi River, that would connect the Iowa portion of the route to either the:

- Nelson Dewey Substation, which would be a new crossing, or the
- Stoneman Substation, which currently connects to the existing 161/69kV transmission facilities across the river.

Two route alternatives would begin at the Nelson Dewey Substation, southwest of County Highway (CTH) VV, northwest of the village of Cassville, Grant County. These routes consist of:

- Nelson Dewey-North, which would connect to Western-North, and
- Nelson Dewey-South), which would connect to Western-South.

The route subsegments included in each Nelson Dewey route alternative are identified in Table 6-1 (Figures 1.1 and 1.2., Appendix A).

Table 6-1 Mississippi River Crossing-Nelson Dewey Substation route alternatives

Route Alternative	Route Subsegments
Nelson Dewey-North*	A01A, A01B*, A02, A03
Nelson Dewey-South	A01A, C02A, C02B, C04

*Additional routes under consideration by RUS (Appendix C).

The other two route alternatives would begin at the Stoneman Substation at the intersection of East Crawford Street and Jack Oak Road, in the village of Cassville, Grant County. These route alternatives consist of:

- Stoneman-North (Stoneman-North), which would connect to Western–North, and
- Stoneman-South, which would connect to Western–South.

The route subsegments included in each Stoneman route alternative are identified in Table 6-2 (Figures 1.1 and 1.2, Appendix A).

Figure 6-1 Mississippi River Routing Area

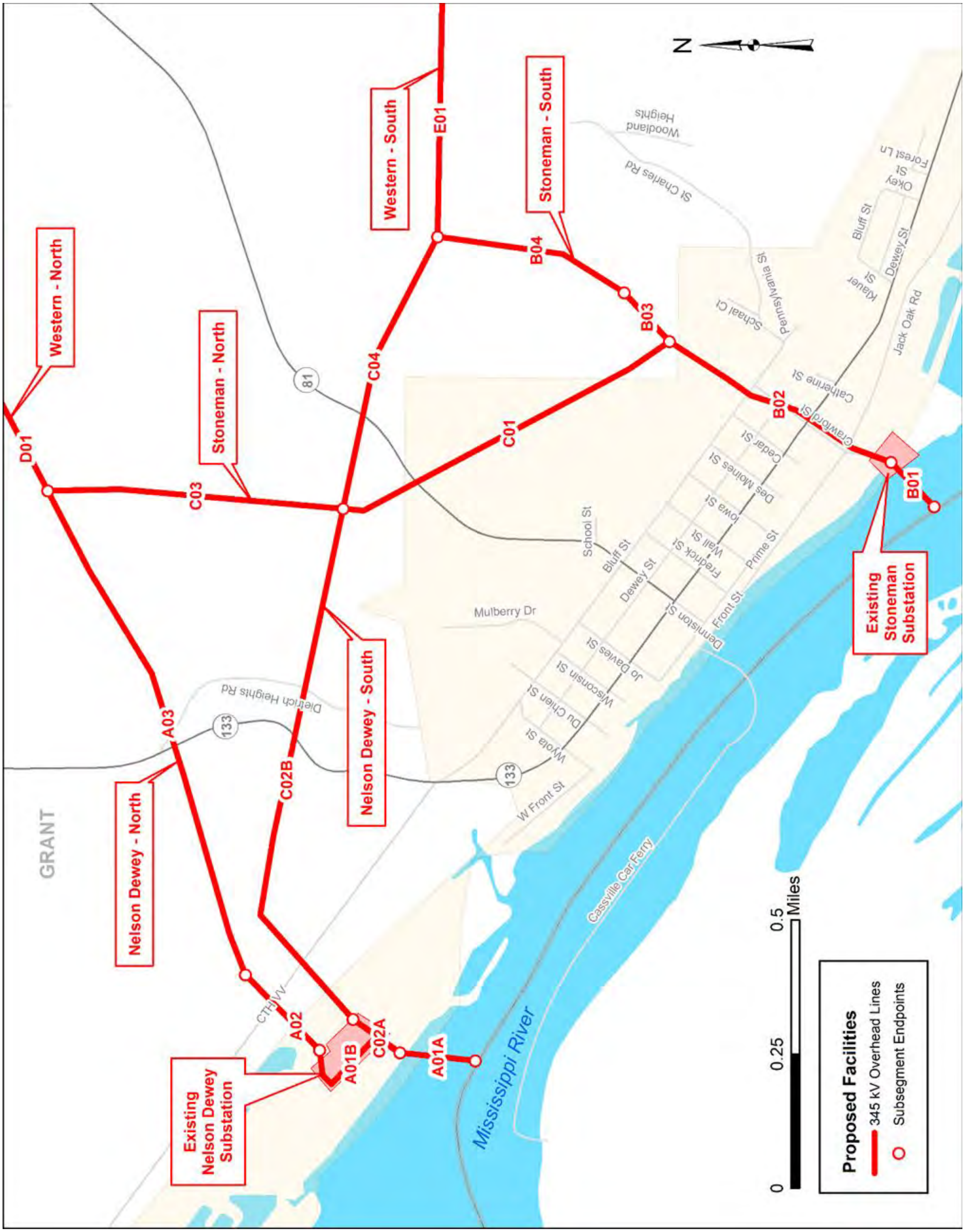


Table 6-2 Mississippi River Crossing-Stoneman Substation route alternatives

Route Alternative	Route Subsegments
Stoneman-North	B01, B02, C01, C03
Stoneman-South	B01, B02, B03, B04

6.1.1.1. Nelson Dewey-North

Nelson Dewey-North would begin midway across the Mississippi River 650 feet[259] south of the existing Nelson Dewey Substation parcel. From there, Subsegment **A01A** would extend 750 feet north to inside the south corner of the Nelson Dewey Substation parcel, in a double-circuit configuration with the DPC 161 kV line, near a public boat launch. A01A is also used in the Nelson Dewey-South route.

A01B would then extend 280 feet north-northeast, then 630 feet northwest along the southwest edge of the Nelson Dewey Substation, then 125 feet northeast, where the DPC 161kV line terminates. A01B would then continue 250 feet east-northeast as a single circuit line.

A02 would then extend 0.2 miles northeast as a single-circuit line to parallel the existing X-15/X-16 transmission lines up the bluff after crossing a railroad and CTH VV.

A03 would then extend 0.6 miles east-northeast in a double-circuit configuration with the X-16 line, across State Highway (STH) 133 and Dietrich Heights Road, within 1000 feet of four private residences. A03 would then continue 0.40 miles northeast as a double-circuit line with X-16 to meet the beginning of the Western-North route.

6.1.1.2. Nelson Dewey-South

Nelson Dewey-South would begin midway across the Mississippi River 650 feet south of the existing Nelson Dewey Substation parcel. From there, Subsegment **A01A** would extend 750 feet north to inside the south corner of the Nelson Dewey Substation parcel, in a double-circuit configuration with the DPC 161 kV line, near a public boat launch. A01A is also used in the Nelson Dewey-North route.

C02A would then extend 288 feet north-northeast where the DPC 161 kV line would diverge to the northwest. C02A would then continue 280 feet north-northeast as a single-circuit line.

C02B would then extend 0.26 miles northeast as a single-circuit line to parallel the existing Q-2D/Q-2E transmission lines up the bluff after crossing a railroad and CTH VV. C02B would then diverge from the Q-2D/Q-2E lines and continue 0.8 miles east-southeast in a double-circuit configuration with the existing X-15 line, across State Highway (STH) 133 and Dietrich Heights Road, within 1000 feet of six private residences.

C04 would then extend 0.3 miles east-southeast in a double-circuit configuration with X-15, across STH 81, within 300 feet of a private residence. C04 would then continue 0.3 miles east-southeast as a double-circuit line with X-15 to meet the beginning of the Western-South route.

6.1.1.3. Stoneman-North

Stoneman-North would begin midway across the Mississippi River 920 feet southwest of the existing Stoneman Substation. From there, Subsegment **B01** would extend 610 feet northeast to the eastern shore of the Mississippi River, in a double-circuit configuration with the existing DPC 161 kV line (Q-1161), near a public boat launch and paved parking lot. The proposed 345 kV line would replace the existing

[259] All measurements mentioned in this document are approximate and the entirety of the possible routes are subject to change pending Commission approval.

DPC 69 kV line (N-9) that is presently in a double-circuit configuration with Q-1161. B01 is also used in the Stoneman-South route.

B02 would then extend 400 feet north-northeast in a double-circuit configuration with Q-2E, continue 650 feet northeast along the east side of E Crawford Street, crossing Jack Oak Road, STH 133, and a block of commercial and residential property, into the north side of a school parking lot. B02 would then continue 470 feet north-northeast, diagonally crossing E Crawford Street and a church parking lot. B02 would then continue 960 feet north-northeast, crossing Bluff Street to the southeast corner of an agricultural field at the top of the bluff. B02 is also used in the Stoneman-South route.

C01 would then extend 0.7 miles north-northwest in a double-circuit configuration with Q-2D, crossing a private driveway, passing within 1000 feet of eight private residences, and crossing STH 81. C01 would then continue 200 feet north to intersect with X-15.

C03 would then extend cross-country 0.6 miles north in a double-circuit configuration with Q-2D to where it would intersect with X-16 and meet the beginning of the Western-North route.

6.1.1.4. Stoneman-South

Stoneman-South would begin midway across the Mississippi River 920 feet southwest of the existing Stoneman Substation. From there, Subsegment **B01** would extend 610 feet northeast to the eastern shore of the Mississippi River, in a double-circuit configuration with the existing DPC 161 kV line (Q-1161), near a public boat launch and paved parking lot. The proposed 345 kV line would replace the existing DPC 69 kV line (N-9) that is presently in a double-circuit configuration with Q-1161. B01 is also used in the Stoneman-North route.

B02 would then extend 400 feet north-northeast in a double-circuit configuration with Q-2E, continue 650 feet northeast along the east side of E Crawford Street, crossing Jack Oak Road, STH 133, and a block of commercial and residential property, into the north side of a school parking lot. B02 would then continue 470 feet north-northeast, diagonally crossing E Crawford Street and a church parking lot. B02 would then continue 960 feet north-northeast, crossing Bluff Street to the southeast corner of an agricultural field at the top of the bluff. B02 is also used in the Stoneman-North route.

B03 would then extend 660 feet northeast as a single-circuit line to where it would meet with the existing DPC 69 kV line (N-11).

B04 would then extend 710 feet north-northeast in a double-circuit configuration with N-11. B04 would then continue 0.3 miles north, crossing St Charles Road within 500 feet of a private residence, to where it would intersect with X-15 and meet the beginning of the Western-South route.

6.1.2. Proposed ROW in Mississippi River Routing Area

Table 6-3 Proposed route alternatives in the Mississippi River Routing Area

Route Alternative	Length (Miles)	Existing ROW Shared (Acres)	New ROW (Acres)	Total ROW (Acres)	Percentage Of Shared ROW
Nelson Dewey-North	1.54	7.11	20.84	27.95	25%
Nelson Dewey-South	1.82	3.43	29.71	33.14	10%
Stoneman-North	1.83	11.73	21.55	33.28	35%
Stoneman-South	1.08	7.56	12.14	19.7	38%

6.1.3. Unique constraints in the routing area

6.1.3.1. WisDOT concerns

The Great River Road National Scenic Byway follows the Mississippi River for 3,000 miles, from Minnesota into the Gulf of Mexico. In Wisconsin, the Great River Road National Scenic Byway is a 250-mile stretch that runs from Prescott to Keiler, Wisconsin. The federal designation of the Great River Road as a *National Scenic Byway* recognizes this road, as well as the communities and landscapes it traverses, for its unique culture, history, nature, recreation, and scenic beauty. The applicants provided a photo simulation, which shows how the new transmission would affect the scenery of the byway[260]. The expansion of the transmission easement would create new visual impacts to drivers and alter the scenic aesthetics of the area.

Near Cassville, Subsegments A03, B02, and C02B (which encompasses all route alternatives in the Mississippi River Routing Area) would cross Wisconsin's Great River Road National Scenic Byway. The potential impacts to the Great River Road from the construction and operation of the proposed project would depend upon the structure locations as well as if there would be any new crossings of this federally designated scenic byway.

6.1.3.2. Avian risks

The Mississippi River Routing Area contains the most densely packed avian collision risk areas of the entire project area. The elevated risk in this area is attributed at least in part, to the abundance of preferred habitat provided by the presence of the two IBAs (Wyalusing to Dewey IBA and Upper Mississippi River NWR IBA), the Refuge, and the Mississippi River which is a major migratory pathway for hundreds of thousands of birds every spring and autumn. Refer to Section 2.5.6 for more information on IBAs in the project area. Commission staff are waiting on additional information about potential mitigation options from the applicants regarding the high-risk areas identified in the Avian Risk Review.

Within this routing area, the Avian Risk Review provided by the applicants identified high-risk collision areas totaling almost three miles (Appendix F). There are three identified areas of increased risk for avian collisions as identified in Table 6-4 as well as Figure 6 (Appendix A). Given the described habitat and documented use by specific avian groups (i.e., waterbirds and raptors), the proposed route segments that intersect the Upper Mississippi River NWR IBA pose an increased risk of avian collision relative to other segments.

Subsegments A01B, A01C, A02, and C02B intersect the southernmost boundary of the Wyalusing to Nelson Dewey IBA immediately northeast of the Mississippi River crossing in Grant County. Subsegments that intersect with this IBA are also considered to present an increased avian collision risk relative to other route segments.

---

[260] PSC REF#: 347477

Table 6-4 Areas of increased avian risk within the Mississippi River Routing Area adapted from the Avian Risk Review for the Cardinal-Hickory Creek Project (Figure 3, Appendix F)

Route Alternative	Route Subsegment(s)	Potential Avian Collision Risk Areas	Approx. Length (feet)	Characteristics and Factors Contributing to Avian Collision Risk
Nelson Dewey-North	A01B A02 B-IA2* (Refuge)	360th Street (B-IA2) to intersection with CTH VV	7,145	Mississippi River, ponds, backwaters, wetlands, and bald eagle nest locations; Upper Mississippi River National Wildlife and Fish Refuge
Nelson Dewey-South	C02A C02B	Stateline to intersection with CTH VV	1,229	
Nelson Dewey-North and Nelson Dewey-South	A01A B-IA* (Refuge)	360th Street (B-IA) to north end of A01A	7,173	

6.1.4. Off-ROW access roads

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads or the ROW is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.2.5.1. Along the proposed routes, there are many areas of steep topography that would make accessing work areas via the ROW difficult or more impactful than the use of off-ROW roads.

The application states that the off-ROW access roads would typically be 30 feet in width. There could be locations where the access road may need to be wider than 30 feet to accommodate certain topography and vehicles. If the project would be approved, the applicants would refine off-ROW access routes during final construction planning. This planning stage would include landowner discussion and negotiations. The width of the off-ROW access route is wider than that stated in other recent CPCN projects, and may cause more impacts to adjacent land and vegetation. Landowners may be able to negotiate which area is more impacted by the widening of existing routes to accommodate the proposed 30 feet width. After construction is completed, off-ROW access roads may be restored to pre-construction conditions or, depending on negotiations with the property owner, access roads constructed in upland areas may be left in place.

The applicants have identified off-ROW access roads in the Mississippi River Routing Area. If either Stoneman River Crossing route would be approved, one off-ROW access road approximately 1,400 feet in length would be used in an area of steep terrain. If the Nelson Dewey-North Crossing route would be approved, it appears one off-ROW access road, made up of segments interspersed with areas of existing ROW[261] would need to be used due to steep terrain. This area has records of a special concern snake species in the area of the off-ROW access road. See Section 6.2.6. for more information on the project and rare species impacts. If the Nelson Dewey-South Crossing Route would be approved, one off-ROW access road approximately 1,350 feet in length would be used to avoid areas of steep terrain. Another off-ROW access road approximately 100 feet in length might be needed near the eastern side of the Nelson Dewey Substation.

[261] GIS data in this area was not initially clear, see the response to Data Request 4.72(e) (PSC REF#: 3559450).

Table 6-5 Off-ROW access road impacts by route alternative[262]

Route Alternative	Number of Roads	Length (Miles)	Area (Acres)	Wetlands (Acres)	Upland Forest (Acres)	Grassland (Acres)	Agriculture (Acres)
Nelson Dewey-North	2	1.52	5.44	0	0.21	1.29	0.72
Nelson Dewey-South	1	0.26	0.92	0	0	0	0.92
Stoneman-North	1	0.26	0.96	0	0.07	0	0.32
Stoneman-South	None identified						

6.1.5. Laydown yards

During construction, laydown yards are utilized to minimize disturbance and provide suitable work surfaces for the temporary storage and staging of construction equipment and material. Laydown yards, also referred to as temporary staging areas, are used throughout construction to set up and store materials, job trailers, storage containers, portable toilets, dumpsters, construction mats, tools, equipment, etc. A typical laydown yard would be about 10 acres in size with a minimum of a 30-foot-wide driveway for ingress and egress; however, for the proposed project laydown yard size varies throughout the project area.

The typical construction activities that are involved in constructing laydown yards include the installation of erosion control measures, leveling of uneven surfaces, stripping and stockpiling of topsoil (if necessary), and installing (as needed) gravel, tracking pads, culvert(s), power, and fencing. This work is generally completed using equipment such as a bulldozer and dump trucks. The disturbance from any laydown yard would depend upon soil type and topography. Areas that are paved or have been previously graded and cleared of vegetation such as parking lots, old gravel pits, or fields are ideal locations for laydown yards.

Generally, the last step in the construction process would be to remove all items such as trailers, security fences, left over materials, storage containers, portable toilets, dumpsters, construction mats, tools, and equipment from the laydown yard. Depending on landowner preferences, laydown yards could be left in place or returned to prior conditions following construction activities.

The proposed laydown yards located within the Mississippi River Routing Area and the potential environmental impacts[263] associated with each proposed laydown yard are included in Table 6.6. The proposed laydown yards are included in the same figures of the proposed route alternatives in Appendix A, as referenced in the table below.

Refer to Section 2.2.5.3 for additional information on temporary workspaces that would also be utilized throughout the project area.

[262] Data compiled from Application, Appendix B, Table 8, updated in response to Data Request 4.72.
[263] PSC REF#: 345376

Table 6-6 Proposed laydown yards near Mississippi River Routing Area

Laydown Yard	Location	Size (acres)	Existing Land Use	Agricultural Land Cover (acres)	Grasslands Land Cover (acres)	Non-Forested Wetland Land Cover (acres)	Developed Land Cover (acres)	Appendix A Reference
LY-01	Nelson Dewey Generating Station	17.52	Stockyard	0.00	0.00	0.00	17.52	Figure 1.01
LY-03	Stoneman Generating Station	16.77	Stockyard/ Agricultural	2.68	6.91	0.00	7.18	Figure 1.01
LY-04	STH 133	7.22	Agricultural	0.00	7.22	0.00	0.00	Figure 1.02

Figure 6-2 Laydown yard LY-01 near Nelson Dewey Substation near the village of Cassville

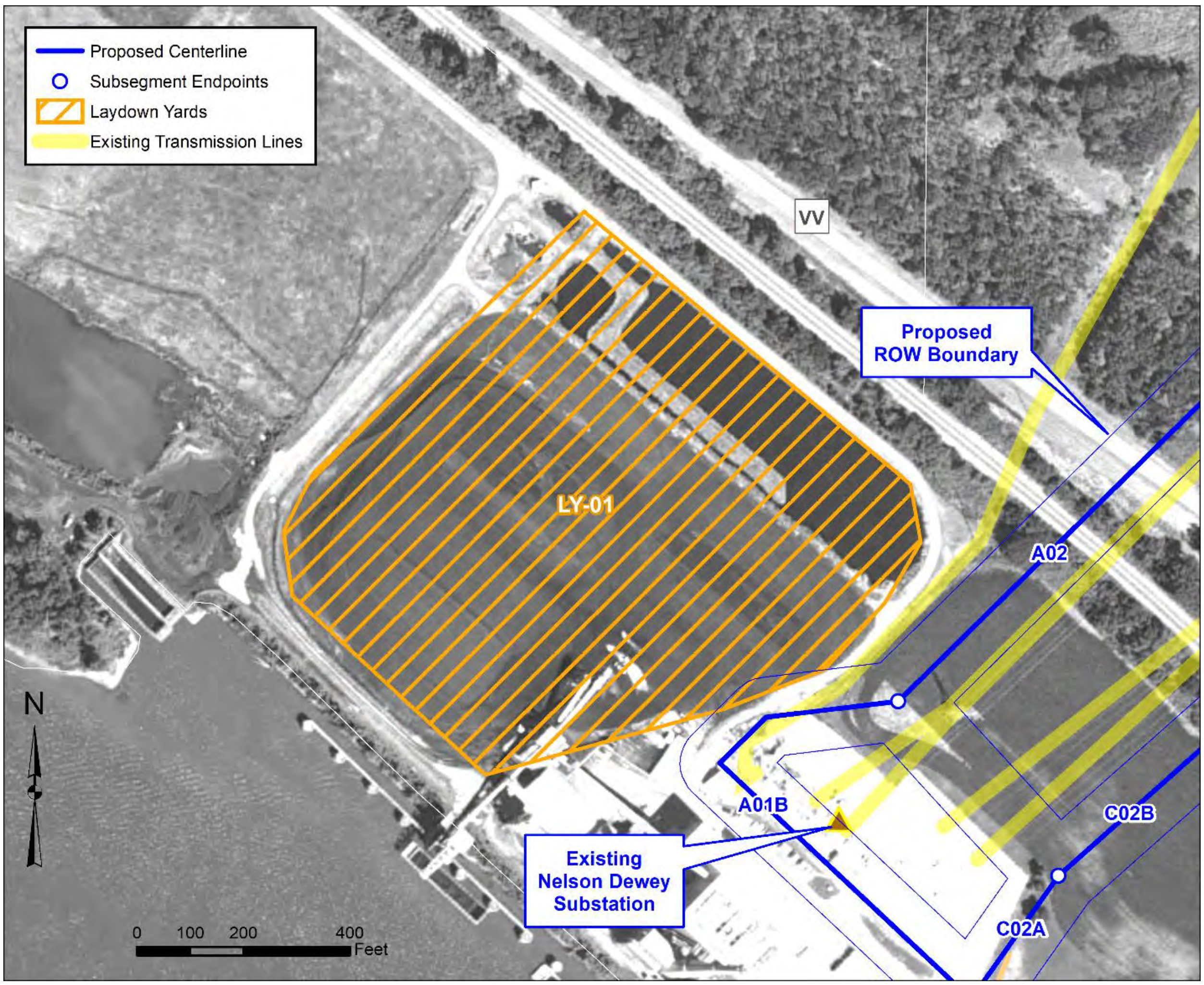
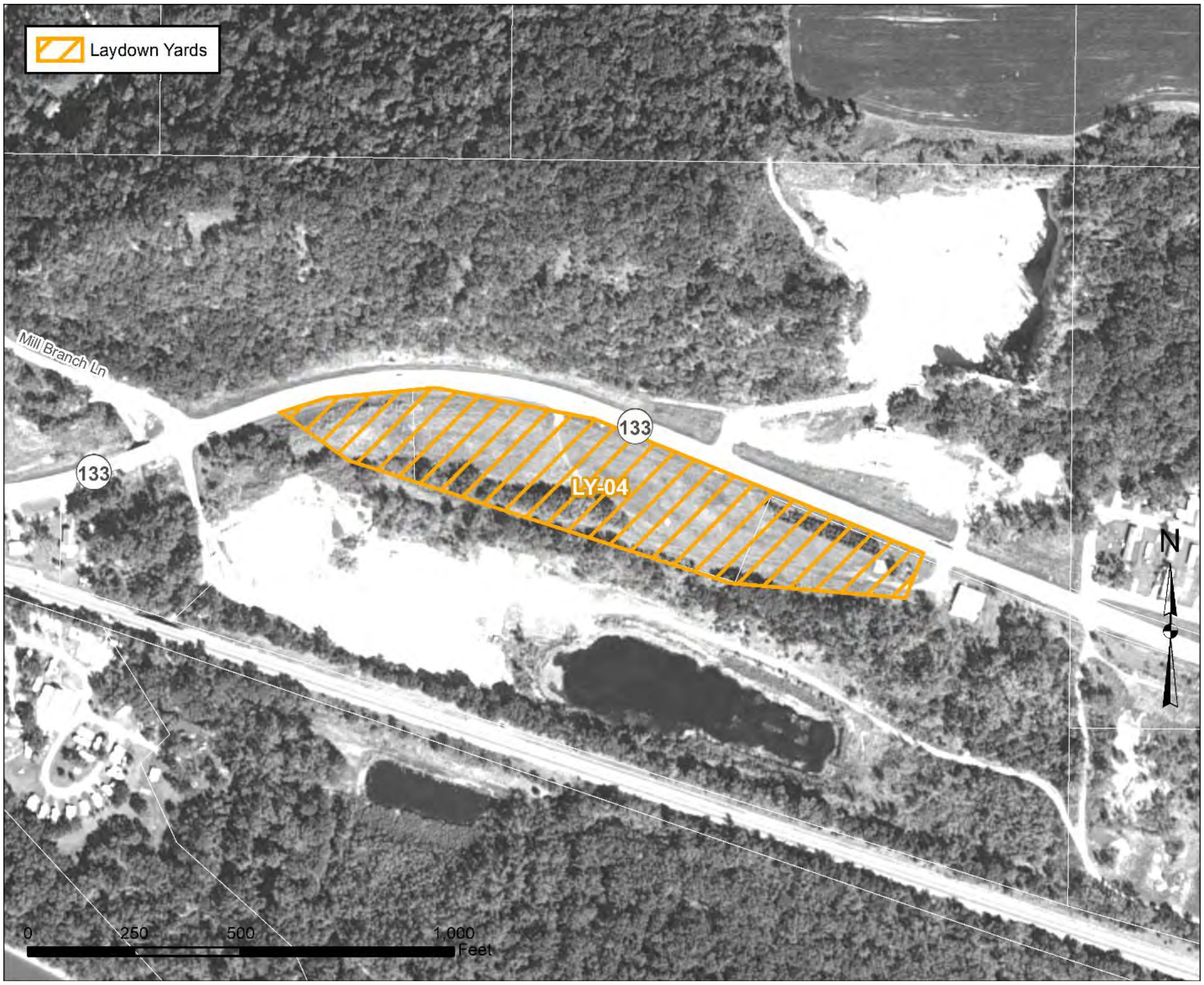


Figure 6-3 Laydown yard LY-03 near Stoneman Substation in the village of Cassville

Figure 6-4 Laydown yard LY-04 on STH 133 near the village of Cassville



6.2. NATURAL RESOURCES AND POTENTIAL IMPACTS

6.2.1. Natural resource properties

This section discusses the properties in this part of the project area that are managed primarily for protecting natural resource habitat. These properties may include publicly-owned lands and also private lands covered by a conservation easement or agreement. There may be some overlap in this section with properties discussed in Section 6.3.5 because some properties serve multiple functions or have multiple designated uses. Note there may be additional conservation easements or agreements not included below that may exist within the project area. If any additional easement or agreements exist, they would be identified during the easement acquisition process if the project is approved.

In instances where impacts are anticipated to occur as a result of the project, the applicants should coordinate as early in the process as possible with the appropriate owner or manager of the property. Specifically, the applicants should attempt to identify landowner concerns, determine the probability and nature of impact, and, if possible work with the landowner to develop a mitigation strategy that would either lessen or eliminate potential impacts.

In cases where the proposed project would impact a property that was purchased with the aid of Land and Water Conservation (LAWCON) funds, a separate review involving DNR and the contributing federal agencies must occur before any construction could occur. This program was established by Congress in 1965 to create parks and open spaces, protect wilderness, wetlands, and refuges, preserve wildlife habitat, and enhance recreational opportunities. The fund has two main components; to serve as a federal program that funds the purchase of land and water areas for conservation and recreation purposes within the nation's four federal and management agencies – Forest Service, Fish and Wildlife Service, National Park Service, Bureau of Land Management; and to also serve as a state matching grants program that provides funds to states for planning, developing, and acquiring land and water areas for state and local parks and recreation areas.

Several natural resource properties, under a range of ownership, exist in the vicinity of the Mississippi River Routing Area (Figure 9, Appendix A). Federally managed natural resources properties within the vicinity include USACE managed wetlands (Rock Island District, Mississippi River Pools), and the USFWS managed Upper Mississippi River National Wildlife and Fish Refuge (numerous smaller management parcels) (Figure 9, Appendix A).

State of Wisconsin managed parks and natural areas include Nelson Dewey State Park, and Dewey Heights Prairie State Natural Area (located within Nelson Dewey State Park). Additionally, in the village of Cassville, adjacent to Riverside Park, Subsegment B02 would pass through parcels purchased with LAWCON funds. If the project is approved and the Mississippi River Crossing at Stoneman is selected, the applicants should consult and coordinate as early as possible their construction and mitigation activities with managers at the State Park and the State Natural Area. A detailed separate review would be required to determine the extent to which the proposed route impacts LAWCON-encumbered property.

Other properties, not directly crossed by the project routes, but still within approximately one mile of the project, include the Cassville Bluffs State Natural Area, and a number of private easements featuring riverine and bluff habitat, held by the Mississippi Valley Conservancy and other non-profit organizations, including the Worsham Property, located just southeast of the proposed river crossing.

As mentioned in Section 2.5.6, two IBAs are also located within the vicinity of the river crossing, namely the Wyalusing to Dewey IBA and the Upper Mississippi NWR IBA. Although these properties are not managed at a federal or state level, they are nonetheless recognized as unique or high quality habitat and managed by the National Audubon Society in cooperation with Birdlife International.

Table 6-7 Potential impacts to natural resource properties within the Mississippi River Routing Area

Route Alternative	Subsegments	Natural Resource Property	Ownership/Management	Potential Impact
Nelson Dewey - North	A01A and A01B	Private Easement	Owned and managed by USACE	Construction of new ROW, loss of vegetation associated riverine habitat
	A01B and A02	Wyalusing to Dewey IBA	Managed by National Audubon Society and Birdlife International	Existing ROW, vegetation loss, potential introduction of invasive plant species
Nelson Dewey - South	A01A	Private Easement	Owned and managed by USACE	Construction of new ROW, loss of vegetation associated with riverine habitat
	C02A and C02B	Wyalusing to Dewey IBA	Managed by National Audubon Society and Birdlife International	Existing ROW, vegetation loss, potential introduction of invasive plant species
Stoneman-North	B01	Private Easement	Owned and managed by USACE	Existing ROW, loss of vegetation associated with riverine habitat
Stoneman-South	-	-	-	-

6.2.2. Forested lands

General impacts to forested communities from high-voltage transmission lines are discussed in greater detail in Section 4.6.2. The discussion below focuses on forest resources and forested communities in the Mississippi River Routing Area, and although impacts to forested wetlands are mentioned, refer to Section 6.2.4 for more information. Many of the tree species mentioned in this section would be considered incompatible vegetation by transmission owners and therefore would be actively eliminated within the proposed ROW. This would significantly alter, and permanently affect, the existing and future ecological communities within the proposed ROW. If trees are removed from the proposed ROW and the remaining vegetation is not actively managed to encourage an ecological community that effectively outcompetes[264] tree seedlings, the ROW could become dominated with fast growing incompatible vegetation that could quickly colonize the ROW and require significant effort and disturbance to remove. Refer to Section 4.6.5 for more information about vegetative assets in utility ROWs.

All of the proposed route alternatives within this routing area are sited along existing high-voltage transmission line corridors. If the applicants do not release the existing easements and continue to maintain the existing corridors as utility ROWs, even though transmission facilities would be double-circuited with the proposed Cardinal-Hickory Creek project, the quantification of impacts to forested areas provided by the applicants in its application would greatly underestimate the cumulative impacts forest resources and forest communities would experience if the Cardinal-Hickory Creek project was approved. The new Cardinal-Hickory Creek corridor would be, in some areas, much greater than the 150-foot-wide corridor identified in the application. Refer to Section 4.6.2.1 about the impacts associated with forest fragmentation.

The Mississippi River Routing Area is located entirely within the Western Coulees and Ridges[265] ecological landscape (Figure 3, Appendix A). This landscape used to contain the state's most extensive area of oak forest, oak openings, and oak woodland. The hardwood dominated forests found in this landscape are more extensive than in other southern Wisconsin ecological landscapes; however, they have been dissected and interspersed with agricultural and residential areas. Forest cover is currently dominated by oaks and hickories, with maples and basswoods also making up a significant portion of the mature forest canopy. Bottomland hardwoods dominated by silver maple, swamp white oak, river birch, ashes, elms, and cottonwood are also common in this area, especially within the floodplains of the larger rivers in the area. Due to the steep topography found throughout this landscape, limited access, development, and cultivation along steep slopes have allowed them to stay heavily forested. Dry-mesic and mesic hardwood forests are common throughout this ecological landscape, and these oak-dominated hardwoods are well known for their high ecological, economic, aesthetic, and recreational importance. Sustainable management of these oak-dominated forests is very difficult considering that mature oak stands and their associated ecological communities are very difficult to restore once lost. This should be taken into consideration when evaluating the impacts the proposed project would have on the forest resources and forested communities in this area.

In addition to the trees that are located in more natural settings, trees are also vitally important to cities, villages, and towns; and similar to electricity and water, an urban tree canopy is considered a part of the

---

264 For example, implementation of an IVM program accredited by the ROWSC.

265 Wisconsin Department of Natural Resources. 2015. *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management.* Chapter 22, Western Coulees and Ridges Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS-1131X 2015, Madison.

infrastructure of the community providing valuable environmental, economic, and social benefits[266]. This routing area is located within and adjacent to the village of Cassville.

The applicants' characterized the forests[267] within the proposed ROW of this routing area as deciduous, and mixed deciduous/coniferous stands consisting of pole-size and sawtimber, all under private ownership used primarily for recreation. This area has very steep slopes along the bluffs, which would make tree clearing more difficult in these areas. Of special note, Alliant Energy's Goat Prairie exists along proposed Segments A and C. It contains a closed canopy mesic woodland along a previously cleared existing transmission ROW. This woodland is dominated by eastern red-cedar, black walnut, eastern cottonwood, northern red oak, and bitternut hickory with honeysuckle and multiflora rose (both invasive species) common in the understory. Eastern red-cedar and red oak within the existing transmission line corridor is actively cleared. As stated earlier, this area is characterized by unglaciated ridge and valley topography that can prove challenging to access along the entire length of the ROW. Many of the hillsides are heavily forested, and in areas where the structures span forested valleys, there may not be a need to clear all woody vegetation from the ROW.

6.2.2.1. Nelson Dewey-North

A total of approximately 7.1 acres of upland forest would be impacted and permanently lost if this route alternative was constructed. No forested wetlands or MFL properties have been identified along this route alternative. Off-ROW access roads identified for this route alternative would clear approximately 0.21 acres of upland forest.

Alliant Energy's Goat Prairie and the Wyalusing to Dewey IBA both exist along proposed Segments A and C. The Wyalusing to Dewey IBA contains critical floodplain and upland forest habitat for southern forest interior birds.[268.]

6.2.2.2. Nelson Dewey-South

A total of approximately 16.8 acres of upland forest would be impacted and permanently lost if this route alternative was constructed. No forested wetlands or MFL properties have been identified along this route alternative. Off-ROW access roads identified for this route alternative would not require additional clearing of forested areas.

Alliant Energy's Goat Prairie and the Wyalusing to Dewey IBA both exist along proposed Segments A and C. The Wyalusing to Dewey IBA contains critical floodplain and upland forest habitat for southern forest interior birds.[269]

6.2.2.3. Stoneman-North

Along this route alternative, a total of approximately 11.4 acres of upland forest would be impacted and permanently lost if this route alternative was constructed. No forested wetlands or MFL properties have been identified along this route alternative. Off-ROW access roads identified for this route alternative would clear approximately 0.07 acres of upland forest.

Alliant Energy's Goat Prairie and the Wyalusing to Dewey IBA both exist along proposed Segments A and C. The Wyalusing to Dewey IBA contains critical floodplain and upland forest habitat for southern forest interior birds.[270]

---

266 Urban and community forests, DNR accessed at: https://dnr.wi.gov/topic/UrbanForests/.
267 Response to Data Request 4.50, Table 2 Environmental Inventory (PSC REF#: 353722).
268 **National Audubon Society.** *Important Bird Areas in the U.S.* s.l. : National Audubon Society, 2013.
269 National Audubon Society. Important Bird Areas in the U.S. s.l. : National Audubon Society, 2013.
270 **National Audubon Society.** *Important Bird Areas in the U.S.* s.l. : National Audubon Society, 2013.

6.2.2.4. Stoneman-South

Along this route alternative, a total of approximately 5.57 acres of upland forest would be impacted and permanently lost if this route alternative was constructed. No forested wetlands or MFL properties have been identified along this route alternative.

6.2.2.5. Summary of potential impacts

Table 6-8 Summary of proposed impacts to forested areas by route alternative in the Mississippi River Routing Area

Route Alternative	Upland Forest (acres)	Forested Wetland (acres)	Total Forest Area (acres)	Off-ROW Upland Forest Area (acres)	MFL Properties (count)
Nelson Dewey-North	7.1	0	7.1	0.21	0
Nelson Dewey-South	16.8	0	16.8	None identified[271]	0
Stoneman-North	11.4	0	11.4	0.07	0
Stoneman-South	5.6	0	5.6	None identified[272]	0

6.2.3. Grasslands

Many grasslands on these route sections are in existing utility line ROW. These types of grasslands often consist of non-native, cool-season grasses, and other weedy plant species. They may be managed by regular mowing and some use of herbicides. There may be areas of remnant prairie habitats not identified in the application. On site visits to other projects in this region of the state, Commission and DNR staff have come across areas of more diverse prairie vegetation in road ROWs, railroad embankments, and utility corridors than in other parts of the state. If the project is authorized, a review of grassland habitat in the approved ROW should determine if there are areas of remnant prairies prior to starting construction. If any prairie remnants are found, the applicants should adopt mitigation actions accordingly to avoid impacts to these ecologically valuable areas.

Impacts to any wet grassland habitats are not covered in this section of the EIS, see Section 6.2.4 for impacts to these habitat types.

Expected impacts from construction activities would include direct damage to plants, the potential spread of invasive species, and the rutting or compaction of soils. Disruption to vegetation and soils on the slopes found in the Driftless Area can cause erosion and soil run-off. These impacts could be minimized through the use of matting, accessing the site during frozen conditions or during plant dormancy, and the use of BMPs to avoid spreading invasive species. Identifying, marking and directly avoiding any areas of high plant diversity would likely be the most effective way of avoiding impacts to rare plant species. Any reseeding used during site restoration should use a mix of native species suitable to the area. Treatment of invasive species using non-specific herbicide application could impact native plant species. In areas where considerable work has gone into restoring or developing prairie habitats, any herbicide drift or non-specific application could have longer-term impacts on the success of any prairie conservation work.

6.2.3.1. Nelson Dewey-North

A total of 9.8 acres of grassland would be impacted by work in the transmission ROW. Approximately 5.04 acres is located in existing ROW, and approximately 4.76 acres of new grassland habitat would be impacted. Of this acreage, there would be up to 5.2 acres of dry/goat prairie associated with an Alliant

[271] No off-ROW access roads have been identified for these route alternatives in response to Data Request 4.72.
[272] No off-ROW access roads have been identified for these route alternatives in response to Data Request 4.72.

Energy prairie restoration project impacted. An off-ROW access road is needed to reach the eastern side of this route, resulting in another 1.29 acres of grassland impacts.

Both route options that would use the Nelson Dewey Crossing would impact acreage associated with a dry prairie restoration project by Alliant Energy. Impacts to vegetation or soils in this area could setback or eliminate the work done in restoring this area of habitat. The applicants should work with Alliant Energy environmental staff to identify the areas of restored prairie. Avoiding machinery access in areas of established prairie plants would be the most effective way to prevent impacts. If that cannot be achieved, vehicle and machinery access should utilize one of the mitigation methods such as accessing the site in winter to reduce impacts to established prairie species. Invasive species BMPs should be followed and any ruts or damage to soil should be corrected (Section 4.6.4.2.1). Consultation with Alliant Energy environmental staff should occur if seeding in this area is required, in order to develop a reseeding plan that would work in conjunction with the restoration activities.

6.2.3.2. Nelson Dewey-South

A total of 5.2 acres of grassland would be impacted. Approximately 2.6 acres is located in existing ROW, and approximately 2.6 acres of new grassland habitat would be impacted. Of this acreage, there would be up to 1.78 acres of dry/goat prairie associated with an Alliant Energy prairie restoration project impacted.

Both route options that would use the Nelson Dewey Crossing would impact acreage associated with a dry prairie restoration project by Alliant Energy. Impacts to vegetation or soils in this area could setback or eliminate the work done in restoring this area of habitat. The applicants should work with Alliant Energy environmental staff to identify the areas of restored prairie. Avoiding machinery access in areas of established prairie plants would be the most effective way to prevent impacts. If that cannot be achieved, vehicle and machinery access should utilize one of the mitigation methods such as accessing the site in winter to reduce impacts to established prairie species. Invasive species BMPs should be followed and any ruts or damage to soil should be corrected (Section 4.6.4.2.1). Consultation with Alliant Energy environmental staff should occur if seeding in this area is required, in order to develop a reseeding plan that would work in conjunction with the restoration activities.

6.2.3.3. Stoneman-North

A total of 8.67 acres of grassland would be impacted by work in the transmission line ROW. Approximately 6.28 acres is located in existing ROW, and approximately 2.39 acres of new grassland habitat would be impacted.

6.2.3.4. Stoneman-South

A total of 3.6 acres of grassland would be impacted by work in the transmission line ROW. Approximately 2.75 acres is located in existing ROW, and approximately 0.85 acres of new grassland habitat would be impacted.

6.2.3.5. Summary of potential impacts

Table 6-9 Summary of grassland impacts within the Mississippi River Routing Area

Route Alternative	Shared ROW (acres)	New ROW (acres)	Off-ROW Access Roads (acres)	Total Impact (acres)
Nelson Dewey-North	5.04	4.76	1.29	11.09
Nelson Dewey-South	2.6	2.6	0	5.2
Stoneman-North	6.28	2.39	0	8.67
Stoneman-South	2.75	0.85	0	3.6

6.2.4. Wetlands

General information about wetland resources and the potential short- and long-term potential impacts of constructing transmission line through and across wetlands can be found in Section 4.6.7.

6.2.4.1. Nelson Dewey-North

Based on field investigations conducted by the applicants during the 2017 growing season, there were no wetlands identified within the proposed ROW for Subsegments A01A, A01B, A02, and A03. There are no wetlands within the proposed off-ROW areas for these subsegments, based on a desktop review of available mapping resources (Wisconsin Wetland Inventory, soil maps, and recent aerial photographs), and would be field verified if this route alternative is ordered.

6.2.4.2. Nelson Dewey-South

Based on field investigations conducted by the applicants during the 2017 growing season, there were no wetlands identified within the proposed ROW for Subsegments A01A, C02A, C02B, and C04. There are no wetlands within the proposed off-ROW areas for these subsegments, based on a desktop review of available mapping resources (Wisconsin Wetland Inventory, soil maps, and recent aerial photographs), and would be field verified if this route alternative is ordered.

6.2.4.3. Stoneman-North

Based on field investigations conducted by the applicants during the 2017 growing season, there were no wetlands identified within the proposed ROW for Subsegments B01, B02, C01, and C03. There are no wetlands within the proposed off-ROW areas for these subsegments, based on a desktop review of available mapping resources (Wisconsin Wetland Inventory, soil maps, and recent aerial photographs), and would be field verified if this route alternative is ordered.

6.2.4.4. Stoneman-South

Based on field investigations conducted by the applicants during the 2017 growing season, there were no wetlands identified within the proposed ROW for Subsegments B01, B02, B03, and B04. There are no wetlands within the proposed off-ROW areas for these subsegments, based on a desktop review of available mapping resources (Wisconsin Wetland Inventory, soil maps, and recent aerial photographs), and would be field verified if this route alternative is ordered.

6.2.4.5. Summary of potential impacts

The wetlands present within each route alternative are summarized in Tables 6-10 and 6-11 below.

Table 6-10 Wetland habitat present within the proposed ROW of route alternatives within the Mississippi River Routing Area

Route Alternative	Forested Wetland			Non-Forested Wetland		Significant/High Quality Wetlands (count)
	Existing Shared ROW Not Cleared (acres)	Existing Shared ROW (acres)	New ROW (acres)	Existing Shared ROW (acres)	New ROW (acres)	
Nelson Dewey-North	0	0	0	0	0	0
Nelson Dewey-South	0	0	0	0	0	0
Stoneman-North	0	0	0	0	0	0
Stoneman-South	0	0	0	0	0	0

Table 6-11 Wetland impacts within the proposed ROW of route alternatives within the Mississippi River Routing Area. Off-ROW access roads are not anticipated to add any additional wetland impacts.

Route Alternative	Total Wetland Present (acres)	Temporary Wetland Impact (acres)	Permanent Wetland Impact (acres)	Wetland Conversion (acres)
Nelson Dewey-North	0	0	0	0
Nelson Dewey-South	0	0	0	0
Stoneman-North	0	0	0	0
Stoneman-South	0	0	0	0

6.2.5. Waterways

General information about waterways and the potential short- and long-term potential impacts of constructing transmission line through and across waterways can be found in Section 4.6.6.

The proposed project would cross a major navigable waterway, the Mississippi River in Cassville, Wisconsin. The applicants have proposed two possible river crossings that would connect to either the:

- Nelson Dewey Substation (new crossing), or
- Stoneman Substation (existing crossing).

In data provided by the applicants, the subsegments that would cross the Mississippi River (A01A to Nelson Dewey or B01 to Stoneman) start in the middle of the river presumably at the Wisconsin state line. Both river crossings would connect the Iowa and Wisconsin portions of the proposed Cardinal-Hickory Creek 345kV transmission line through the Upper Mississippi River Wildlife and Fish Refuge.

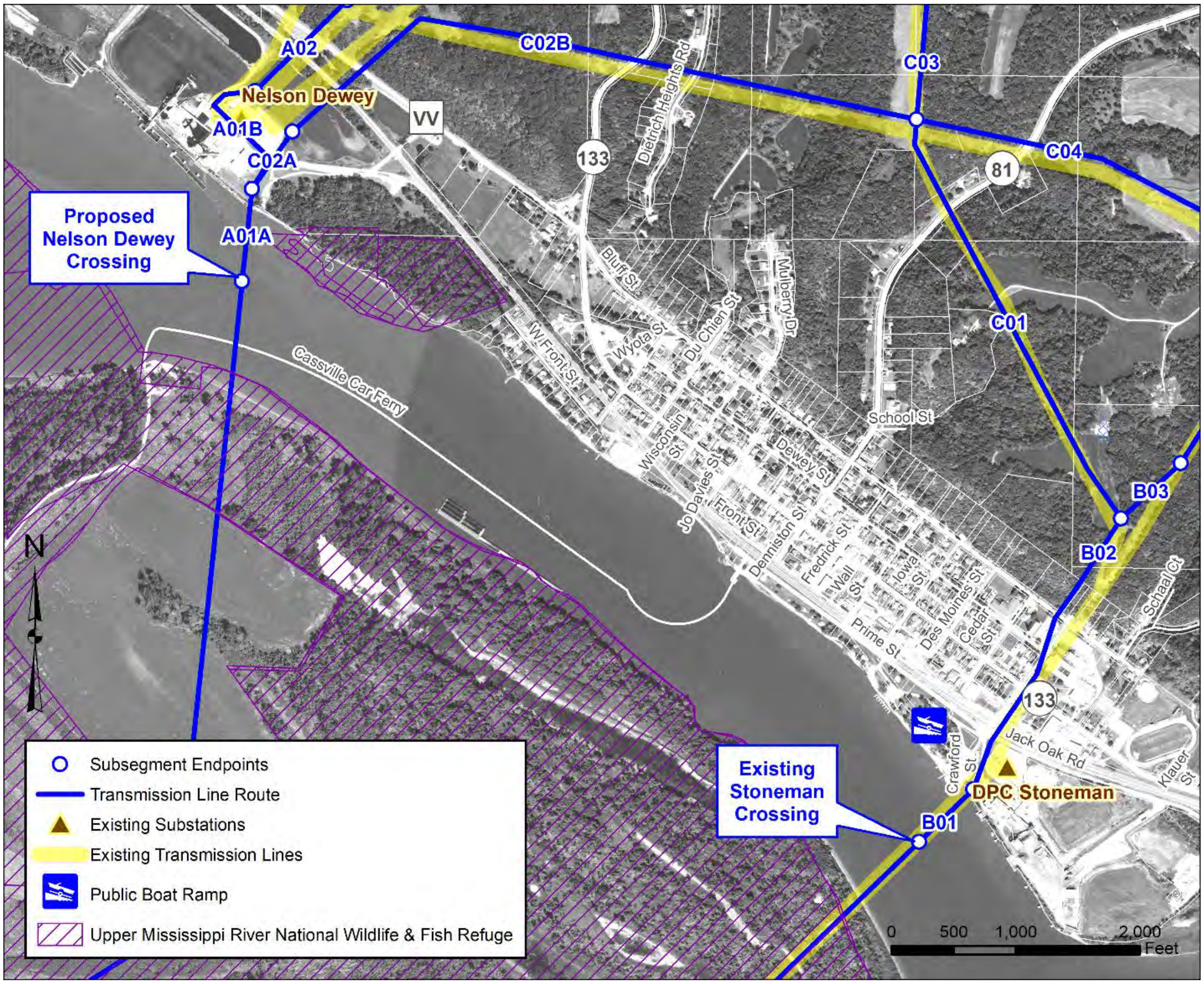
At the proposed new Nelson Dewey river crossing, the Mississippi River is approximately 1,500 feet wide and is not a designated ASNRI in this stretch. At the proposed existing Stoneman river crossing, the Mississippi River is approximately 1,250 feet wide and is not a designated ASNRI in this stretch.

For both river crossings, the applicants propose to span the entire river with structures placed on each bank of the river in both Wisconsin and Iowa. The height of these structures is anticipated to be approximately 173 and 198 feet tall from the ground, with a minimum water to wire to clearance of 91 to 94 feet. These bank structures are taller than the typical structures throughout the rest of the project to meet the minimum height clearance requirements set by the U.S. Coast Guard.

To string the new conductors across the Mississippi River, the applicants would use a helicopter, pontoon boat, or a larger vessel to pull ropes across the river. Due to the stringing activities, the river would be closed for approximately four hours to recreational traffic but not to barge traffic. If a helicopter is used for stringing activities, it is anticipated the recreational closures would be shorter in duration (2-3 hours per phase) but would occur several times over the course of a week or less. The applicants would work with the US Coast Guard to monitor and safely avoid boat traffic on the Mississippi River during the wire pulling activity. Prior to commencing line stringing across the Mississippi River, the applicants would contact the U.S. Coast Guard to coordinate timing and regulation of boat traffic. During the stringing activities, the applicants would be in communication with the lock and dams adjacent to the crossing, so the construction crews are aware of oncoming barge traffic. The construction crews would stop all pulling activities when barges approach and pulling would resume after passing.

The applicants have stated that there are no anticipated impacts to public boat ramps along the Mississippi River or the Cassville Car Ferry operation (Figure 6-5). The public boat ramps would remain open during construction. The small boat ramp by the Nelson Dewey Substation is proposed to have a structure approximately 85 feet from the edge of a gravel parking area.

Figure 6-5 Cassville car ferry and the proposed Mississippi River crossings



6.2.5.1. Nelson Dewey-North

Subsegments A01B and A02 do not contain any waterways within the proposed ROW.

Subsegment A03 contains one waterway within the proposed ROW, the Furnace Branch, which is a tributary to the Mississippi River. This waterway is not designated as an ASNRI but is considered a spring fed coldwater stream. This waterway would not be traversed for vehicle access.

There are no waterway impacts associated with off-ROW areas for Nelson Dewey-North.

6.2.5.2. Nelson Dewey-South

Subsegment C02A does not contain any waterways within the proposed ROW.

Subsegment C02B contains one waterway within the proposed ROW, the Furnace Branch, which is a tributary to the Mississippi River. This waterway is not designated as an ASNRI but is considered a spring fed coldwater stream. This waterway would not be traversed for vehicle access.

Subsegment C04 contains one waterway, an unnamed tributary to Furnace Branch and ultimately the Mississippi River. This waterway is not designated as an ASNRI but is considered a spring fed coldwater stream. This waterway is proposed to be traversed via a TCSB for vehicle access.

There are no waterway impacts associated with off-ROW areas for Nelson Dewey-South.

6.2.5.3. Stoneman-North

Subsegment B02 (common subsegment for Stoneman-North and Stoneman-South) contains one waterway within the proposed ROW, an unnamed intermittent stream, which is a tributary to the Mississippi River. This waterway is not designated as an ASNRI. This waterway is proposed to be traversed via a TCSB for vehicle access.

Subsegment C01 contains one waterway, an unnamed tributary to Furnace Branch and ultimately the Mississippi River. This waterway is not designated as an ASNRI but is considered a spring fed coldwater stream. This waterway is proposed to be traversed via a TCSB for vehicle access.

There are no waterway impacts associated with off-ROW areas for Stoneman-North.

6.2.5.4. Stoneman-South

Subsegment B02 (common subsegment for Stoneman-North and Stoneman-South) contains one waterway within the proposed ROW, an unnamed intermittent stream, which is a tributary to the Mississippi River. This waterway is not designated as an ASNRI. This waterway is proposed to be traversed via a TCSB for vehicle access.

Subsegment B03 contains one waterway, an unnamed tributary to the Mississippi River. This waterway is not designated as an ASNRI. This waterway would not be traversed for vehicle access.

Subsegment B04 contains one waterway, an unnamed intermittent stream, which is a tributary to the Mississippi River. This waterway is not designated as an ASNRI and would not be traversed for vehicle access.

There are no waterway impacts associated with off-ROW areas for Stoneman-South.

6.2.5.5. Summary of potential impacts

The proposed waterways impact by route alternative are summarized in Table 6-12 below.

Table 6-12 Waterways present within the proposed ROW of route alternatives within the Mississippi River Routing Area. Off-ROW access roads are not anticipated to have any additional waterway impacts.

Route Alternative	Waterways Present	ASNRI Waterways Present	Waterway Crossings Proposed	**TCSB's** Required	**TCSB's** Required Over ASNRI
Nelson Dewey-North	2	0	0	0	0
Nelson Dewey-South	3	0	1	1	0
Stoneman-North	3	0	2	2	0
Stoneman-South	3	0	1	1	0

6.2.6. Endangered resources

This section discusses the potential impacts to endangered resources that may be affected by construction or operation of the proposed route alternatives in the Mississippi River Routing area: Nelson Dewey-North, Nelson Dewey-South, Stoneman-North, and Stoneman-South. A general discussion of endangered resources is presented earlier in Section 4.6.1.

Endangered resources include rare or declining species, high quality or rare natural communities, and animal concentration sites. Endangered resources are tracked via the state's NHI database which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the proposed ROW and a buffer of 1.0 mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

This section identifies the endangered resources that could be present within the Mississippi River Routing Area, the potential impacts of the project on these resources, and the avoidance measures that should be implemented. This section does not cover endangered resources that, while they may be present in the area, would not be impacted by this project. Rare species are discussed individually or as taxa groups if there is a high level of concern. The information discussed in this section include information from existing sources within DNR including the NHI database, as well as external sources including landowners and surveys completed by the applicants.

For specific subsegments, an incidental take of state threatened or endangered animal species may occur as defined by Wis. Stat. § 29.604. Should this happen, an ITA would be required for construction to proceed on those subsegments. Instances where existing information indicates that additional assessment or consultation for would be needed to assess potential incidental take are also described in this EIS.

6.2.6.1. Birds

Both Nelson Dewey route alternatives cross the Wyalusing to Nelson Dewey IBA. This area encompasses the rugged Driftless Area bluffs and ravines from the confluence of the Wisconsin and Mississippi rivers at Wyalusing State Park south to Nelson Dewey State Park. The site is characterized by steep hills and bluffs forested with oaks and hickories, with floodplain forest in the bottomlands. Some oak savanna, planted prairie, cool-season grasslands, and lowland brush are present. There also are numerous hillside springs, bare cliffs, and talus slopes. This area supports high breeding populations of numerous high-priority species, including red-shouldered hawk, Acadian flycatcher, yellow-throated vireo, Bell's vireo, cerulean warbler, Kentucky warbler, Louisiana waterthrush, and, in one of the few breeding locations in the state, yellow-throated warbler. Golden eagles use the area in winter and tens of thousands of landbirds and raptors pass through during migration.

During seasonal or diurnal migrations, birds can collide with transmission lines and lines can present barriers to their use of stopover habitat. The risk to birds increases when the lines are vertically arrayed; when they reach above other visible barriers such as tree lines or buildings; or when they are placed in areas of abundant bird use like migration corridors, colonial nesting areas, or stopover habitat. If the lines are constructed on transmission structures with a reduced height, there is often a tradeoff requiring a wider ROW width and/or shorter span lengths. DNR recommendations to minimize impacts to birds in areas of known high bird traffic include a reduction of transmission structure heights. Ideally structure heights of less than 105 feet would help mitigate impacts to the bird species. Commission staff are waiting on additional information regarding structure heights across the Mississippi River. Bird diverters are an important tool in preventing bird collisions with transmission conductors. Areas with high bird traffic include where the routes cross the IBA mentioned above, including Subsegments A02, portions of A03, and the subsegments that cross the Mississippi River. Depending on a route the Commission would approve, the determination of the appropriate type of bird diverters, the location of where bird diverters should be installed, and areas where lower transmission structures could minimize impacts should be determined by the DNR, in consultation with the USFWS and the applicants.

The NHI database indicates several occurrences for the bald eagle, which is federally protected through the Bald and Golden Eagle Protection Act within the vicinity of all four route possibilities. While the specific nests are more than 0.5 mile from the project ROW, there is suitable habitat (large trees in proximity to lakes and rivers) along these subsegments for the species to be present and nesting. Bird surveys were not completed for this area; therefore, it is unknown if this species is currently present within the area. If these subsegments are approved, additional bird surveys may be recommended. Per USFWS guidelines, it is a requirement to maintain a buffer of at least 660 feet between project activities and an active bald eagle nest. Work may be conducted closer if done outside of the nesting season (August through mid-January). If these guidelines cannot be followed, USFWS must be consulted for further assistance prior to the start of construction.

6.2.6.1.1 Nelson Dewey-North and Nelson Dewey-South

Four state-listed (including one federal species of concern) and two special concern bird species have been recorded in the NHI database in the vicinity of Nelson Dewey-North and Nelson Dewey-South. Suitable habitat for these birds mostly include upland woods and open savannas, both of which appear to be present along these route alternatives. In particular, Nelson Dewey-South has two bird species identified fairly close to the proposed ROW. Therefore, if either of these route alternatives are approved additional bird surveys or time of year restrictions during the nesting season would be required.

6.2.6.1.2 Stoneman-North and Stoneman-South

Two state-listed and one special concern bird species have been recorded in the NHI database in the vicinity of Stoneman-North and Stoneman-South. Suitable habitat for these birds include upland woodlands which appears to be present along these route alternatives. In particular, two bird species have been identified within and immediately adjacent to the proposed ROW for Stoneman-North. Therefore, if either of these route alternatives are approved, additional bird surveys or time of year restrictions during the nesting season would be required.

6.2.6.2. Mammals

6.2.6.2.1 Nelson Dewey-North and Nelson Dewey-South

One state threatened bat has been documented in the vicinity of Nelson Dewey-North and Nelson Dewey-South. This species can be found roosting in tree snags, bat houses, and buildings during the summer and hibernates in caves and mines from fall through spring. It forages primarily over open water and along edge habitats. Where suitable habitat occurs, avoidance/minimization measures for this species may include presence/absence surveys and limited tree clearing during the species' maternity period.

6.2.6.2.2 Stoneman-North and Stoneman-South

No rare mammals were documented in the NHI database within the vicinity Stoneman river crossing.

6.2.6.3. Herptiles

6.2.6.3.1 Nelson Dewey-North and Nelson Dewey-South

Five special concern reptile species have been documented as occurring in the vicinity of Nelson Dewey river crossing; including one species that has been found within the proposed ROW of Nelson Dewey-North. These species prefer a variety of upland habitats including forests, savannas, and bluff prairies all of which could be present along this route alternative. Possible recommended avoidance measures for these species may include conducting work in areas where the species does not overwinter during their inactive season, have a monitor onsite during the active season to relocate any individuals found, and/or installing taller herp exclusion fencing in areas of suitable habitat and conducting removals within the fenced area.

6.2.6.3.2 Stoneman-North

One special concern reptile species have been documented as occurring in the vicinity of Stoneman-North. This species prefers forests, savannas, and bluff prairies all of which could be present along this route alternative. Possible recommended avoidance measures for these species may include conducting work in areas where the species does not overwinter during their inactive season, have a monitor onsite during the active season to relocate any individuals found, and/or installing taller herp exclusion fencing in areas of suitable habitat and conducting removals within the fenced area.

6.2.6.3.3 Stoneman-South

No rare herptiles were documented in the NHI database within the vicinity of Stoneman-South.

6.2.6.4. Terrestrial invertebrates

6.2.6.4.1 Nelson Dewey-North

Several rare moths and butterflies (including one federal species of concern) have been observed in the vicinity of Nelson Dewey-North. They include three endangered species, one threatened species, and eight species of special concern. Suitable habitat for all 12 of these butterfly, moth, grasshopper, and planthopper species include woodland edges, barrens, savannas, and prairies which appear to be present along this route alternative. If Nelson Dewey-North is ordered, host plant surveys would be required in suitable habitat locations for the four endangered/threatened species. If host plants were located, surveys for the species itself would then be required if not already assumed present.

One state threatened and three special concern snail species are known to be present within the vicinity of the ROW. Suitable habitat for these species include wooded hillsides and prairies both of which appear to be present within the proposed ROW. If suitable habitat would be disturbed, presence/absence surveys would likely be required for the state listed species and if found, and an ITA would be necessary. Further minimization measures would need to be determined at that time.

6.2.6.4.2 Nelson Dewey-South

Several rare moths and butterflies (including one federal species of concern) have been observed in the vicinity of Nelson Dewey-South. They include two endangered species, one threatened species, and six species of special concern. Suitable habitat for all nine of these butterfly, moth, grasshopper, and planthopper species include woodland edges, barrens, savannas, and prairies which appear to be present along this route alternative. If Nelson Dewey-South is ordered, host plant surveys would be required in suitable habitat locations for the four endangered/threatened species. If host plants were located, surveys for the species itself would then be required if not already assumed present.

One state threatened and three special concern snail species have been documented within the NHI Database, and three of these species are specifically known to occur either within or immediately adjacent to the proposed ROW. If suitable habitat would be disturbed, presence/absence surveys would likely be required for the state listed species and if found, and an ITA would be necessary. Further minimization measures would need to be determined at that time.

6.2.6.4.3 Stoneman-North and Stoneman-South

One state threatened and three special concern snail species have been documented within the NHI Database, and three of these species are specifically known to occur either within or immediately adjacent to both proposed ROWs. If suitable habitat would be disturbed, presence/absence surveys would likely be required for the state listed species and if found, an ITA would be necessary. Further minimization measures would need to be determined at that time.

6.2.6.5. Fish and aquatic invertebrates

The proposed project crosses the Mississippi River, which contains a wealth of endangered, threatened, and special concern fish and aquatic invertebrates. The applicants are highly encouraged to implement strict erosion control and siltation measures when working within and adjacent to the river. In addition, any impacts to the river bed would likely result in disturbance to these species and an ITA would likely be required. Details on each route alternative can be found below.

6.2.6.5.1 Nelson Dewey-North and Nelson Dewey-South

A total of nine endangered/threatened and one special concern fish species (including one federal species of concern) are known to be present at the Mississippi crossing. To avoid impacts to these species, any work in the river where suitable spawning habitat is present or that would cause siltation within the water would need to take place outside of the collective spawning season (April 20-July 31). The special concern species is also known to be present within Furnace Branch which crosses both route alternatives and impacts to that stream should be minimized or avoided to the extent practicable during the spawning season.

Seven state listed and one special concern mussel species (including one that is federally listed as endangered) may be present within the Mississippi River. For any work done on the bed of the river or that would cause disturbance to the river bed, further assessments would be needed to determine if these species are present. If they are present, avoidance measures likely would include removing each mussel within the impacted area and relocating it to an upstream location.

A special concern dragonfly species is also known to be present within the river and may be impacted by project activities occurring below the ordinary high water mark. Strong erosion and siltation control measures are encouraged to minimize impacts.

6.2.6.5.2 Stoneman-North and Stoneman-South

Similar to Nelson Dewey route alternatives, a total of nine endangered/threatened and one special concern fish species (including one federal species of concern) are known to be present at the Mississippi crossing. To avoid impacts to these species, any work in the river where suitable spawning habitat is present or that would cause siltation within the water would need to take place outside of the collective spawning season (April 20-July 31).

Seven state listed and one special concern mussel species (including one that is federally listed as endangered) may be present within the Mississippi River. For any work done on the bed of the river or that would cause disturbance to the river bed, further assessments would be needed to determine if these species are present. If they are present, avoidance measures likely would include removing each mussel within the impacted area and relocating it to an upstream location.

A special concern dragonfly species is also known to be present within the river and may be impacted by project activities occurring below the ordinary high water mark. Strong erosion and siltation control measures are encouraged to minimize impacts.

6.2.6.6. Plants

Impacts on natural communities can ultimately change habitat conditions and make it difficult for rare plants to persist. Wisconsin's Endangered Species Law protects state-listed endangered and threatened plant species only on public lands, but utility (including transmission line projects), agriculture, forestry, and bulk sampling projects are exempted from this protection. Additional surveys and avoidance/minimization measures for rare plant species are encouraged and recommended. Potential avoidance measures may include conducting plant surveys to determine presence/absence and avoiding areas where known plants occur. Other measures, such as winter construction, use of mats to limit direct disturbance, or relocation, can minimize losses. DNR would also recommend that the applicants and landowners with rare species on their property develop a plan to protect these species.

6.2.6.6.1 Nelson Dewey-North and Nelson Dewey-South

Seven special concern plant species occur in the vicinity of Nelson Dewey-North and Nelson Dewey-South including one species that has been found within the proposed North ROW and two species that have been found within the proposed ROW for Nelson Dewey-South. Suitable habitat for these species includes woodlands and prairies, both of which can be found along this route alternative. Further review would be highly recommended to determine where habitat and species surveys should be conducted.

6.2.6.6.2 Stoneman-North and Stoneman-South

The NHI database identified five and four special concern plant species in the vicinity of Stoneman-North and Stoneman-South, respectively. This includes two species that have been found within or immediately adjacent to both proposed ROWs. Suitable habitat for these species includes woodlands and prairies, both of which can be found along this route alternative. Further review would be highly recommended to determine where habitat and species surveys should be conducted.

6.2.6.7. Natural communities

Natural communities may contain rare or declining species and protection of these communities should be incorporated into the project design as much as possible. Given the predominance of private lands, it is likely that additional diverse, high quality, or rare natural community occurrences exist beyond those documented in the NHI database. Minimizing impacts to and incorporating buffers along the edges of these natural communities is recommended.

6.2.6.7.1 Nelson Dewey-North and Nelson Dewey-South

Four upland natural communities have been documented as occurring within the vicinity of Nelson Dewey-North and three upland natural communities have been documented as occurring within the vicinity of Nelson Dewey-South. Two of these natural communities are highly likely to have been documented along both route alternatives. These natural communities likely contain many of the rare species mentioned previously and should be protected to the extent practicable. Mitigation measures could include completing work under frozen ground conditions, implementing strict invasive species BMPs, and using a native prairie seed mix during the restoration phase.

6.2.6.7.2 Stoneman-North and Stoneman-South

Three upland natural communities have been documented as occurring within the vicinity of the Stoneman-North and Stoneman-South, and they are all likely to be present within the proposed ROW. These natural communities likely contain many of the rare species mentioned previously and should be protected to the extent practicable. Mitigation measures could include completing work under frozen ground conditions, implementing strict invasive species BMPs, and using a native prairie seed mix during the restoration phase.

6.2.6.8. Summary of potential impacts

Tables 6-13 through 6-16 identify the general types and numbers of rare species, natural communities, and other features that were identified as potentially present along route alternatives within the Mississippi River Routing area based primarily on information from the NHI database.

Table 6-13 Summary of endangered resources impacted along Nelson Dewey-North

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed, Candidate, or Species of Concern	Not Applicable
Birds	4	2		1	
Mammals	1				
Herptiles		5			
Terrestrial Invertebrates	5	11		1	
Fish/Aquatic Invertebrates	16	3	1	1	
Plants		7			
Natural Communities					4
Summary	26	28	1	3	4

Table 6-14 Summary of endangered resources along Nelson Dewey-South

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	4	2		1	
Mammals	1				
Herptiles		5			
Terrestrial Invertebrates	4	9		1	
Fish/Aquatic Invertebrates	16	3	1	1	
Plants		7			
Natural Communities					3
Summary	25	26	1	3	3

Table 6-15 Summary of endangered resources along Stoneman-North

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	2	1			
Mammals					
Herptiles		1			
Terrestrial Invertebrates	1	3			
Fish/Aquatic Invertebrates	16	3	1	1	
Plants		5			
Natural Communities					3
Summary	19	14	1	1	3

Table 6-16 Summary of endangered resources along Stoneman-South

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	2	1			
Mammals					
Herptiles					
Terrestrial Invertebrates	1	3			
Fish/Aquatic Invertebrates	16	3	1	1	
Plants		4			
Natural Communities					3
Summary	19	11	1	1	3

As many of the documented rare species occurrences in the NHI database originate from surveys conducted on public lands, the Nelson Dewey route alternatives have more rare species within their buffers due to being closer to Nelson Dewey State Park and various state natural areas. The NHI database seems to indicate that Stoneman-North and Stoneman-South are not as diversely rich in rare species as Nelson Dewey-North and Nelson Dewey-South; however, all route alternatives in this routing area cross similar terrain and habitats including cliffs, woodlands, and open uplands which could include prairies. As a result, there may be many unknown rare species present along the Stoneman route alternatives which should be taken into consideration should the Stoneman crossing be chosen.

Any of the route alternatives that are chosen would have a negative impact on the rare birds that occur in this area and may render the habitat unusable to certain species, especially within the Wyalusing to Nelson Dewey IBA. However, clearing of the ROW and future maintenance as open space would greatly benefit many of the rare herptiles, pollinators, terrestrial snails, plants, and natural communities that may be present in the area. This would especially be the case if the ROW was restored with a native dry prairie mix and maintained to allow those species to become established; all of which would be highly encouraged.

For areas of known high bird traffic, in particular the Mississippi River crossing and within the Important Bird Area, DNR recommends minimizing impacts to birds by reducing the transmission structure heights and using bird diverters. If the Commission approves the project, the determination of the appropriate type of bird diverters, the location of where bird diverters should be installed, and areas where lower transmission structures could help minimize these impacts should be determined by the DNR, in consultation with the USFWS and the applicants.

6.2.7. Invasive species

The applicants had access to some, but not all, areas of the proposed project during the planning stage. Where the applicants had access to proposed route alternatives during the 2017 growing season, observations of invasive plant species were noted when practicable. The general location and species observed were added to an overall evaluation of the risk of spreading invasive species, pests, or diseases as a result of project construction activities. Wetland delineations and vegetation mapping tasks were the source of most of these observations; however, a targeted survey of proposed route alternatives to identify invasive species was not done.

In addition to the applicants' observations of invasive species in the project area, Commission staff reviewed the project using the DNR Lakes and Aquatic Invasive Species Viewer. This database has some records of aquatic invasive species, but the lack of any observations should not be interpreted as meaning there are no invasive species in a given area. This route area has zebra mussels reported in the Mississippi River at the project location, with other invasive species up and downstream. Where this project would involve installation of facilities near the Mississippi River there is a risk of aquatic invasive species being spread. The application states that work below the OHWM would be avoided to the extent practicable. Any machinery, equipment, or materials that are placed below the OHWM of a waterway should be decontaminated for invasive species before being used in another waterway in accordance with Wis. Admin. Code § NR 329.04(5).

The project area of southwestern Wisconsin has a range of plant pests that could affect trees and forestry operations such as oak wilt, emerald ash borer, and gypsy moths. See Section 4.6.2 for more discussion on these potential impacts to forests. The applicants state that standard BMPs to reduce the spread of these plant pests would be used during tree clearing operations. These BMPs include avoiding impacts to oak trees from April 1-July 15, and following guidelines to avoid spreading emerald ash borer and gypsy moths by leaving cut vegetation on site when possible.

A full list of invasive species recorded in the project area is provided in Section 4.6.4.3.; however, no observations of invasive species were reported in the application for this routing area. It is important to note that this does not mean they are not present in the routing area and a more thorough assessment of invasive species presence should be done prior to construction activities starting. When invasive species are encountered, the applicants should implement the BMPs identified in Section 4.6.4.2 to minimize the spread of invasive species as a result of any activities conducted for the proposed project.

6.2.8. Archaeological and historic resources

The applicants completed several reviews in order to identify archaeological and historic resources within the Mississippi River Routing Area.[273] These reviews identified one historic district, two historic buildings, two archaeological sites, and three human burial sites within this routing area. Commission staff requested additional details from the applicants regarding potential impacts to resources as well as mitigation options.[274] Commission staff have also contacted the Ho-Chunk Tribal Historic Preservation Officer for comment regarding potential impacts to Native American burial mounds and have not received any additional information regarding potential impacts of the proposed project at this time.

6.2.8.1. Nelson Dewey-South

- **GT-0750/BGT-0395 (Subsegment C02B)** consists of a group of three catalogued Native American conical burial mounds located less than 85 feet from Subsegment C02B. The archaeological consultant field surveyed and field verified the site. They recommended an additional survey, protection, and avoidance of the site during construction.
- **GT-0753 (Subsegment C02B)** consists of the remains of a farmstead that is intersected by Subsegment C02B. The archaeological consultant has not field surveyed or field verified the site and recommended a complete survey.

6.2.8.2. Stoneman-North and Stoneman-South

- **E. Dewey Street Residential Historic District: AHI 44243, 236270, 236271, 236272, 236273, 232674, and 236275 (Subsegment B02)** constitutes a collection of seven late-nineteenth/early twentieth century residences in the village of Cassville that are less than 800 feet from Subsegment

[273] PSC REF#s: 341912, 341878, 341879, 341880, 345377, 345378, 345379, 345380, 355953, and 341426
[274] PSC REF#: 343192, 345369, 346685, 350239, and 355945

B02. The architectural historian consultant recommended that the properties would potentially be eligible for listing on the NRHP and that they may be affected by the proposed project.

- **AHI 236278 (Subsegment B02)** consists of the St. Charles Borromeo Catholic Church in the village of Cassville that is less than 300 feet from Subsegment B02. The architectural historian consultant recommended that the property would potentially be eligible for listing on the NRHP and that it may be affected by the proposed project.
- **AHI 236279 (Subsegment B02)** consists of the Klindt-Geiger Canning Company building in the village of Cassville that is located less than 250 feet from Subsegment B02. The architectural historian consultant recommended that the property would potentially be eligible for listing on the NRHP, however they believed it would not be affected by the proposed project.

6.2.8.3. Laydown yards

- **GT-0022/BGT-0326** consists of a group of at least 25 uncatalogued Native American conical burial mounds in a heavily disturbed and altered area intersected by a laydown yard. The archaeological consultant recommended a complete survey of the burial site.[275]
- **GT-0034** consists of a campsite or village site intersected by a laydown yard. The archaeological consultant has not field verified the site and recommended a complete survey.
- **GT-0037/BGT-024** consists of two linear and three conical uncatalogued Native American burial mounds in a heavily disturbed and altered area located under a laydown yard. The archaeological consultant recommended a complete survey of the site.

6.2.8.4. Summary of potential impacts

Table 6-17 Summary of potential archaeological and historic resource impacts in the Mississippi River Routing Area

Route Alternative	Archaeological Sites	Human Burial Sites	Historic Buildings	Historic Districts
Nelson Dewey-North	0	0	0	0
Nelson Dewey-South	1	1	0	0
Stoneman-North	0	0	7	1
Stoneman-South	0	0	7	1
Laydown Yards	1	2	0	0

In accordance with Wis. Stat. § 44.40 and the PSC-SHPO Interagency Programmatic Agreement, Commission staff is consulting with SHPO regarding resources identified within this section of the proposed project. Any work conducted within human burial sites would need a Permit to Disturb a Human Burial as per Wis. Stat. § 157.70. To further minimize or avoid impacts to archaeological and historic resources in the project area, the applicants should implement the recommended actions identified for each site.

6.3. COMMUNITY RESOURCES AND POTENTIAL IMPACTS

6.3.1. Agriculture

The presence of a high-voltage transmission line can adversely affect farm operations and field productivity. Refer to Section 4.5.2 for a discussion of potential impacts associated with transmission line construction and operation in agricultural fields. Transmission lines can affect field operations, irrigation, aerial spraying, windbreaks, and future land uses. DATCP will present its analyses of the potential impacts

[275] The applicants incorrectly label this site as GT-0031; Commission staff requested a correction in Data Request 4.38. (PSC REF#: 350239)

of the proposed project to farmed fields in its AIS. See Section 1.3.3. for a discussion of the role of DATCP in this project.

According to the application, no clear evidence of drain tile lines along the segments was apparent from either aerial photography interpretation or field investigation. However, there are areas of farmland along each route alternative that contain hydric soils in close proximity to ditches, which suggests that drain tiles may exist in these locations. If drainage tiles do exist along an approved route, construction vehicle traffic could break them. During the final design process, the applicants should work with landowners to place structures so that impacts to drain tiles are minimized, to the extent practicable. Other agricultural practices that may be affected by this project include windbreaks, organic farms, and automated tractor use.

Windbreaks consist of rows of trees that can help reduce wind erosion by providing a barrier on the windward side of a field. Depending on soil conditions and supporting practices, a single row of trees protects for a distance downwind of approximately 10 to 12 times (or more) the height of the windbreak. The removal of windbreaks because of transmission line construction, especially in agricultural soils highly susceptible to wind erosion, could result in reduced crop productivity due in part to a permanent loss of top soil and the potential for additional non-point pollution of downwind streams.

In recent years there has been discussion about the potential for construction projects to spread farm pests and diseases or to otherwise affect the health of farming operations. Concerns have been raised about Johne's disease, soybean cyst nematode, the spreading of ginseng diseases to plots reserved for future ginseng production, and pesticide contamination of soils on organic farms. Issues of biosecurity can be a concern to many farm operators.

Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly affect future crop yields. Soils may be mixed during the excavation of pole foundations or during the undergrounding of electrical lines. The excavation depth for transmission structure foundations can vary greatly, but in some projects may be more than 50 feet deep. Excavated parent material or subsoils should not be mixed with topsoils and spread on the surface of the ROW. Significant rutting can occur when soils become saturated or in areas of sensitive soils. Rutting might impact agricultural lands by increasing the mixing of soils, allowing topsoils to erode during rain events, and compacting soils. Compacted soils inhibit percolation of rainwater and, in turn, inhibit seed germination and crop root growth. The degree to which soils are compacted by heavy construction equipment again depends on the type of soil and its saturation level. Ineffective erosion controls may wash valuable topsoils downhill and impact wetlands and waterways. Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed.

Farms that practice organic farming would require specific protection measures during construction to avoid the spread of farm pests and diseases or to protect organic certifications. Additional issues for organic farms might be caused by the removal of tree buffers for new ROWs or the enlargement of existing ROWs. The removal of buffers might threaten the organic status of a crop by increasing the potential for herbicide drift from adjacent fields. Biosecurity and organic farm impacts can be minimized by the applicants working with agricultural landowners well in advance of construction, giving advance notice of construction activities, and following through with agreed to protective measures.

The full width of the ROW would likely be cleared for construction of the proposed line, including properties currently planted with trees as part of plantations or tree farms. Under state statute (Section 4.4), landowners must be compensated for any crop damage caused by construction or maintenance of a high-voltage transmission line. The applicants should work with tree farm and plantation landowners to minimize construction impacts and determine allowable post-construction use of the land within the easement.

Wisconsin Stat. § 182.017(7)(c) through (h) contains a list of landowner rights, many of which address issues important to farm fields, and these rights include required construction impact mitigation measures such as proper segregation of topsoils, post-construction restoration of the field, repair of damaged fences or drainage tile, payment for crop damage and others. A detailed discussion of landowners' statutory rights is included in Section 4.4.

In general, in advance of any construction for the project the applicants would and should coordinate with each agricultural landowner regarding their farm operation including field facilities like drainage tiles, locations of farm animals and crops, current farm biological security practices, landowner concerns, and use of access routes. Potential impacts to each farm property along an ordered route would need to be identified and, where practicable, construction impact minimization measures would need to be agreed upon and implemented. Site-specific practices would need to vary according to the activities of the landowner/farm operator, the type of agricultural operation, the susceptibility of site-specific soils to compaction, the degree of construction occurring on the parcel, and the ability to avoid areas of potential concern.

Prime farmland is land that contains soils with certain characteristics that allow for high yields of a variety of commonly grown agricultural crops. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding. Prime farmland, as described here, is a categorization based on environmental factors. It is not a program, certification, or an easement category. The geologic history of the area played a large role in the formation of these farmlands.

Much of the land that is actively being farmed in the proposed ROWs of the project is comprised of NRCS-classified prime farmland. PSC staff reviewed GIS information to analyze and confirm the locations of prime farmland along the project routes.

Soil properties are only one of several criteria that are necessary for an area to be designated prime farmland. Other considerations include:

- Land use – Prime farmland is designated independently of current land use, but it cannot include areas of water or urban or built-up land. Map units that are complexes or associations containing components of urban land or miscellaneous areas as part of the map unit name cannot be designated as prime farmland.
- Frequency of flooding – Some map units may include both prime farmland and land that is not prime farmland because of variations in flooding frequency.
- Water table – Some map units include both drained and undrained areas. Only the drained areas meet the prime farmland criteria.

6.3.1.1. Nelson Dewey-North

Approximately 10.7 percent of Nelson Dewey-North is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 2.99 acres of cropland would be impacted by Nelson Dewey-North. There are no specialty crops that have been identified along this route alternative.

There are no agricultural buildings within 300 feet or dairy operations within 0.5 miles of the centerline of this route alternative.

No organic farming operations have been identified along this route alternative.

6.3.1.2. Nelson Dewey-South

Approximately 16.6 percent of Nelson Dewey-South is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 5.48 acres of cropland would be impacted by Nelson Dewey-South. There are no specialty crops that have been identified along this route alternative.

There are no agricultural buildings within 300 feet or dairy operations within 0.5 miles of the centerline of this route alternative.

No organic farming operations have been identified along this route alternative.

6.3.1.3. Stoneman-North

Approximately 13.6 percent of Stoneman-North is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 4.52 acres of cropland would be impacted by Stoneman-North. There are no specialty crops that have been identified along this route alternative.

There are no agricultural buildings within 300 feet or dairy operations within 0.5 miles of the centerline of this route alternative No known organic farming operations have been identified along this route alternative.

6.3.1.4. Stoneman-South

Approximately 12.7 percent of Stoneman-South is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 1.52 acres of cropland would be impacted by Stoneman-South. There are no specialty crops that have been identified along this route alternative.

There are no agricultural buildings within 300 feet or dairy operations within 0.5 miles of the centerline of this route alternative. No known organic farming operations have been identified along this route alternative.

6.3.1.5. Summary of potential impacts

Refer to the draft AIS that is being prepared by DATCP for additional information regarding impacts from the proposed project on agricultural land and landowners. Refer to Appendix G for DATCP's Summary of Analysis and Recommendations from the draft AIS that was prepared for the Cardinal-Hickory Creek Project.

Table 6-18 Agricultural impacts in the Mississippi River Routing Area

Route Alternative	Actively Cropped Land				Specialty Crops		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)
Nelson-Dewey North	8,118	0.96	2.03	2.99	0.0	0.0	0.0
Nelson-Dewey South	9,624	0.64	4.84	5.48	0.0	0.0	0.0
Stoneman-North	9,664	1.98	2.54	4.52	0.0	0.0	0.0
Stoneman-South	5,720	1.37	1.15	2.52	0.0	0.0	0.0

6.3.2. Land use plans

In general, residential uses are considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily because of potential adverse aesthetic effects. Greater potential for conflict with land use plans exists in areas of urban development, where existing and planned residential and commercial uses are more common. The potential for conflict is also present in areas undergoing land use change, such as where rural land is being converted to residential use.

Corridor sharing with different types of infrastructure (e.g. transmission lines and multi-lane highways) can mitigate impacts by causing incremental impacts instead of entirely new impacts associated with a new ROW corridor. Not all corridors that can be shared with a transmission line serve to lessen potential impacts, though. Places with narrow, canopy-covered local roads, winding rural roads, and residential areas supporting smaller lots may experience greater impacts from a new high-voltage transmission line.

6.3.2.1. Nelson Dewey-North

Once this proposed route reaches the Mississippi River shore, it would cross the Nelson Dewey Power Plant property, an industrial area in the village of Cassville. Upon crossing the railroad track, the route would enter an area designated "Exclusive Agriculture" by the town of Cassville that is predominantly wooded. The route would follow existing transmission line ROWs for nearly its entire length in this sector.

6.3.2.2. Nelson Dewey-South

Once this proposed route reaches the Mississippi River shore, it would cross the Nelson Dewey Power Plant property, an industrial area in the village of Cassville. Upon crossing the railroad track, the route would enter an area designated Exclusive Agriculture by the town of Cassville, that is predominantly wooded. After turning to the east, the route would cross Dietrich Heights Road, along which several homes are located. The route would follow existing transmission line ROWs for nearly its entire length in this sector.

6.3.2.3. Stoneman-North

After crossing the Mississippi River, the route would pass between the Stoneman Power Plant and Riverside Park in the village of Cassville, before crossing railroad tracks. A strip of industrial land is located on the north side of the tracks. The route would continue through a residential area and pass adjacent to Cassville High School and Cassville Elementary School before entering a rural forested area in the town of Cassville designated "Exclusive Agriculture." The route would follow existing transmission line ROWs for nearly its entire length in this sector.

6.3.2.4. Stoneman-South

After crossing the Mississippi River, the route would pass between the Stoneman Power Plant and Riverside Park in the village of Cassville, before crossing railroad tracks. A strip of industrial land is located on the north side of the tracks. The route would continue through a residential area and pass adjacent to Cassville High School and Cassville Elementary School before entering a rural forested area in the town of Cassville designated Exclusive Agriculture. The route would follow existing transmission line ROWs for nearly its entire length in this sector.

6.3.3. Proximity to residences and potentially sensitive populations

This section discusses the proximity of the proposed project to homes, schools, daycares, hospitals, and other places where people frequently gather. Information for this section came from the tables submitted in the project application that categorize the number of residences and dwellings within specified distances of the proposed centerline of the new 345 kV line and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public and conducted numerous site visits along the proposed routes.

The proximity of properties to a high-voltage transmission line is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, magnetic fields, and other electrical phenomenon, and personal and public safety.

Commission staff recognizes that individuals and families have substantial financial, physical, and emotional investments in their homes and properties and that the discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes.

A generalized discussion of some of these issues is contained in Chapter 4 including:

- aesthetics (Section 4.5.1);
- electric and magnetic fields (Section 4.5.6);
- property values (Section 4.5.7);
- safety (Section 4.5.10);
- stray voltage (Section 4.5.11); and
- noise and light impacts (Section 4.5.13).

Appendix E contains a brief review of the potential health issues associated with electric and magnetic fields generated by transmission lines. Additionally, potential aesthetic and visual impacts in this routing area are discussed in Section 6.3.4 for several specific areas or properties along the proposed route and others that are recognized regionally or state-wide for their natural beauty.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of this high-voltage transmission line cannot be adequately addressed in this document, but a discussion of some special concerns that have been raised follows in Section 6.3.3.2.

6.3.3.1. Residential impacts

6.3.3.1.1 Nelson Dewey-North

There are no residences within 300 feet of the proposed centerline of Nelson Dewey-North. There are no apartment units or apartment buildings within 300 feet of the proposed centerline.

6.3.3.1.2 Nelson Dewey-South

There is one residence within 150 to 300 feet of the proposed centerline of Nelson Dewey-South. This residence is located on Dietrich Heights Road approximately 275 feet north of Subsegment C02B. There are no apartment units or apartment buildings within 300 feet of the proposed centerline.

6.3.3.1.3 Stoneman-North

There are a total of 20 residences located within 300 feet of the proposed centerline of Stoneman-North. Five residences are located within 51 to 100 feet, 4 residences within 101 to 150 feet, and 11 residences within 151 to 300 feet. Most of these residences are located along Subsegment B02 between Jack Oak Road and Bluff Street in the village of Cassville (Figure 6-6). The remaining two residences are located along Subsegment C01 north of the village. There are no apartment units or apartment buildings within 300 feet of the proposed centerline.

6.3.3.1.4 Stoneman-South

There are eighteen residences located within 300 feet of the proposed centerline of Stoneman-South. Five residences are located within 51 to 100 feet, three residences within 101 to 150 feet, and ten residences within 151 to 300 feet. All of these are the same residences located along Subsegment B02 between Jack Oak Road and Bluff Street in the village of Cassville, Wisconsin on Stoneman-North. There are no apartment units or apartment buildings within 300 feet of the proposed centerline.

6.3.3.1.5 Summary of potential impacts

Table 6-19 Number of residential structures within 300 feet of the proposed centerline along route alternatives in the Mississippi River Routing Area

Route Alternative	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
Nelson Dewey-North	0	0	0	0	0
Nelson Dewey-South	0	0	0	1	1
Stoneman-North	0	5	4	11	20
Stoneman-South	0	5	3	10	18

6.3.3.2. Potentially sensitive populations and properties

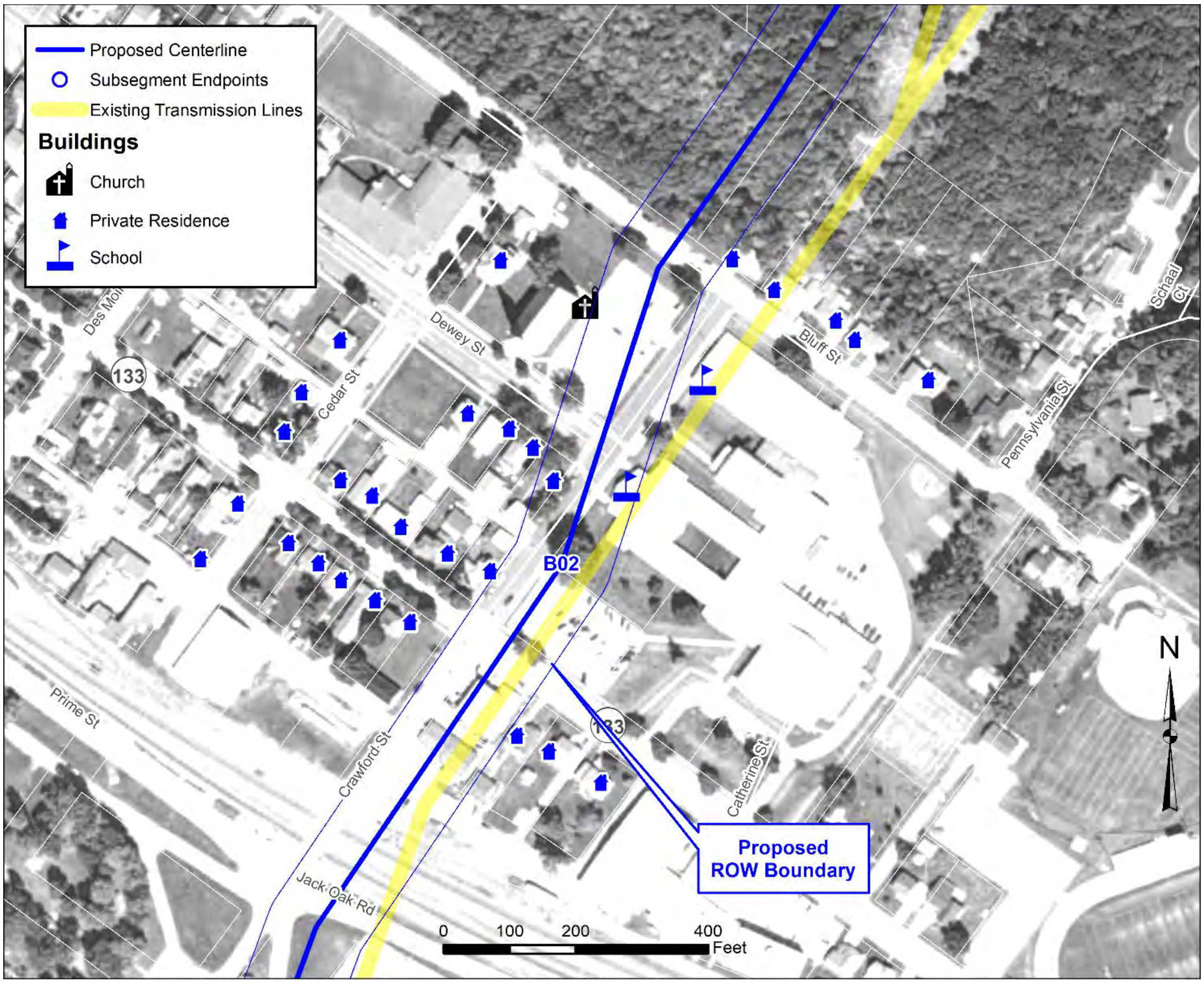
Near Stoneman-North and Stoneman-South there are two schools within 300 feet of the proposed ROW centerline (Figure 6-6). Cassville High School is located within 75 feet of Subsegment B02 and holds 23 staff and 102 grade 7-12 students throughout the school year. Cassville Elementary School is located within 101 to 150 feet of subsegment B02 and holds 20 staff and 98 K-6 students throughout the school year. In the application, the applicants proposed to move the existing 161kV facilities that currently go over both schools to be double-circuited with the Cardinal-Hickory Creek transmission facilities along Stoneman-North or Stoneman-South.[276] The applicants later stated that this would no longer be the case.[277] The applicants stated that height restrictions from the Cassville airport would prohibit double-circuiting the existing transmission facilities with the proposed Cardinal-Hickory Creek facilities. However, in another recent response to staff the applicants' stated that if the structures were marked and lighted in accordance with the FAA marking and lighting advisory circular then these structures would no longer be considered a hazard.[278] It is unclear why the applicants could not double-circuit the existing

[276] Appendix M (PSC REF#: 350875)
[277] Response to Data Request 5.10 (PSC REF#: 354918)
[278] Response to Data Request 7.4 (PSC REF#: 359116)

facilities (that go over both Cassville High School and Cassville Elementary School) with the proposed Cardinal-Hickory Creek facilities.

At the time the applicants collected sensitive receptor data within the project boundaries, St. Charles Borromeo Catholic Church, located across East Crawford Street from the two schools, was misidentified as a working daycare. However, this church does have classrooms and has tentative plans to open a daycare in the future.

Figure 6-6 Proposed ROW along Subsegment B02 (Stoneman-North and Stoneman-South) in the village of Cassville



6.3.3.3. Electric and magnetic fields

Some background information and a general discussion of EMF is found in Section 4.5.6 and in Appendix E of this EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic field lines at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after the proposed line is placed in operation. The magnetic field profiles included in the application appear to be reasonably representative of the potential circuit configurations. Below are brief summaries of the estimated magnetic field levels for the proposed 345 kV transmission line along the various proposed segments along this portion of the proposed route. Commission staff are waiting on missing EMF information for Subsegment A01A.

6.3.3.3.1 Nelson Dewey-North

Subsegments A01B and A02

The proposed 345 kV line would cross the Mississippi River using the Nelson Dewey crossing location near the Nelson Dewey substation in a double-circuit configuration with a DPC 161 kV line that presently exists and terminates upon crossing the river. The proposed 345 kV line would then proceed as a single-circuit line near the Nelson Dewey Substation prior to paralleling existing 138 kV transmission lines X-15 and X-16 for the remainder of the route subsegments, crossing CTH VV. The expected magnetic fields are tabulated below.

Table 6-20 Estimated magnetic fields for Subsegments A01B and A02

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from Centerline (Ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	N/A	N/A	50	50	59	59
100	N/A	N/A	12	12	15	15
200	N/A	N/A	3.8	3.8	4.5	4.5
300	N/A	N/A	1.8	1.8	2.1	2.1

Subsegment A03

The proposed 345 kV line would be double-circuited with the existing X-16 138 kV line, crossing STH 133. The path would typically run north of the existing X-16 centerline by about 75 feet. The expected magnetic fields are tabulated below.

Table 6-21 Estimated magnetic fields for Subsegments A03

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	302 A	349 A	610 A	602 A	715 A	717 A
Distance from Centerline (ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	61	71	66	65	76	77
100	5.29	6.11	16	16	19	19
200	1.33	1.54	4.6	4.5	5.1	5.2
300	0.59	0.68	2.0	2.0	2.3	2.3

6.3.3.3.2 Nelson Dewey-South

Subsegments C02A and C02B

The proposed 345 kV line would cross the Mississippi River using the Nelson Dewey crossing location near the Nelson Dewey Substation in a double-circuit configuration with the DPC Turkey River-Stoneman 161 kV line that presently exists and terminates upon crossing the river. The proposed 345 kV line would then proceed as a single-circuit line near the southeast side of the Nelson Dewey Substation prior to paralleling the existing 161 kV lines Q-2D and Q-2E and crossing CTH VV. The expected magnetic fields are tabulated below.

Table 6-22 Estimated magnetic fields for Subsegments C02A and C02B

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from Centerline (ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	N/A	N/A	50	50	59	59
100	N/A	N/A	12	12	15	15
200	N/A	N/A	3.8	3.8	4.5	4.5
300	N/A	N/A	1.8	1.8	2.1	2.1

Subsegment C02B and C04

The proposed 345 kV line would then cross over the existing 138 kV line X-15, upon which the proposed line would be double-circuited with the 138 kV line, proceeding approximately southeast past STH 133 and STH 81. The double-circuited line would be offset from the centerline of the existing X-15 line for constructability. The expected magnetic fields are tabulated below.

Table 6-23 Estimated magnetic fields for Subsegments C02B and C04

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	189 A	217 A	610 A	602 A	715 A	717 A
Distance from Centerline (ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	33	38	60	58	70	69
100	3.28	3.76	13	13	15	15
200	0.83	0.95	3.4	3.2	4.0	3.8
300	0.37	0.42	1.5	1.4	1.7	1.6

6.3.3.3.3 Stoneman-North

Subsegment B01

The proposed 345 kV line would cross at the location of an existing double-circuited 161/69 kV line that goes into the Stoneman Substation. The existing double-circuit line would be replaced by a 345/161 kV double-circuit line, with the 69 kV terminating in Iowa. The expected magnetic fields are tabulated below.

Table 6-24 Estimated magnetic fields for Subsegment B01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	442 A	510 A	610 A	602 A	715 A	717 A
Distance from Centerline (ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	7.6	8.9	24	25	30	31
100	4.37	5.09	18	19	22	23
200	1.72	2.00	6.9	7.1	8.6	9.0
300	0.84	0.98	3.2	3.3	4.1	4.3

Subsegment B02

Updated information from the applicants state that the proposed 345 kV line would pass as a single-circuit, passing west to east through the village of Cassville which differs from their initial application which stated that the new 345 kV line would be double-circuited with the existing 161 kV line. The expected magnetic fields are tabulated below.

Table 6-25 Estimated magnetic fields for Subsegment B02

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from Centerline (ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	N/A	N/A	50	50	59	59
100	N/A	N/A	12	12	15	15
200	N/A	N/A	3.8	3.8	4.5	4.5
300	N/A	N/A	1.8	1.8	2.1	2.1

Subsection C01

The 345 kV line continues as a double-circuit line with an existing 161 kV line approximately northwest, passing west of Cassville and crossing STH 81. The expected magnetic fields are tabulated below.

Table 6-26 Estimated magnetic fields for Subsegment C01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	538 A	618 A	610 A	602 A	715 A	717 A
Distance from Centerline (ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	106	121	76	77	89	91
100	9.40	11	21	22	25	25
200	2.36	2.72	6.2	6.4	7.2	7.5
300	1.06	1.21	2.9	3.0	3.3	3.5

Subsection C03

The 345 kV line continues as a single-circuit line paralleling the path of 161 kV line Q-2D approximately north before terminating at subsection D01. The expected magnetic fields are tabulated below.

Table 6-27 Estimated magnetic fields for Subsegment C03

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from Centerline (ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	N/A	N/A	50	50	59	59
100	N/A	N/A	12	12	15	15
200	N/A	N/A	3.8	3.8	4.5	4.5
300	N/A	N/A	1.8	1.8	2.1	2.1

6.3.3.3.4 Stoneman-South

Subsegment B01

The proposed 345 kV line would cross at the location of an existing double-circuited 161/69 kV line that goes into the Stoneman Substation. The existing double-circuit would be replaced by a 345/161 kV double-circuit, with the 69 kV terminating in Iowa. The expected magnetic fields are tabulated below.

Table 6-28 Estimated magnetic fields for Subsegment B01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	442 A	510 A	610 A	602 A	715 A	717 A
Distance from Centerline (ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	7.6	8.9	24	25	30	31
100	4.37	5.09	18	19	22	23
200	1.72	2.00	6.9	7.1	8.6	9.0
300	0.84	0.98	3.2	3.3	4.1	4.3

Subsegments B02 and B03

Updated information from the applicants state that the proposed 345 kV line would pass as a single-circuit line, passing west to east through the village of Cassville which differs from their initial application which stated that the new 345 kV line would be double-circuited with the existing 161 kV line. The line then continues until it meets the DPC 69 kV line N-11. The expected magnetic fields are tabulated below.

Table 6-29 Estimated magnetic fields for Subsegments B02 and B03

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from Centerline (ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	N/A	N/A	50	50	59	59
100	N/A	N/A	12	12	15	15
200	N/A	N/A	3.8	3.8	4.5	4.5
300	N/A	N/A	1.8	1.8	2.1	2.1

Subsegment B04

The proposed 345 kV line is double-circuited with the DPC 69 kV line N-11 and continues until reaching subsegment E01. The expected magnetic fields are tabulated below.

Table 6-30 Estimated magnetic fields for Subsegment B04

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load	80% of Peak Load	100% of Peak Load
Current	70 A	91 A	610 A	602 A	715 A	717 A
Distance from Centerline (ft)	Magnetic Field (mG)	Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)	Estimated Magnetic Field (mG)
25	8.5	11	52	51	61	61
100	0.81	1.06	10	10	12	12
200	0.21	0.27	2.8	2.7	3.3	3.3
300	0.09	0.12	1.3	1.2	1.5	1.5

6.3.4. Aesthetics and visual impacts

The following discussion summarizes the aesthetic impacts of proposed project facilities according to their location within the Mississippi River Routing Area. This section begins with crossing the Mississippi River at a new location to the Nelson Dewey Substation, or at an existing high-voltage transmission line crossing to the Stoneman Substation. At either of these locations, the proposed transmission facilities would span the Mississippi River either to the northwest or to the southeast of the village of Cassville (Grant County). From there, both routes would cross a narrow floodplain before rising northeast onto bluffs and then travelling east across sparsely populated forest, grassland, and agricultural areas.

6.3.4.1. Mississippi River crossing-Nelson Dewey Substation

At the western end of the Wisconsin portion of the proposed project, if the Nelson Dewey crossing would be selected, the route would begin with the construction of a new crossing over the Mississippi River (Subsegment A01A). This crossing would be comprised of a double-circuit transmission line configured with new 345 kV line as well as an existing 161 kV line that currently spans the river to the southeast. On the Wisconsin-side of river, near the Nelson Dewey Substation, new support structures would also be constructed. These would be taller than typical transmission line structures in order to span the river at the minimum height clearance determined by the U.S. Coast Guard.

The Upper Mississippi River has been recognized by Congress as a nationally significant ecosystem and commercial navigation system. Although no direct impacts to the river are proposed, the project would cause visual changes and altered aesthetics. Vegetation removal along the banks would likely be required during construction of the project and for ongoing maintenance. Additionally, the new transmission lines and support structures would be visible from a far distance. The applicants provided several photo simulations of the proposed project in this area, which shows the transmission line and structures clearly visible from the river.[279] These changes would affect the natural and scenic aesthetic of the area.

Nelson Dewey-North would run through the area of the decommissioned Nelson Dewey Generation Station and the existing Nelson Dewey Substation, then over County Road VV, and rise to the northeast bluffs (Subsegments A01B, A02, and A03). Next, the line would travel northeast through agricultural land, forest, grassland, and a small waterway. These subsegments would all be next to existing transmission lines and ROW.

Nelson Dewey-South would instead create a connection from the river crossing to the Western-South (Subsegments C02A, C02B, and C04). These segments would also run through the area of the

[279] PSC REF#: 341397

decommissioned generation station and the existing substation, then over County Road VV, and to the northeast bluffs. Then the line would travel northeast through agricultural land, forest, grassland, and a small waterway. These lines would all be next to existing transmission lines and ROW.

Both of these route alternatives would be located near one another; therefore, they would mostly cause similar impacts to the aesthetics of the surrounding area. The aesthetics here are currently heavily disturbed due to an existing substation, several transmission lines, and the remnants of a generation station. Additional forest would likely be cleared to make way for new or expanded ROW, increasing the visibility of the new lines for several rural residences along the routes. Constructing new lines with their associated structures would further disturb any natural or scenic aesthetics of the area.

Additionally, these subsegments would be located near Nelson Dewey Memorial State Park, which overlooks the Mississippi River from a 500-foot bluff, and is used for year-round outdoor recreation activities. The applicants provided a photo simulation of the proposed project from the park. These show the new transmission lines and structures clearly visible near the banks of the Mississippi River, affecting the aesthetics of the park and scenic views.[280]

These subsegments would also cross STH 133, which is designated as part of the Great River Road National Scenic Byway (Section 6.1.3.1). The road is one of the longest scenic routes in the country that allows drivers to travel over 3000 miles from northern Minnesota to the Gulf of Mexico through ten states and hundreds of communities. As a scenic roadway, people travelling the route likely expect natural and scenic aesthetics. Therefore, although the new line would follow existing transmission ROW, the expansion and addition to the existing infrastructure would increase the visual impacts on the Great River Road.

6.3.4.2. Mississippi River crossing-Stoneman Substation

This crossing is also on the western end of the Wisconsin portion of the project, and is located to the southeast of Cassville (Grant County). This crossing would be comprised of a new double-circuit line where an existing 161 kV transmission line currently spans the river (Subsegment B01).

The Mississippi River has significance as an ecosystem, navigation system, and recreational resource. The applicants have provided a photo simulation showing the visual scale of a new transmission line and its support structures.[281] Since the proposed facilities would replace an existing crossing at the same location, the new line would be less impactful than if no previous crossing had been present. However, the new crossing would also be larger than the existing crossing and therefore increase the visual impacts of the existing transmission line. The crossing of the river, vegetation removal for construction and maintenance, as well as size of the support structures, would alter the aesthetics of the surrounding area and affect the scenic views of the river.

Following the Mississippi River crossing, the route would continue from Stoneman Substation (Subsegment B02) and run parallel to an existing transmission line and ROW over the southeast section of the village of Cassville to the northeast bluffs. From there, two options are available:

- Subsegments B03 and B04 which would connect to the Western-South by heading northeast.
- Subsegments C01 and C03 would instead create a connection from the crossing to the Western-North by heading northwest. Both options would mostly travel along existing transmission ROW.

[280] PSC REF#: 347477
[281] PSC REF#: 341398

These segments would affect commercial, residential, and public buildings in the village of Cassville. Although transmission lines already exist along the proposed route, the introduction of additional lines would increase the aesthetic impacts in this location. Many residences in Cassville would be visually impacted by the new line, as well as several buildings that are potentially eligible for listing in the National Register of Historic Places (NRHP). Additionally, several rural residences along the route would experience increased visual impacts. These segments would also cross through forest and grassland, where construction of the project and maintenance of the ROW could reduce the appeal of natural areas and further alter any scenic aesthetics.

6.3.5. Public lands and recreation

The proximity of the project to the Mississippi River and the Refuge provide the public with a range of public recreational activities. The Mississippi River is used for fishing, boating, and swimming, among other uses. In addition, where the river is adjacent to the Refuge it provides even more opportunities for hunting, trapping, hiking, birdwatching, as well as other recreational activities. Nelson Dewey State Park near Subsegment A02 on Nelson Dewey-North is the closest (within approximately 400 feet of Subsegment A02) and largest State owned property in the Mississippi River Routing Area.

6.3.6. Airports and airstrips

The applicants identified public and private airports and heliports located within four miles of the proposed route centerlines and provided information on these airports and airstrips as part of the application. The FAA reviewed information provided by the applicants regarding potential structure heights, locations, and ground elevations for the proposed project and used this information to conduct an aeronautical study under federal regulations to determine if the structures, as described, exceed obstruction standards and/or would have an adverse interference effect on navigable airspace or air navigation facilities. The applicants provided the correspondence from the FAA on these determinations as Appendix H, Exhibit 3[282] of the application.

The only airport identified in the application in the Mississippi River Routing Area is the Cassville Municipal Airport, which is located to the southeast of Cassville and is managed by the village. It has an approximately 3,000-foot asphalt runway with a northwest/southeast alignment, located between Jack Oak Road and STH 133.

6.3.6.1. Nelson Dewey Route Alternatives

The Nelson Dewey river crossing would have the proposed centerline located approximately 1.7 miles (9,300 feet) from the Cassville Municipal Airport boundary, and 1.8 miles (9,700 feet) from the nearest end of the runway. None of the structures associated with the route alternatives associated with the Nelson Dewey river crossing would be presumed hazards to the Cassville Municipal Airport.

6.3.6.2. Stoneman Route Alternatives

The Stoneman river crossing would have the proposed centerline located approximately 2,300 feet (0.44 miles) from the Cassville Municipal Airport boundary, and 2,700 feet (0.53 miles) from the nearest end of the runway. With the information provided by the applicants in March 2018, the FAA determined that four structures located on subsegments B01, B02, and potentially B03 would be presumed hazards to air navigation. The FAA states the height adjustment that could lead to a determination of the structure not creating a hazard; however, at these locations some of the height adjustments may require additional

[282] The relevant set of correspondence is found in part 1 of 3 in Appendix H, Exhibit 3 (PSC REF#: 341407).

engineering prior to construction. The response to staff Data Request 7.4[283] stated that ITC requested a further study of these structures and the FAA subsequently issued a determination of no hazard provided that the structures would be marked and lighted. These markings would need to be in accordance with an FAA Advisory circular and would likely include red flashing lights. These actions to mitigate impacts to airports and air navigation would likely increase the aesthetic impacts of the transmission line.

6.3.7. Communication facilities

An initial assessment[284] of the potential impact to communication facilities was conducted by

Electrical Consultants, Inc. to determine whether a viable risk to communication operations was present. As discussed in Section 4.5.14, the primary types of potential interference with communication facilities include:

- AM broadcast antenna re-radiation,
- transferred voltages to communication facility grounding systems, and
- microwave line-of-sight signal degradation.

The initial assessment found a significant number of communication facilities within a 10-kilometer radius of the proposed route alternatives. If the project is approved, additional analyses (phase 2) would be expected to determine the operational status of these facilities, the likelihood of interference, and the appropriate range of mitigation measures.

A review of FCC database showed that no microwave radio antenna line-of-sight paths would be obstructed by the proposed transmission line structures in this routing area. If the project is approved, a field review prior to construction would confirm that there are no microwave line-of-sight path issues. If any issues would be found, the applicants would work with the licensee to mitigate the issue.

No AM stations were located within 10 km of the Mississippi River Routing Area.

Communication facilities were found within 500 feet of the proposed route alternatives. A ground system inspection would need to be completed for each of these communication facilities to assure they meet OSHA grounding standards to avoid induced voltages causing problems with communications equipment and safety risks. Any facilities identified that do not meet OSHA requirements would need further investigation and mitigation.

6.3.8. Electric distribution facilities

There does not appear to be any distribution lines that would require removal and relocation in the Mississippi River Routing Area.

283 Response to Data Request 7.4 (PSC REF#: 359116).
284 Appendix K, Exhibit 1 (PSC REF#: 341394).

CHAPTER

7

7. Environmental Analysis: Western Routing Area

7.1. ROUTE ALTERNATIVE COMPARISONS

7.1.1. Detailed route descriptions

The Western Routing Area is located in Grant, Iowa, and Lafayette Counties. The Western Routing Area is comprised of two main route alternatives:

- Western-North, and
- Western-South

Either of these route alternatives connect the route alternatives in the Mississippi River Routing Area (Nelson Dewey-North, Nelson Dewey-South, Stoneman-North, and Stoneman-South) to the route alternatives in the Eastern Routing Area (Eastern-North and Eastern-South) at the new Hill Valley Substation. Both Western-North and Western-South traverse highly dynamic topographies in Grant County, but Western-South is typically routed along flatter road ROW in Lafayette County and Iowa County. Western-North generally travels 32 miles northeast from the village of Cassville, through the city of Lancaster, to the village of Montfort. Western-South generally travels 31 miles east from the village of Cassville, to the city of Platteville, and then 21 miles north to the village of Montfort. Before reaching the new Hill Valley Substation, both Western-North and Western-South would share common subsegments to get into the Hill Valley Substation.

The route subsegments included in the Western Routing Area are identified in Table 7-1 (Figures 1.1-1.14, Appendix A).

Table 7-1 Western Routing Area route subsegments

Route Alternative	Route Subsegments
Western-North	D01, D03, D04, D05, D08, D09A
Western-South*	E01, E03, E04, E06, E07, E09, E10, E12, E13, E14, E16, E18, E19, G01, F01, F02, F03, G06A, G06B, G08, G09, H01, H02, H03, H06, H07, H09, I01, I02, I05, I06, 107, I08, I09, K01, L01, L02, L03, L04, D10C
Common Subsegments	D10A, D10B, L05

*Additional routes under consideration by RUS in the vicinity of Platteville and Livingston. (Appendix C).

7.1.1.1. Western-North

Western-North would begin in the town of Cassville at the top of the bluff where A03 and C03 intersect. From there, Subsegment **D01** would extend cross-country 1.6 miles northeast in a double-circuit configuration with X-16.

D03 would then extend 500 feet east-northeast, crossing a private driveway within 500 feet of two private residences. D03 would then continue 0.8 miles northeast, crossing Settlement Road within 500 feet of a private residence, crossing Hauger Lane twice, and passing within 300 feet of four private residences.

D04 would then extend 14.5 miles generally northeast in a double-circuit configuration with X-16, crossing several roads and private driveways, and passing within proximities of less than 1000 feet of several private residences. From west to east, D04 would cross STH 81 and a private driveway, pass through the corner of the town of Waterloo crossing Rattlesnake Road, and then cross into the town of Beetown. D04 would then cross CTH U, cross Blackjack Road within 400 feet of a private residence, cross Grant River Road within 400 feet a private residence, and pass within 650 feet of another private residence further east along Grant River Road. D04 would then cross Five Points Road, pass within 750 feet of a private residence, cross Bee Lane as it enters the town of South Lancaster, pass within 200 feet of a private residence, cross a private driveway, and pass within 500 feet of a private residence. D04 would then cross CTH N, cross Boice Creek Road, pass within 300 feet of a private residence, and pass within 500 feet of another private residence before crossing Old Potosi Road. D04 would then cross Stage Road within 450 feet of a private residence, pass within 1000 feet of five private residences, cross U. S. Highway (USH) 61, pass within 750 feet of a private residence, and end in an agricultural field 450 feet west of STH 129.

D05 would then extend 650 feet northeast as a single-circuit line across a private driveway, while X-16 diverges to connect to the Lancaster substation. D05 would then extend east-northeast 0.22 miles across STH 129 to where it would meet back up with X-16.

D08 would then extend 14.5 miles generally northeast in a double-circuit configuration with X-16, crossing several roads and private driveways, and passing within proximities of less than 1000 feet of several private residences. From west to east, D08 would cross Muldoon Lane, pass within 400 feet of a private residence, pass within 900 feet of another private residence, and cross Lincoln Road into the town of Ellenboro. D08 would then pass within 500 feet of a private residence, cross Orfield Lane, pass within 750 feet of a private residence, and cross CTH A into the town of Liberty. D08 would then pass within 850 feet of two private residences, and pass within 300 feet of another private residence before crossing Coon Hollow Road. D08 would then pass within 900 feet of a private residence, pass within 750 feet of another private residence, and cross Ridge Road within 750 feet of another private residence. D08 would then cross Scenic Road, pass within 700 feet of a private residence, and cross Sleepy Hollow Road within 850 feet of another private residence. D08 would then pass within 1000 feet of a private residence, cross Pine Knob Lane into the town of Clifton, cross CTH E, and pass within 600 feet of a private residence before crossing Hopewell Road. D08 would then pass within 750 feet of a private residence, cross Rock Church Road, pass within 500 feet of three private residences, cross La Platte Road into the town of Wingville, and end just south of Ebenezer Road.

D09A would then extend 0.3 miles northeast across Ebenezer Road and Stockyard road, passing within 300 feet of a private residence. D09A would then diverge from X-16 as a single-circuit line and extend 820 feet east-northeast, passing within 350 feet of a private residence, and end just south of the proposed Hill Valley Substation.

L05 would then extend 210 feet north as a single-circuit line and terminate at the proposed Hill Valley Substation. L05 is also used in the Western-South route.

X-16 would continue, from the end of D09A, 530 feet east along the **D10A**, and then extend 210 feet north along **D10B**, and terminate at the proposed Hill Valley substation. D10A and D10B are also used in the Western-South route.

7.1.1.2. Western-South

Western-South would begin in the town of Cassville at the north end of B04, just north of St Charles Road. From there, subsegments E01, E03, E04, E06, E07, E09, E10, E12, E13, E14, E16, E18, E19 would extend 30 miles generally east in a double-circuit configuration with X-15, crossing several roads and private driveways, and passing within proximities of less than 1000 feet of several private residences.

From west to east, **E01** would pass within 600 feet of a private residence, pass within 750 of another private residence, and cross Millstream Lane. E01 would then pass within 450 feet of a private residence, pass within 650 feet of another private residence, and cross Caldwell Road within 800 feet of another private residence. E01 would then pass within 500 feet of another private residence before intersecting STH 133.

E03 would pass within 500 feet of a private residence, and intersect with STH 133 where the road curves back south.

E04 would then cross Adrian Hollow Road into the town of Waterloo, and pass within 800 feet of three private residences.

E06 would then pass within 300 feet of a private residence.

E07 would then cross W Haas Lane, Chaffie Hollow Road, and a private driveway. E07 would then pass within 950 feet of a private residence, pass within 450 feet of another private residence, and cross East Park Lane within 400 feet of another private residence. E07 would then cross CTH N, pass within 700 feet of a small cluster of private residences and businesses, cross Dugway Road twice, cross North Dutch Hollow Road within 350 feet of a private residence, and pass within 550 feet of another private residence.

E10 would then pass within 400 feet of a private residence into the town of Potosi, and then cross Reynolds Ridge Road, CTH U, and Old Potosi Road.

E12 would then pass the Potosi substation, while X-15 ties into the substation and rejoins the E12 subsegment. E12 would then cross Stage Road.

E13 would continue cross-country.

E14 would then pass within 250 feet of two private residences, cross Buena Vista Lane, and cross USH 61 within 600 feet of a business and two more private residences.

E16 would then pass within 350 feet of a private residence, cross a private driveway, cross Rockville Road, and pass within 150 feet of a private residence into the town of Harrison. E16 would then pass within 350 feet of a private residence, cross West Road, and pass within 700 feet of another private residence. E16 would then pass within 750 feet of a private residence, cross Big Platte Road, cross Bennett Lane within 250 feet of another private residence, and pass within 900 feet of another private residence.

E18 would then cross Stanton Road within 200 feet of a private residence.

E19 would then pass within 300 feet of a private residence, cross Harrison Road, cross Morris Road, and pass within 700 feet of two more private residences. E19 would then cross into the town of Platteville, pass within 500 feet of five private residences, and cross Maple Glen Lane.

G01 would then diverge from X-15 as a single-circuit line and extend cross-country 0.3 miles south along parcel lines.

F01 would then extend 0.3 miles east, crossing Southwest Road.

F02 would then extend cross-country 0.4 miles east.

F03 would then extend 1.1 miles east, crossing CTH D.

G06A would then extend 250 feet south.

G06B would then extend 0.2 miles south, crossing USH 151 and College Farm Road. G06B would then continue 0.9 miles east, passing within 150 feet of a private residence, and crossing Pleasant Valley Road. G06B would then continue 0.7 miles northeast, passing within 500 feet of two private residences, and crossing STH 80 to meet up with the existing ATC 138 kV line (X-14).

G08 would then extend 3.7 miles east in a double-circuit configuration with X-14, passing within 250 feet of a private residence, and crossing Ipswitch Road to where X-14 would continue east.

G09 would then extend 1.5 miles north as a single-circuit line, passing within 750 feet of a private residence, crossing CTH XX, passing within 650 feet of another private residence, and crossing USH 151.

H01 would then extend 0.5 miles north, passing within 700 feet of a private residence to meet the existing ATC 69 kV line (Y-105) at Michell Hollow Road.

H02 would then extend cross-country 1.0 miles north in a double-circuit configuration with Y-105 to CTH B, within 300 feet of a private residence. H02 would then continue 0.3 miles west, along the south side of CTH B, passing within 150 feet of two private residences. H02 would then continue cross-country 1.0 miles north, crossing CTH B. H02 would then continue cross-country 0.5 miles west, and continue 0.5 miles north, passing within 650 feet of a private residence.

H03 would then extend 0.4 miles northwest along Sunny Lane, passing within 500 feet of three private residences. H03 would then continue 980 feet north, crossing W Mound Road.

H06 would then extend 1.0 miles north along the east side of Sunnydale Lane, passing within 250 feet of two private residences, passing within 850 of another private residence, crossing Hamilton Drive. H06 would then cross a private driveway, passing within 250 feet of a private residence, and passing within 200 feet of another private residence near the intersection of Sunnydale Road and CTH G. H06 would then continue 1.1 miles north, into the town of Mifflin, along the east side of CTH G, crossing Turnbill Road, and passing within 400 feet of a private residence. H06 would then continue another 0.9 miles north, crossing a private driveway within 350 feet of a private residence, and crossing into the village of Rewey. H06 would then continue 0.2 miles north, crossing a private driveway, and passing within 150 feet of a private residence.

H07 would then extend 0.2 miles north-northwest across 2nd Street, continue 0.2 miles north across CTH A, and then continue 0.2 miles north-northeast all within 1000 feet of several blocks of private residences in the village of Rewey. H07 would then continue 0.7 miles north along the west side of CTH G, crossing back into the town of Mifflin, crossing a private driveway within 150 feet of a private residence, and passing within 150 feet of another private residence. H07 would then extend 0.2 miles north, crossing to the east side of CTH G near the intersection of Argall Road and CTH G, and passing within 900 feet of a private residence.

H09 would then extend 1.0 miles north along the east side of CTH G, crossing a private driveway and the intersection of CTH G and CTH E. H09 would then continue 0.7 miles north-northeast along the east side of CTH E, crossing a private driveway within 250 feet of a private residence, passing within 250 feet of another two private residences, and crossing another private driveway. H09 would then continue 0.4 miles north along the east side of CTH E, passing within 200 feet of a private residence, and crossing Bollant Road.

I01 would then extend 440 feet north along the east side of CTH E.

I02 would then extend 700 feet north, diagonally crossing from the east side to the west side of CTH E, then extend 0.2 miles north, diagonally crossing back to the east side of CTH E, passing within 150 feet of a private residence.

I05 would then extend 0.6 miles north along the east side of CTH E to just south of Enloe Road.

I06 would then extend 0.2 miles east-northeast across the north/south section of CTH E, passing within 200 feet of a private residence, and then crossing to the north side of the east/west section of CTH E.

I07 would then extend 0.3 miles east along the north side of CTH E.

I08 would then extend cross-country 1.0 miles north continuing in a double-circuit configuration with Y-105's new alignment, crossing CTH X.

I09 would then extend 0.7 miles west along the north side of CTH X, crossing a private driveway, and meeting back up with Y-105's current alignment.

K01 would then extend 0.8 miles north along STH 80, and then extend 250 feet north-northwest, diagonally crossing from the east side to the west side of STH 80. K01 would then continue 660 feet north along the west side of STH 80, passing within 300 feet of a private residence. K01 would then extend 200 feet northeast, diagonally crossing from the southwest side to the northeast side of the intersection of STH 80 and Hopewell Road. K01 would then extend 0.9 miles north along the east side of STH 80, passing within 150 feet of a private residence, crossing a private driveway, and passing within 200 feet of another private residence.

L01 would then extend 0.2 miles north along the east side of STH 80 into the town of Eden to where Y-105 would continue north in its present alignment.

L02 would then extend cross-country 0.3 miles northeast as a single-circuit line into the town of Wingville, passing within 400 feet of two private residences. L02 would then continue 0.2 miles north.

L03 would then continue 230 feet north to the south side of Ebenezer Road.

L04 would then extend 0.3 miles north, crossing Ebenezer Road, and passing within 550 feet of a private residence. L04 would then extend 330 feet west-northwest to just south of the proposed Hill Valley substation.

L05 would then extend 210 feet north as a single-circuit line and terminate at the proposed Hill Valley substation. L05 is also used in the Western-North route.

X-16 would tap off its existing alignment and extend 650 feet east along **D10C** as a single-circuit line, then continue 530 feet east along **D10A**, and then extend 210 feet north along **D10B**, and terminate at the proposed Hill Valley substation. D10A and D10B are also used in the Western-North route.

7.1.2. Proposed ROW in Western Routing Area

Table 7-2 Proposed route alternatives in the Western Routing Area. Associated metrics for the common subsegments are included in each route alternative, as appropriate.

Route Alternative	Length (miles)	Existing ROW Shared (acres)	New ROW (acres)	Total ROW (acres)	Percentage of Shared ROW
Western-North	32.54	204.22	387.15	591.37	35%
Western-South	50.42	317.1	598.17	915.27	35%

7.1.3. Unique constraints in the Routing Area

7.1.3.1. WisDOT concerns

The Great River Road National Scenic Byway follows the Mississippi River for 3,000 miles, from Minnesota into the Gulf of Mexico. In Wisconsin, the Great River Road National Scenic Byway is a 250-mile stretch that runs from Prescott to Keiler, Wisconsin. The federal designation of the Great River Road as a *National Scenic Byway* recognizes this road, as well as the communities and landscapes it traverses, for its unique culture, history, nature, recreation, and scenic beauty. The applicants provided a photo simulation, which shows how the new transmission would affect the scenery of the byway[285]. The expansion of the transmission easement would create new visual impacts to drivers and alter the scenic aesthetics of the area.

East of Cassville, Subsegment E03 (Western-South) would cross Wisconsin's Great River Road National Scenic Byway. If Western-South is selected, the potential impacts to the Great River Road from the construction and operation of the proposed project would depend upon the structure locations as well as if there would be any new crossings of this federally designated scenic byway.

7.1.3.2. Avian risks in the Western Routing Area

This section discusses specific subsegments within the Western Routing Area that have been identified in the Avian Risk Review as having an elevated risk for avian impacts (Appendix F). In general, when comparing the risk of avian collisions between Western-North and Western-South, the north route would pose a greater risk for avian collisions (Figure 6, Appendix A). Refer to Table 7-3 below for areas of increased avian risk within the Western Routing Area. Commission staff are waiting on additional information about potential mitigation options from the applicants regarding the high risk areas identified in the Avian Risk Review.

The Western-North route alternative has four identified avian collision risk areas with a total of 13,479 linear feet. Approximately 4,263 feet of Subsegment D04, near the intersection with the Rattlesnake Creek and associated wetlands, was identified as a high risk area due to the proximity of the creek and its associated wetlands. Further east near its intersection with the Grant River, 3,900 feet of D04 was identified as posing avian collision risk, due to the proximity of the Grant River and several known bald eagle nest locations. Near the intersection with Pigeon Creek, another 1,058 feet was also identified because of its proximity to Pigeon Creek and a nearby pond with associated wetlands. The final avian risk area identified along Western-North was 4,258 feet along Subsegment D08 near its intersection with the Platte River.

[285] PSC REF#: 347477

The Avian Risk Review identified only one area with elevated risk for avian collision along Western-South; namely, 1,771 linear feet of Subsegment E16 near its intersection with Big Platte Road which is near a substantial complex of wetlands associated with the Platte River.

Table 7-3 Areas of increased avian risk within the Western Routing Area adapted from the Avian Risk Review for the Cardinal-Hickory Creek Project (Figure 3, Appendix F)

Route Alternative	Route Subsegment(s)	Potential Avian Collision Risk Areas	Approx. Length (feet)	Characteristics and factors contributing to avian collision risk
Western-North	D04	From western intersection of waterway (south of Rattlesnake Rd) to northern intersection of waterway, near T3N R5W/R4W boundary	4,263	Rattlesnake Creek and wetlands
	D04	From westernmost to easternmost intersections of Grant River	3,900	Grant River and known nest locations
	D04	Area along pond and waterway crossing	1,058	Pigeon Creek, pond, and wetlands
	D08	Area along waterway and bald eagle nest location	4,258	Platte River and known nest locations
Western-South	E16	Area that spans across waterway crossing and wetland complex to Big Platte Road	1,771	Platte River, wetland complex, and known nest locations

7.1.4. Off-ROW access roads

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads or the ROW is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.2.5.1. Along the proposed routes, there are areas of steep topography that would make accessing via the ROW difficult or more impactful than the use of off-ROW roads.

The application states that the off-ROW access roads would typically be planned to 30 feet in width. There could be locations where the access road may need to be wider than 30 feet to accommodate certain topography and vehicles. If the project is approved, the applicants would refine off-ROW access routes during final construction planning. This planning stage would include landowner discussion and negotiations. The width of the off-ROW access route is wider than that stated in other recent CPCN projects, and may cause more impacts to adjacent land and vegetation. Landowners may be able to negotiate which area is more impacted by the widening of existing routes to accommodate the proposed 30 feet width. After construction is completed, off-ROW access roads may be restored to pre-construction conditions or, depending on negotiations with the property owner, access roads constructed in upland areas may be left in place.

Table 7-4 Off-ROW access road impacts by route alternative[286]

Route Alternative	Number of Roads	Length (miles)	Area (acres)	Wetlands (acres)	Upland Forest (acres)	Grassland (acres)	Agriculture (acres)
Western-North	90	35.93	130.65	0.07	3.58	24.28	76.88
Western-South	64	24	87.27	0.05	4.86	12.50	49.45

[286] Data compiled from Application, Appendix B, Table 8, updated in response to Data Request 4.72.

7.1.4.1. Western-North

The Western-North route alternative would require the use of many off-ROW access roads due to its crossing of the Driftless Area, an area with steep wooded slopes, deep valleys, and open ridgetops. This area is characterized by unglaciated ridge and valley topography that can prove challenging to access along the entire length of the ROW. Many of the hillsides are heavily forested, and in areas where the structures span forested valleys, there may not be a need to clear all woody vegetation from the ROW. Due to these landscape considerations, off-ROW access roads can reduce impacts on steeper slopes that would require massive forest clearance or grading to be useable for construction equipment.

Along Western North, some of the off-ROW access routes would be in areas where farm lanes already exist. These lanes range in size and material composition and may need widening and additional aggregate material brought in to create stable routes for machinery. Other off-ROW access routes proposed follow field edges where farm machinery is able to access, but no farm tracks or roads are observed. These areas would require more substantial grading and use of access materials such as aggregate or construction matting to allow for safe access and use. Other areas proposed for off-ROW access routes include private drives, which would likely impact landowners that use those private drives to access their property. Safety restrictions when construction teams are working in those areas may limit other landowner access or require careful coordination of activities. Off-ROW access routes are also proposed in some areas of field and forest edges where topography is flat enough to allow access and there are not areas of wetlands that would require fill. These grasslands and forests would require vegetation clearing and should include strict erosion control measures to prevent runoff and erosion due to new soil and vegetation disturbance.

In addition to vegetation clearing, limits to landowner access, and potential increase in erosion and runoff, there are potential impacts to soils and waterways as a result of the use of off-ROW access roads. The passage of heavy machinery along off-ROW routes would likely cause soil compression which can affect agricultural productivity (Section 4.5.2). This can be mitigated by the use of construction matting, access during frozen soil conditions, or thorough decompaction of soils after construction work is complete. Off-ROW access roads used on this route may require 13 waterway crossings. Some of the existing lanes and driveways that would be used already have culverts, allowing for waterway crossings if they are found able to support the proposed machinery. Other waterway crossings would require the use of a TCSB to facilitate passage of machinery and vehicles. The use of TCSBs and waterway crossings is described further in Section 4.6.6.

A number of threatened and endangered species or species of special concern are located in areas that would be crossed by proposed off-ROW access roads. Amphibians, reptiles, rare plants, and bald eagles may be impacted by off-ROW access road construction or use. Section 7.2.6 of this DEIS describes ways to limit or mitigate impacts to rare species in the project route sections. A previously identified burial site would be crossed if this route is approved. The response to Data Request 4.38 states that if this route is ordered, the applicants would investigate modifying portions of the access road to avoid this site[287]. See Section 7.2.8 for more analysis of the project's potential impacts to historic resources. It appears that part of the off-ROW access road can reach the work area from the north, avoiding the burial site completely, so it is unclear why the applicants submitted a route that crosses this clearly marked historic site.

7.1.4.2. Western-South

The Western-South route alternative would require the use of many off-ROW access roads due to its crossing of the Driftless Area, an area with steep wooded slopes, deep valleys, and open ridgetops. Most of these off-ROW access roads would be needed in the western part of this route. This area is

[287] PSC REF#: 355945

characterized by unglaciated ridge and valley topography that can prove challenging to access along the entire length of the ROW. Many of the hillsides are heavily forested, and in areas where the structures span forested valleys, there may not be a need to clear all woody vegetation from the ROW. Due to these landscape considerations, off-ROW access roads can reduce impacts on steeper slopes that would require massive forest clearance or grading to be useable for construction equipment.

Off-ROW access road use decreases substantially further east along this route as topography becomes flatter and the route crosses more areas of open agricultural land where access along the ROW is easier. In the western part of this route, many of the off-ROW access routes would be in areas where farm lanes already exist. These lanes range in size and material composition and may need widening and additional aggregate material brought in to create stable routes for machinery. Other off-ROW access routes proposed follow field edges where farm machinery is able to access, but no farm tracks or roads are observed. These areas would require more substantial grading and use of access materials such as aggregate or construction matting to allow for safe access and use.

Some areas proposed for off-ROW access routes include private drives, which would likely impact landowners that use those private drives to access their property. Safety restrictions when construction teams are working in those areas may limit other landowner access or require careful coordination of activities. Off-ROW access routes are also proposed in some areas of field and forest edges where topography is flat enough to allow access and there are not areas of wetlands that would require fill. These grasslands and forests would require vegetation clearing and should include strict erosion control measures to prevent runoff and erosion due to new soil and vegetation disturbance.

In addition to vegetation clearing, limits to landowner access, and potential increase in erosion and runoff, there are potential impacts to soils and waterways as a result of the use of off-ROW access roads. The passage of heavy machinery along off-ROW routes would likely cause soil compression which can affect agricultural productivity (Section 4.5.2). This can be mitigated by the use of construction matting, access during frozen soil conditions, or thorough decompaction of soils after construction work is complete. Off-ROW access roads used on this route may require nine waterway crossings. Some of the existing lanes and driveways that would be used already have culverts, allowing for waterway crossings if they are found able to support the proposed machinery. Other waterway crossings would require the use of a TCSB to facilitate passage of machinery and vehicles. The use of TCSBs and waterway crossings is described further in Section 4.6.6 of this DEIS.

A number of threatened and endangered species or species of special concern are located in areas that would be crossed by proposed off-ROW access roads. Amphibians, reptiles, invertebrates, and rare plants may be impacted by off-ROW access road construction or use. Section 7.2.6 of this DEIS describes ways to limit or mitigate impacts to rare species in the project route sections. A previously identified burial site would be crossed if this route is approved. The response to Data Request 4.38 states that if this route is ordered, the applicants would investigate modifying portions of the access road to avoid this site.[288] See Section 7.3.8 for more analysis of the project's potential impacts to historic resources.

7.1.5. Laydown yards

During construction, laydown yards are utilized to minimize disturbance and provide suitable work surfaces for the temporary storage and staging of construction equipment and material. Laydown yards, also referred to as temporary staging areas, are used throughout construction to set up and store materials, job trailers, storage containers, portable toilets, dumpsters, construction mats, tools, equipment, etc. A

[288] PSC REF#: 355945

typical laydown yard would be about 10 acres in size with a minimum of a 30-foot-wide driveway for ingress and egress; however, for the proposed project laydown yard size varies throughout the project area.

The typical construction activities that are involved in constructing laydown yards include the installation of erosion control measures, leveling of uneven surfaces, stripping and stockpiling of topsoil (if necessary), and installing (as needed) gravel, tracking pads, culvert(s), power, and fencing. This work is generally completed using equipment such as a bulldozer and dump trucks. The disturbance from any laydown yard would depend upon soil type and topography. Areas that are paved or have been previously graded and cleared of vegetation such as parking lots, old gravel pits, or fields are ideal locations for laydown yards.

Generally, the last step in the construction process would be to remove all items such as trailers, security fences, left over materials, storage containers, portable toilets, dumpsters, construction mats, tools, and equipment from the laydown yard. Depending on landowner preferences, laydown yards could be left in place or returned to prior conditions following construction activities.

The proposed laydown yards located within the Western Routing Area and the potential environmental impacts[289] associated with each proposed laydown yard are included in Table 7-5. The proposed laydown yards are included in the same figures of the proposed route alternatives in Appendix A, as referenced in the table below.

Refer to Section 2.2.5.3 for additional information on temporary workspaces that would also be utilized throughout the project area.

Table 7-5 Proposed laydown yards near Western Routing Area

Laydown Yard	Location	Size (acres)	Existing Land Use	Agricultural Land Cover (acres)	Grasslands Land Cover (acres)	Non-Forested Wetland Land Cover (acres)	Developed Land Cover (acres)	Appendix A Reference
LY-02	USH 18/Stockyard Road	12.79	Agricultural	12.20	0.59	0.00	0.00	Figures 1.06 & 1.14
LY-05	STH 133/W Haas Lane	17.30	Pasture	0.00	17.30	0.00	0.00	Figure 1.02
LY-06	Southwest Road	7.94	Gravel Pit	0.00	0.00	0.00	7.94	Figure 1.09
LY-07	Bluff Lane	8.14	Gravel Pit	0.32	7.82	0.00	0.00	Figure 1.09
LY-08	STH 80/Enterprise Drive	11.53	Developed/Pasture	0.00	0.00	0.00	11.53	Figures 1.09 & 1.10
LY-09	USH 151/Bonner Road	18.86	Agricultural	18.86	0.00	0.00	0.00	Figure 1.10
LY-10	STH 80/ATC Property	20.59	Agricultural/ proposed substation site option	20.59	0.00	0.00	0.00	Figures 1.06 & 1.14

289 PSC REF#: 345376

Figure 7-1 Laydown yard LY-02 on USH 18 near the village of Montfort

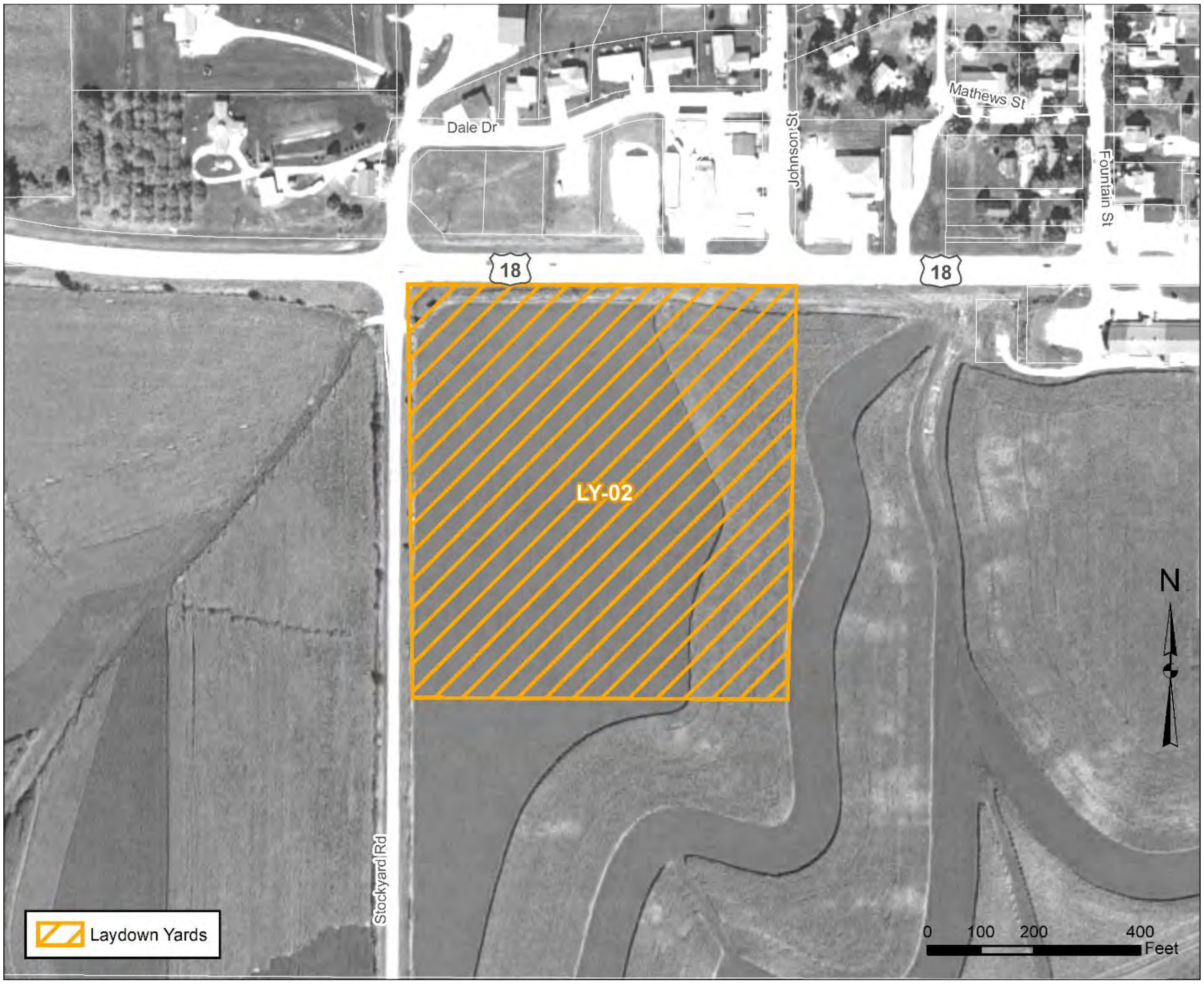


Figure 7-2 Laydown yard LY-05 on STH 133 in the town of Waterloo

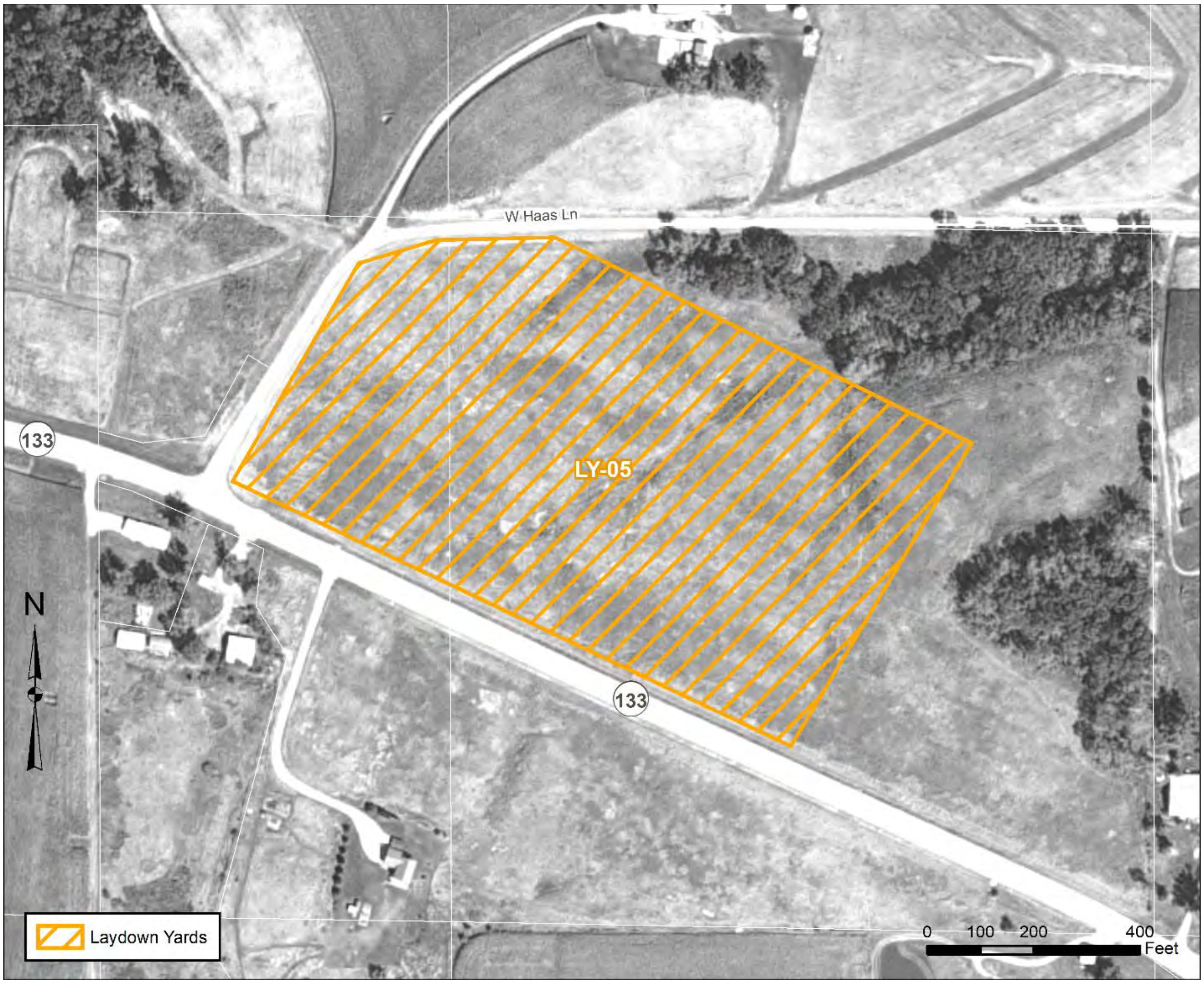


Figure 7-3 Laydown yard LY-06 on Southwest Road in the town of Platteville

Figure 7-4 Laydown yard LY-07 on Bluff Lane in the town of Platteville

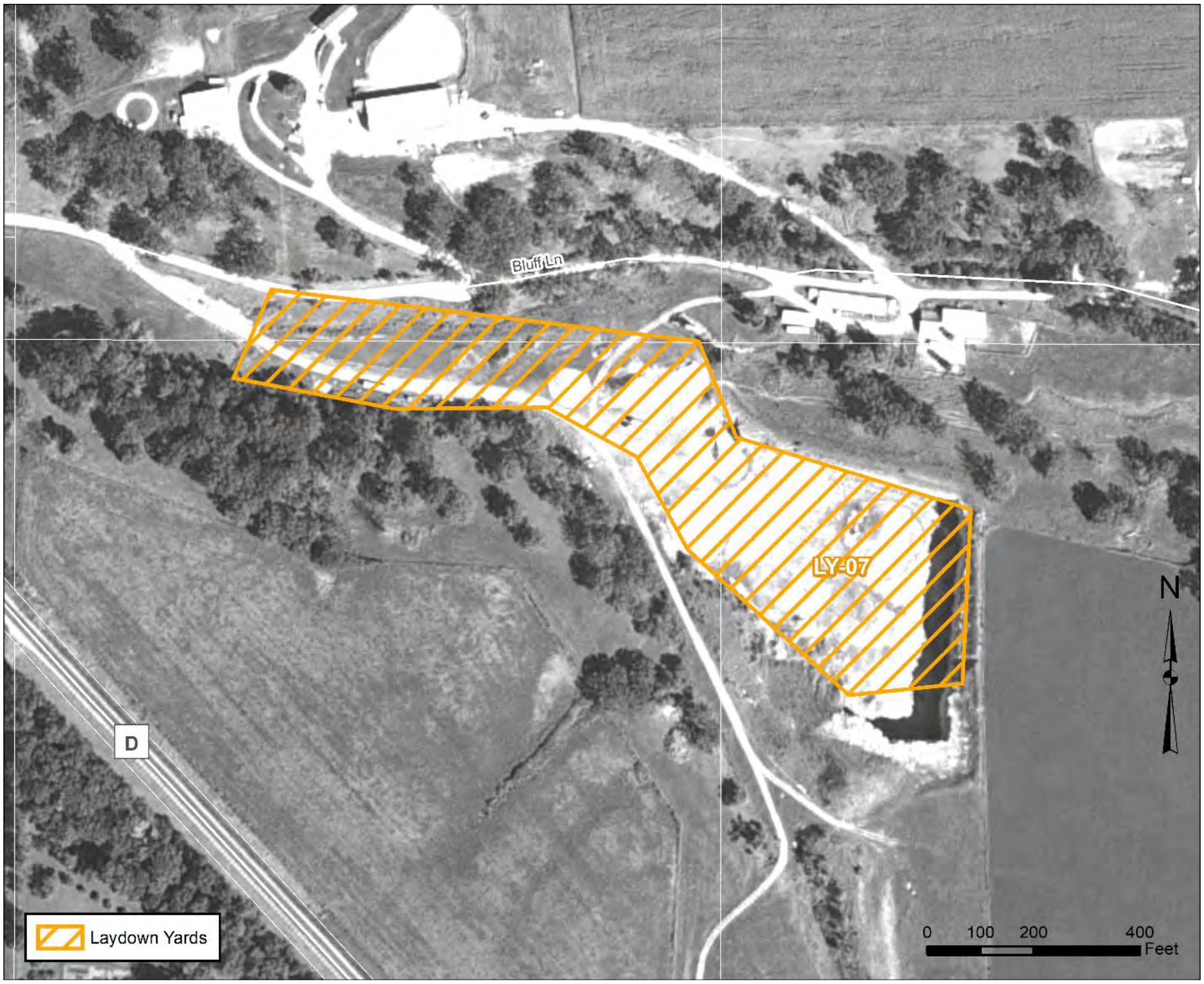


Figure 7-5 Laydown yard LY-08 on STH 80 in the city of Platteville

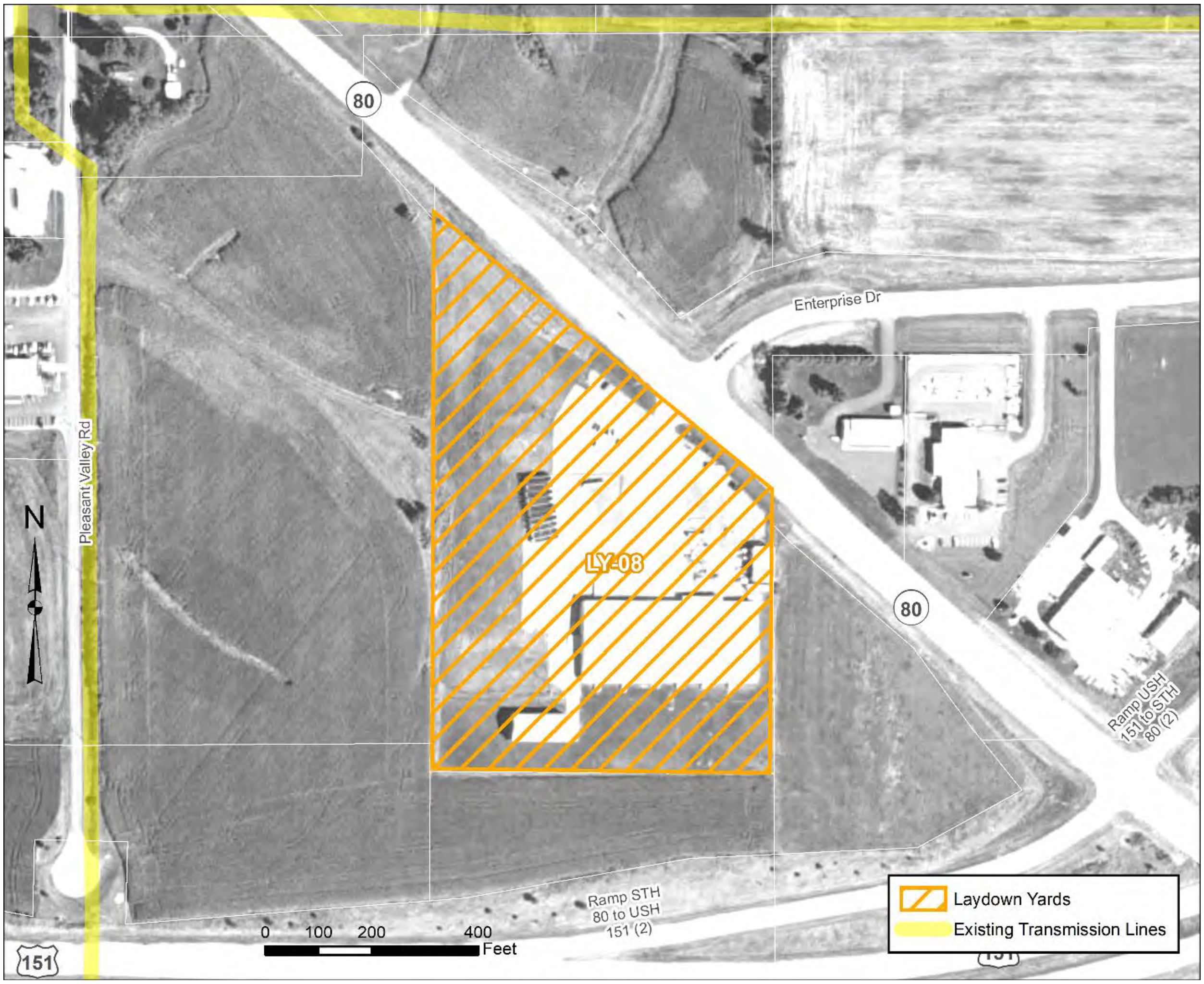


Figure 7-6 Laydown yard LY-09 on USH 151 near the village of Belmont

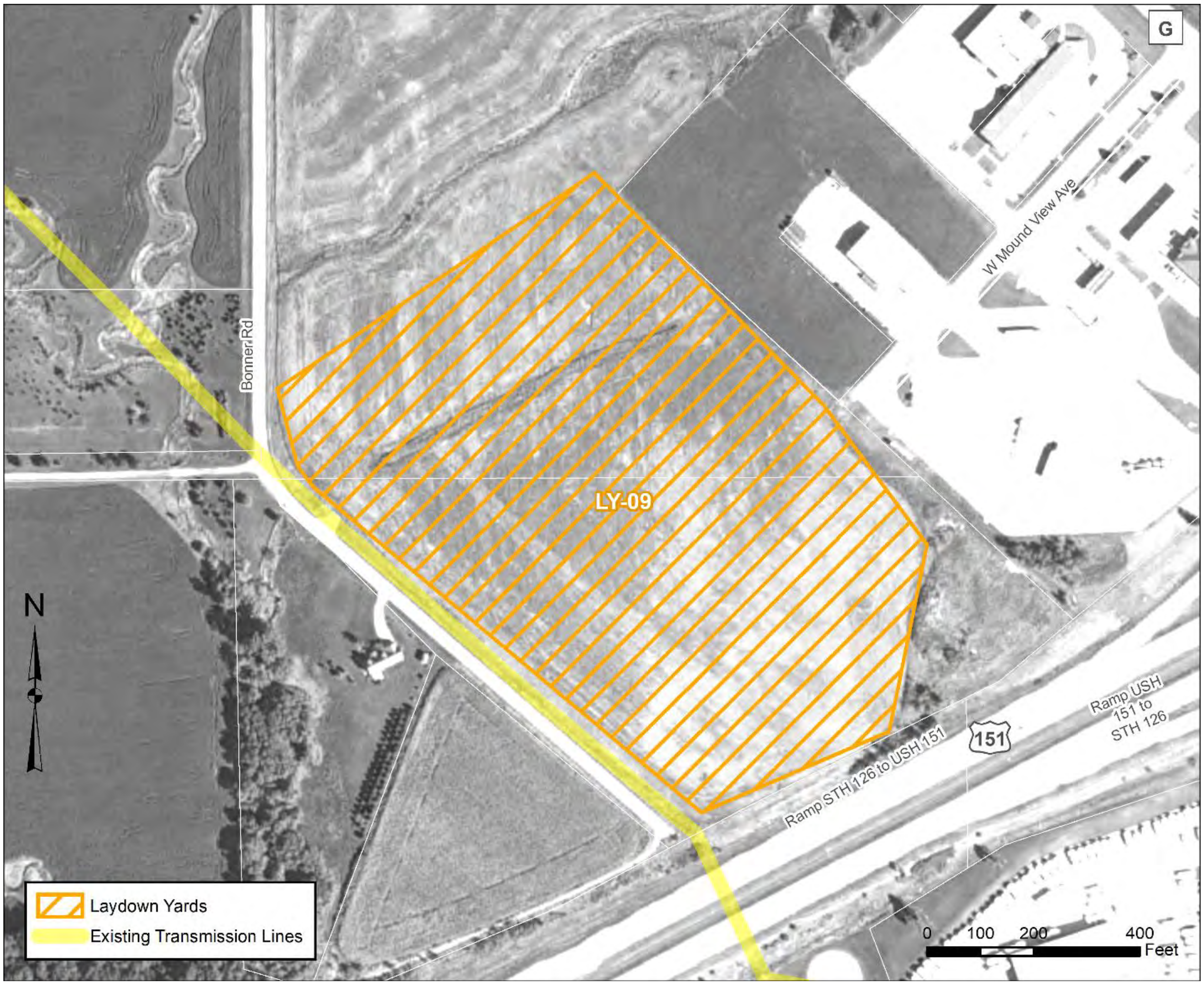
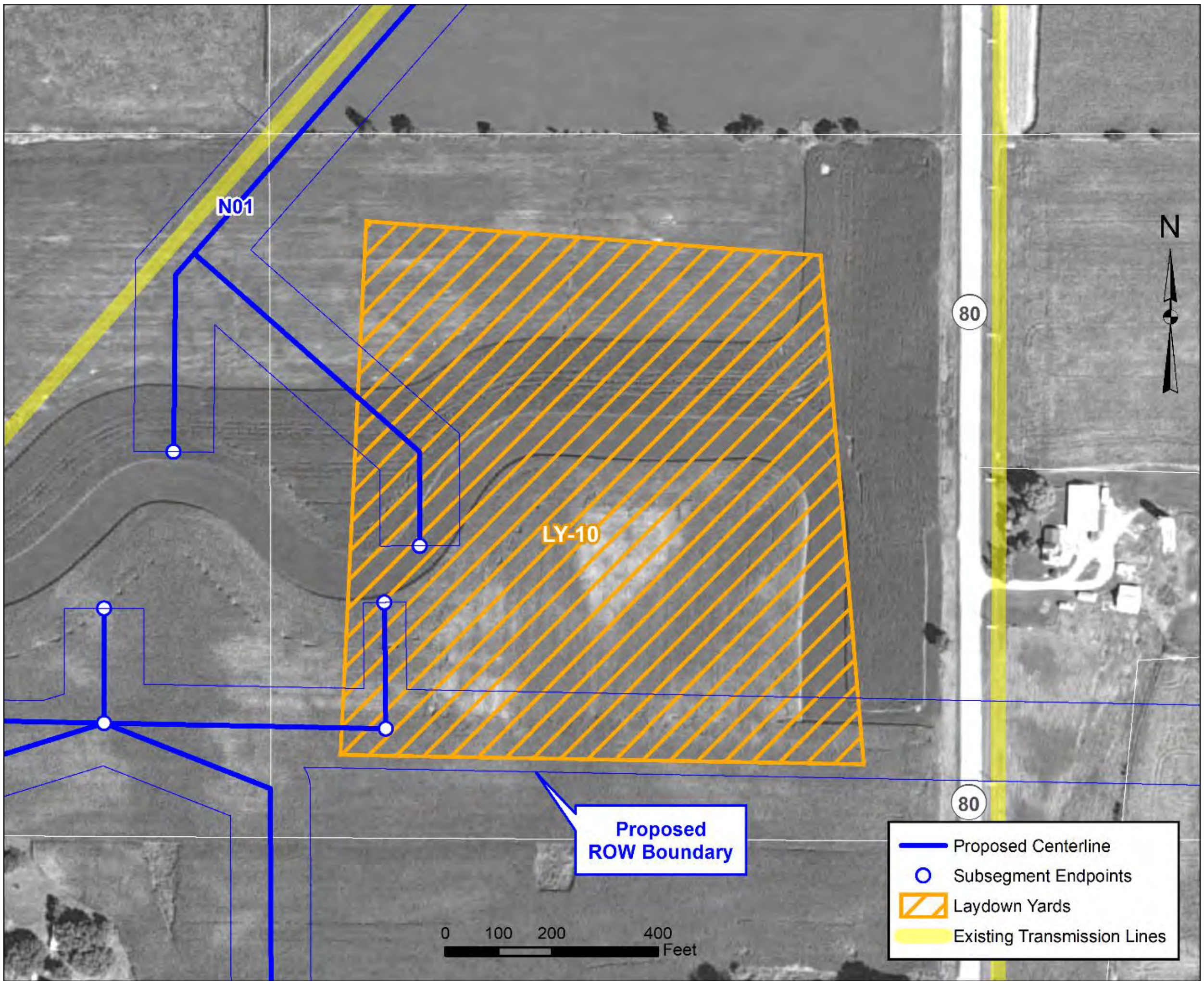


Figure 7-7 Laydown yard LY-10 on STH 80 in the proposed Hill Valley Substation site



7.2. NATURAL RESOURCES AND POTENTIAL IMPACTS

7.2.1. Natural resource properties

This section discusses the properties in this part of the Western Routing Area that are managed primarily for protecting natural resource habitat (Figure 9, Appendix A). These properties may include publicly-owned lands and also private lands covered by a conservation easement or agreement. There may be some overlap in this section with properties discussed in Section 7.3.5 because some properties serve multiple functions or have multiple designated uses. Note there may be additional conservation easements or agreements not included below that may exist within the project area. If any additional easement or agreements exist, they would be identified during the easement acquisition process if the project is approved.

In instances where impacts are anticipated to occur as a result of the project, the applicant should coordinate as early in the process as possible with the appropriate owner or manager of the property. Specifically, the applicant should attempt to identify landowner concerns, determine the probability and nature of impact, and, if possible work with the landowner to develop a mitigation strategy that would either lessen or eliminate potential impacts.

Overall, Western-South would pass through or intersect six properties that are specifically managed for natural resources, whereas Western-North would pass by or intersect only one natural resource property.

7.2.1.1. Western-North

Approximately 9 miles southwest of Montfort, Subsegment D08, after crossing over Sleepy Hollow Road, would pass within 200 feet of the 3-acre Feist Prairie, a private land trust owned and managed by The Prairie Enthusiasts. The prairie contains a large number of species and consists largely of land that has never been cultivated, pastured, or sprayed with herbicide. Although no direct physical impact to this property is anticipated, the applicants should notify the landowner and coordinate project construction near this parcel due to the highly sensitive nature of the habitat.

7.2.1.2. Western-South

Approximately 6.5 miles east of Platteville, Subsegment E16 passes over a 100-foot stretch of DNR managed land associated with the Platte River. It appears from current aerial imagery and other topographical resources that the parcel may be a streambank easement associated with the Platte River. The applicant should consult with WDNR to determine the nature of this property (i.e. were LAWCON funds used to purchase this parcel). The applicants should also coordinate with DNR on potential impacts, land use conflicts with the anticipated design of the project, and possible mitigation strategies associated with the construction of the project.

Continuing east, approximately three miles southwest of Platteville, near Maple Glen Lane, Subsegment E19 would follow existing ROW and intersect (2,814 feet in total) both the Little Platte River Fishery Area (a DNR-managed parcel), and a private easement (the Domann Property) owned and managed by the Mississippi Valley Conservancy (MVC). If the project is approved and Western-South is selected, the applicant should consult and coordinate as early as possible with the managers of these two properties (DNR and MVC) prior to project construction to discuss potential impacts to the properties, land use conflicts with the anticipated design of the project, and mitigation strategies.

The Pecatonica State Trail currently terminates in the Town of Belmont, approximately 0.5 miles east of Western-South. Based on information provided by the applicants, there are future plans to extend the trail west to the city of Platteville. This future extension may cross Western-South at the connection point of Subsegments G09 and H01. If the project is approved and this segment of route is chosen, the applicant should consult with DNR, the city of Platteville, and the town of Belmont to discuss potential impacts, land use conflicts with the anticipated design of the project, and mitigation strategies should the extension occur.

The connection point of Subsegments G09 and H01 is proposed immediately adjacent to the Belmont Prairie State Natural Area (SNA) owned by the DNR. Based on the project's proximity to DNR land, it is likely that a portion of the proposed ROW would overlap the SNA. The trail has parcels that were purchased with LAWCON funds and encumbered with Knowles-Nelson Stewardship grants. Lafayette County may also have management interests in the current trail and area designated for future expansion. The applicant should consult with DNR, the city of Platteville, and the town of Belmont to discuss potential impacts, land use conflicts with the anticipated design of the project, and mitigation strategies should the extension occur.

Table 7-6 Potential impacts to natural resource properties within the Western Routing Area

Route Alternative	Subsegment	Property	Owner/Manager	Potential Impact
Western-North	D08	Feist Prairie	The Prairie Enthusiasts	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
Western-South	E16	DNR-managed lands associated with the Platte River	DNR	Streambank erosion and sedimentation, loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
	E19	Little Platte River Fishery Area	DNR	Streambank erosion and sedimentation, loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
	E19	Domann private conservation easement	MVC	Streambank erosion and sedimentation, loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
	G09 and H01	The Pecatonica State Trail	DNR	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species, interrupted use of public trail
	G09 and H01	Belmont Prairie SNA	DNR	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species, interrupted use of public trail

7.2.2. Forested lands

General impacts to forested communities from high-voltage transmission lines are discussed in greater detail in Section 4.6.2. The discussion below focuses on forest resources and forested communities in the Western Routing Area and although impacts to forested wetlands are mentioned, refer to Section 7.2.4 for more information. Many of the tree species mentioned in this section would be considered incompatible vegetation by transmission owners and therefore would be actively eliminated within the proposed ROW. This would significantly alter, and permanently affect, the existing and future ecological communities within the proposed ROW. If trees are removed from the proposed ROW and the remaining vegetation is not actively managed to encourage an ecological community that effectively outcompetes[290] tree seedlings, the ROW could become dominated with fast growing incompatible vegetation that could quickly colonize the ROW and require significant effort and disturbance to remove. Refer to Section 4.6.5 for more information about vegetative assets in utility ROWs.

Both of the route alternatives within this routing area are sited along existing high-voltage transmission line corridors. If the applicants do not release the existing easements and continue to maintain the existing corridors as utility ROWs even though transmission facilities would be double-circuited with the proposed Cardinal-Hickory Creek project, the quantification of impacts to forested areas provided by the applicants in its application would greatly underestimate the cumulative impacts forest resources and forest communities would experience if the Cardinal-Hickory Creek project was approved. The new Cardinal-Hickory Creek corridor would be, in some areas, much greater than the 150-foot-wide corridor identified in the application. Refer to Section 4.6.2.1 about the impacts associated with forest fragmentation.

[290] For example, implementation of an IVM program accredited by the ROWSC.

The Western Routing Area is primarily located within the Southwest Savanna[291] ecological landscape; however, hilly riparian corridors in the area are considered more characteristic of the Western Coulees and Ridges[292] ecological landscape (Figure 5, Appendix A). Due to the unique boundaries of the ecological landscapes and the lengths of proposed route subsegments in this routing area, it would not be accurate to identify the proposed route subsegments in each ecological landscape.

The Southwest Savanna is currently dominated by agricultural crops with grasslands, forest, and residential areas making up the remaining 30 percent of this landscape. The lasting forests in this area are dominated by oak-hickory and maple-basswood cover types. Some open-grown oaks still exist in pastures and crop fields that are remnants of the oak savanna communities that used to be common throughout this area. A savanna is generally considered a plant community where the mature tree canopy makes up less than 50 percent of vegetative cover, allowing grasses and other herbaceous vegetation to dominate these community types. The Southwest Savanna was historically dominated by fire-dependent communities such as prairies, oak savannas, oak woodlands, and oak forests that were scattered across the landscape by topography, slope, aspect, and soil characteristics. Much of this landscape has been extensively grazed, but never plowed; therefore, this area supports scattered, isolated remnant oak savanna and tallgrass prairie communities. White oak was historically the dominant species in savannas, woodlands, and some forests here; however, central hardwood species such as American elm, black walnut, and basswood have started to encroach on the oak-hickory cover types. The widespread practice of fire suppression and the conversion of prairie communities into agricultural production has led to the loss of almost all of Wisconsin's native oak savannas. Although contiguous forests are not common within this ecological landscape, the forested communities that do exist are home to distinctive and often times, rare species. This should be taken into consideration when evaluating the impacts the proposed project would have on the forest resources and forested communities in this area.

The Western Coulees and Ridges used to contain the state's most extensive area of oak forest, oak openings, and oak woodland. The hardwood-dominated forests found in this landscape are more extensive than in other southern Wisconsin ecological landscapes; however, they have been dissected and interspersed with agricultural and residential areas. Forest cover is currently dominated by oaks and hickories, with maples and basswoods also making up a significant portion of the mature forest canopy. Bottomland hardwoods dominated by silver maple, swamp white oak, river birch, ashes, elms, and cottonwood are also common in this area, especially within the floodplains of the larger rivers in the area. Due to the steep topography found throughout this landscape, limited access, development, and cultivation along steep slopes have allowed them to stay heavily forested. Dry-mesic and mesic hardwood forests are common throughout this ecological landscape, and these oak-dominated hardwoods are well known for their high ecological, economic, aesthetic, and recreational importance. Sustainable management of these oak-dominated forests is very difficult considering that mature oak stands and their associated ecological communities are very difficult to restore once lost. This should be taken into consideration when evaluating the impacts the proposed project would have on the forest resources and forested communities in this area.

In addition to the trees that are located in more natural settings, trees are also vitally important to cities, villages, and towns; and similar to electricity and water, an urban tree canopy is considered a part of the

291 Wisconsin Department of Natural Resources. 2015. The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Chapter 20, Southwest Savanna Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS1131V 2015, Madison

292 Wisconsin Department of Natural Resources. 2015. *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management*. Chapter 22, Western Coulees and Ridges Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS-1131X 2015, Madison.

infrastructure of the community providing valuable environmental, economic, and social benefits.[293] This routing area is adjacent to several communities including Cassville, Beetown, Lancaster, Montfort, Eden, Potosi, Platteville, Rewey, and Livingston.

The applicants' characterized the forested areas[294] within the proposed ROW of this routing area as deciduous and mixed deciduous/coniferous stands consisting of pole-size and sawtimber logs, all under private ownership used primarily for recreation. There are several properties within this routing area that have forested lands enrolled in MFL. As stated earlier, this area is characterized by unglaciated ridge and valley topography that can prove challenging to access along the entire length of the ROW. Many of the hillsides are heavily forested, and in areas where the structures span forested valleys, there may not be a need to clear all woody vegetation from the ROW. The applicants' identified northern red oak, black walnut, eastern red-cedar, black cherry, slippery elm, basswood, silver maple, bur oak, bitternut hickory, eastern cottonwood, and sugar maple as common in the overstory with multiflora rose and prickly ash being common in the understory.

7.2.2.1. Western-North

Along this route alternative, a total of approximately 113.2 acres of forested lands (111.5 acres of upland forest and 1.7 acres of forested wetland) would be impacted and permanently lost if this route alternative was constructed. There are 11 properties along this route alternative that have forested lands enrolled in MFL that could be impacted by the proposed project. Off-ROW access roads identified for this route alternative would clear approximately 3.55 acres of upland forest.

Subsegment D08 runs immediately adjacent to a known pine relict and moist cliff communities. This area likely contains many of the rare species mentioned in Section 7.2.6 and should be protected to the extent practicable. Minimization measures along this subsegment could include completing work under frozen ground conditions, implementing strict invasive species BMPs, and/or using a native prairie seed mix during the restoration process. Western-North also has more potential for forestland bird species and therefore it is highly recommended that the applicants conduct surveys along this route alternative, if ordered.

7.2.2.2. Western-South

Along this route alternative, a total of approximately 96 acres of forested lands (95.6 acres of upland forest and 0.4 acres of forested wetland) would be impacted and permanently lost if this route alternative was constructed. There are 6 properties along this route alternative that have forested lands enrolled in MFL that could be impacted by the proposed project. Off-ROW access roads identified for this route alternative would clear approximately 4.86 acres of upland forest.

7.2.2.3. Summary of potential impacts

Table 7.7 Summary of proposed impacts to forested lands by route alternative in the Western Routing Area

Route Alternative	Upland Forest (acres)	Forested Wetland (acres)	Total Forest Area (acres)	Off-ROW Upland Forest Area (acres)	MFL Properties (count)
Western-North	111.5	1.7	113.2	3.55	11
Western-South	95.6	0.4	96	4.86	6

[293] Urban and community forests, DNR accessed at: https://dnr.wi.gov/topic/UrbanForests/.
[294] Response to Data Request 4.50, Table 2 Environmental Inventory (PSC REF#: 353722).

7.2.3. Grasslands

Many grasslands on these route sections are in existing utility line ROW. These types of grasslands often consist of non-native cool-season grasses and other weedy plant species. They may be managed by brush cutting, mowing, and some use of herbicides. Other grassland habitats crossed by the proposed routes include areas of road ROWs, pastures, and fallow fields which likely have similar plant compositions. There are some areas of more diverse grassland habitats, such as dry prairie or prairie remnants identified in the application materials. These areas would have warm-season grasses such as little bluestem, and a range of native forb species.

There may be areas of remnant prairie habitats not identified in the application. On site visits to other projects in this region of the state, Commission and DNR staff have come across areas of more diverse prairie vegetation in road ROWs, railroad embankments, and utility corridors than in other parts of the state. If the project is authorized, a review of grassland habitat in the approved ROW should determine if there are areas of remnant prairies prior to starting construction. If any prairie remnants are found, the applicants should adopt mitigation actions accordingly to avoid impacts to these ecologically valuable areas.

Impacts to any wet-grassland habitats are not covered in this section of the EIS, see Section 7.2.4 for impacts to these habitat types.

Expected impacts from construction activities would include direct damage to plants, the potential spread of invasive species, and the rutting or compaction of soils. Disruption to vegetation and soils on the slopes found in the Driftless Area can cause erosion and soil run-off. These impacts could be minimized through the use of matting, accessing the site during frozen conditions or during plant dormancy, and the use of BMPs to avoid spreading invasive species (Section 4.6.4.2.1). Identifying, marking and directly avoiding any areas of high plant diversity would likely be the most effective way of avoiding impacts. Any reseeding used during site restoration should use a mix of native species suitable to the area. Treatment of invasive species using non-specific herbicide application could impact native plant species. In areas where considerable work has gone into restoring or developing prairie habitats, any herbicide drift or non-specific application could have longer-term impacts on the success of any prairie conservation work.

7.2.3.1. Western-North

A total of 192.82 acres of grassland would be impacted by work done in the transmission line ROW. Approximately 97.4 acres would be located in existing ROW, and approximately 95.42 acres of new grassland habitat would be impacted. An additional 22.95 acres of grassland habitat would be impacted due to the need for off-ROW access roads along this route. Large amounts of grassland habitat along this route near Pigeon Creek east of CTH N appear to be dominated by reed canary grass. However, due to the steep topography in the surrounding area, grassland vegetation should be retained to the greatest extent possible to avoid erosion and runoff into nearby waterways in the case of extreme rain events.

7.2.3.2. Western-South

A total of 326.01 acres of grassland would be impacted by work done in the transmission line ROW. Approximately 116.14 acres would be located in existing ROW, and approximately 111.12 acres of new grassland habitat would be impacted. An additional 12.57 acres of grassland habitat would be impacted due to the need for off-ROW access roads along this route.

This route passes through the Southwest Wisconsin Grassland and Stream Conservation Area (SWGSCA). This area is the focus of a partnership between the DNR and other agencies, organizations and landowners that has a goal of improving grasslands, savannas, and streams. Part of this partnership includes the goal of DNR acquisition of parcels of suitable land, and nearby landowner participation in conservation programs. The application did not identify any parcels acquired by DNR through this partnership on this route alternative.

Subsegment E19 crosses an area that is subject to a conservation easement through the Mississippi Valley Conservancy. No details are provided about this area in the grassland section of the application, but it appears to be approximately 6.2 acres of grassland habitat according to land cover data provided and aerial imagery.

7.2.3.3. Summary of potential impacts

Table 7-8 Summary of grassland impacts within the Western Routing Area

Route Alternative	Shared ROW (acres)	New ROW (acres)	Off-ROW Access Roads (acres)	Total Impact (acres)
Western-North	97.4	95.42	22.95	215.77
Western-South	116.14	111.12	12.57	239.83

7.2.4. Wetlands

General information about wetland resources and the potential short- and long-term potential impacts of constructing transmission line through and across wetlands can be found in Section 4.6.7.

7.2.4.1. Western-North

Subsegment D01 contains one wetland within the proposed ROW, an open water pond with 0.09 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. This wetland would not be permanently or temporarily filled by this proposed project, and no forested wetland conversion is proposed.

Subsegment D04 contains 12 wetlands within the proposed ROW, totaling 6.18 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow, open water pond, and deciduous forest. Based on field investigations, 7 of the 12 wetlands were identified as significant or high-quality. Two structures would be constructed in wetlands, resulting in 0.004 acres of permanent wetland impact. Temporary wetland impacts are anticipated to be 2.44 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 1.69 acres.

Subsegment D08 contains 17 wetlands within the proposed ROW, totaling 10.43 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow, open water pond, and shrub-scrub. Based on field investigations, 11 of the 17 wetlands were identified as significant or high-quality. Two structures would be constructed in wetlands, resulting in 0.004 acres of permanent wetland impact. Temporary wetland impacts are anticipated to be 2.76 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Off-ROW temporary wetland impacts are anticipated to be 0.06 acres due to the placement of construction matting. This would occur in one wet meadow complex.

7.2.4.2. Western-South

Subsegment E01 contains six wetlands within the proposed ROW, totaling 0.33 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow, shrub-scrub, and deciduous forest. Based on field investigations, four of the six wetlands were identified as significant or high-quality. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.15 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.04 acres.

Subsegment E03 contains one wetland within the proposed ROW, a wet meadow totaling 0.08 acres. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.03 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment E07 contains two wetlands within the proposed ROW, totaling 0.02 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. Both wetlands are classified as wet meadow. Neither wetlands were identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.014 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment E10 contains six wetlands within the proposed ROW, totaling 1.45 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow and deciduous forest. Based on field investigations, all 6 wetlands were identified as significant or high-quality. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.41 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.10 acres.

Subsegment E14 contains two wetlands within the proposed ROW, totaling 0.33 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. Both wetlands are classified as wet meadow. Neither wetlands were identified as significant or high-quality when considering factors such as species composition, structural diversity, and hydrological functions. A total of one structure would be constructed in wetlands, resulting in 0.002 acres of permanent wetland impact. Temporary wetland impacts are anticipated to be 0.301 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment E16 contains ten wetlands within the proposed ROW, totaling 1.27 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow and deciduous forest. Based on field investigations, seven of the ten wetlands were identified as significant or high-quality. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.45 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.22 acres.

Subsegment E19 contains two wetlands within the proposed ROW, totaling 0.17 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. Both wetlands are classified as wet meadow. Neither wetlands were identified as significant or high-quality when considering factors such as species composition, structural diversity, and hydrological functions Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.04 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment G06B contains two wetlands within the proposed ROW, totaling 0.77 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. Both wetlands are classified as wet meadow. None of these wetlands were identified as significant or high-quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.38 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment G08 contains three wetlands within the proposed ROW, totaling 0.28 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are all classified as wet meadow. Based on field investigations, one wetland was identified as significant or high-quality. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.10 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment H02 contains three wetlands within the proposed ROW, totaling 0.13 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are all classified as wet meadow. None of these wetlands were identified as significant or high-quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.05 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment H03 contains one wetland within the proposed ROW, a wet meadow, totaling 0.65 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.30 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment I06 contains one wetland within the proposed ROW, a wet meadow, totaling 0.24 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.16 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment I08 contains three wetlands within the proposed ROW, totaling 1.49 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are all classified as wet meadow. Based on field investigations, one of these wetlands was identified as significant or high-quality. A total of one structure would be constructed in wetlands, resulting in 0.002 acres of permanent wetland impact. Temporary wetland impacts are anticipated to be 0.11 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment I09 contains one wetland within the proposed ROW, a wet meadow, totaling 0.24 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.09 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment K01 contains one wetland within the proposed ROW, a wet meadow, totaling 0.15 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.05 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment L04 contains one wetland within the proposed ROW, a wet meadow, totaling 0.28 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.04 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Subsegment K01 contains one wetland within the proposed ROW, a wet meadow, totaling 0.15 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.05 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Off-ROW temporary wetland impacts are anticipated to be 0.06 acres due to the placement of construction matting. This would occur in three wet meadow complexes.

7.2.4.3. Summary of potential impacts

The wetlands present within each route alternative are summarized in Tables 7-9 and 7-10 below.

Table 7-9 Wetland habitat present within the proposed ROW of route alternatives within the Western Routing Area. Common subsegments have been included in each route alternative, as appropriate.

Route Alternative	Forested Wetland			Non-Forested Wetland		Significant/ High Quality Wetlands (count)
	Existing Shared ROW Not Cleared (acres)	Existing Shared ROW (acres)	New ROW (acres)	Existing Shared ROW (acres)	New ROW (acres)	
Western-North	0	0	1.69	4.55	10.46	18
Western-South	0	0	0.35	1.78	5.74	19

Table 7-10 Wetland impacts within the proposed ROW of route alternatives within the Western Routing Area. Common subsegments have been included in each route alternative, as appropriate.

Route Alternative	Total Wetland Present (acres)	Temporary wetland impact (acres)	Permanent wetland impact (acres)	Wetland conversion (acres)	Off-ROW Access Roads
Western-North	16.70	5.20	0.009	1.69	0.06
Western-South	7.87	3.67	0.004	0.36	0.06

7.2.5. Waterways

General information about waterways and the potential short- and long-term potential impacts of constructing transmission line through and across waterways can be found in Section 4.6.6.

7.2.5.1. Western-North

Subsegment D01 contains three waterways within the proposed ROW, all of which are unnamed tributaries to the Furnace Branch. None of these waterways are designated as an ASNRI. All of these waterways are proposed to be traversed with a TCSB.

Subsegment D04 contains 25 waterways within the proposed ROW. These include Rattlesnake Creek, Grant River, Pigeon Creek, and Beetown Branch. Rattlesnake Creek is a spring and seepage fed stream where almost 100% of its drainage area is used for agricultural purposes. Grant River is classified as a cool-cold mainstem and cool-warm mainstem which is subject to intense streambank erosion due to the steep slopes in this stretch of river. Pigeon Creek is a spring and seepage fed stream. The dominant land use in this watershed is agricultural and it also receives stormwater from the City of Lancaster. Beetown Branch is a spring fed stream that flows into the Grant River. The remaining 21 waterways are unnamed tributaries to the aforementioned waterways. None of these waterways are designated as an ASNRI. Several of these waterways meander in and out of the ROW, creating a total of 36 waterway crossings within the proposed ROW of Western-North. Of the 36 waterway crossings, eight are proposed to be traversed via TCSB's for vehicle access, one is proposed to be traversed via an existing crossing (i.e. culvert, bridge, or ford), and the remaining 27 crossings would not be traversed by vehicles.

Subsegment D08 contains 25 waterways within the proposed ROW. These include the Moore Branch, Austin Branch, Martinville Creek, and the Platte River. The Moore Branch is a tributary to the Austin Branch and is a cold-water stream. The Austin Branch is a tributary to the Platte River and is a designated Class II trout stream for its entire stretch. Martinville Creek is a tributary to the Platte River and is a designated Class II trout stream for a portion of its stretch. The Platte River is a tributary to the Mississippi River, to which it carries a large sediment load annually. The Platte River is a designated Class II trout stream for a portion of its stretch. The remaining 21 waterways are unnamed tributaries to the aforementioned waterways. Three of these waterways are designated as an ASNRI. Several of these waterways meander in and out of the ROW, creating a total of 35 waterway crossings within the ROW. Of the 35 waterway crossings, 12 are proposed to be traversed via TCSB's for vehicle access, and the remaining 23 crossings would not be traversed by vehicles.

There are 15 TCSB's proposed within off-ROW access roads along Western-North, none of which are designated as ASNRI.

7.2.5.2. Western-South

Subsegment E01 contains eight waterways within the proposed ROW. These include the Mill Branch, and McCartney Branch. The Mill Branch is a tributary to the Mississippi River and is a cold-water stream. The McCartney Branch is a spring fed tributary to the Mississippi River. The remaining six waterways are unnamed tributaries to Mill Branch. None of these waterways are designated as ASNRI. Of the eight waterway crossings, six are proposed to be traversed via TCSB's for vehicle access, and the remaining two crossings would not be traversed by vehicles.

Subsegment E07 contains eight waterways within the proposed ROW, including the Grant River. The Grant River is classified as a cool-cold mainstem and cool-warm mainstem which is subject to intense streambank erosion due to the steep slopes in this stretch of river. The remaining six waterways are unnamed tributaries to the Grant River. None of these waterways are designated as ASNRI. Several of these waterways meander in and out of the ROW, creating a total of ten waterway crossings within the

ROW. Of the ten waterway crossings, four are proposed to be traversed via TCSB's for vehicle access, and the remaining six crossings would not be traversed by vehicles.

Subsegment E09 contains one waterway within the proposed ROW, an unnamed tributary to Boice Creek. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Subsegment E10 contains eight waterways within the proposed ROW. These include Graham-Hollow Creek and Boice Creek. Graham-Hollow Creek is a high gradient spring fed tributary to Boice Creek. Boice Creek is a spring and seepage fed stream that is a tributary to the Grant River.

The remaining six waterways are unnamed tributaries to Boice Creek and to Wouldow Creek. None of these waterways are designated as an ASNRI. Several of these waterways meander in and out of the ROW, creating a total of 11 waterway crossings within the ROW. Of the 11 waterway crossings, two are proposed to be traversed via TCSB's for vehicle access, and the remaining nine crossings would not be traversed by vehicles.

Subsegment E13 contains one waterway within the proposed ROW, an unnamed tributary to the Platte River. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Subsegment E14 contains two waterways within the proposed ROW, both unnamed tributaries to the Platte River. Neither of these waterways are designated as an ASNRI. One of these waterways meanders in and out of the ROW, creating a total of four waterway crossings within the ROW. Of the four waterway crossings, all are proposed to be traversed via TCSB's for vehicle access.

Subsegment E16 contains seven waterways within the proposed ROW. These include the Yankee Hollow Creek and the Platte River. Yankee Hollow Creek is a spring fed stream in the Platte River watershed. The Platte River is a tributary to the Mississippi River, to which it carries a large sediment load annually. The Platte River is a designated Class II trout stream for a portion of its stretch.

The remaining four waterways are unnamed tributaries to the aforementioned waterways. None of these waterways are designated as an ASNRI within the segment. Several of these waterways meander in and out of the ROW, creating a total of nine waterway crossings within the ROW. Of the nine waterway crossings, two are proposed to be traversed via TCSB's for vehicle access, and the remaining 27 crossings would not be traversed by vehicles.

Subsegment E18 contains one waterway within the proposed ROW, an unnamed tributary to the Platte River. This waterway is not designated as an ASNRI. This waterway is proposed to have a crossing with a TCSB.

Subsegment E19 contains six waterways within the proposed ROW. These include the Whig Branch and the Little Platte River. The Whig Branch is a spring fed stream that is a tributary to the Little Platte River. The Little Platte River is classified as a cool-cold mainstem and cool-warm mainstem and is a tributary to the Platte River. The Little Platte River is a designated Class II trout stream for a portion of its stretch and a designated ERW waterway. It is also a regionally important small mouth bass fishery. The remaining four waterways are unnamed tributaries to the Little Platte River, which is a designated ASNRI. All six waterways would not be traversed by vehicles.

Subsegment G06B contains three waterways within the proposed ROW, all of which are unnamed tributaries to the Blockhouse Creek. None of these waterways are designated as an ASNRI. All three waterways are proposed to be traversed via TCSB's for vehicle access.

Subsegment G08 contains seven waterways within the proposed ROW. These include Blockhouse Creek and the Galena River. Blockhouse Creek is a spring and seepage fed stream that is a tributary to the Little Platte River. Galena River is classified as a cool-cold mainstem and cool-warm mainstem and is locally known as the Fever River. It is a designated ERW waterway and is a regionally important small mouth bass fishery. The remaining five waterways are unnamed tributaries to the aforementioned waterways. The Galena River is a designated ASNRI. All seven waterways are proposed to be traversed via TCSB's for vehicle access.

Subsegment G09 contains two waterways within the proposed ROW, both of which are unnamed tributaries to the Galena River. Neither of these waterways are designated as an ASNRI. Both waterways are proposed to be traversed via TCSB's for vehicle access.

Subsegment H02 contains three waterways within the proposed ROW. These include the Bonner Branch and the Mounds Branch. The Bonner Branch is a low gradient spring fed stream and is a tributary to the West Branch of the Pecatonica River. The Mounds Branch is classified as a cool-cold mainstem and cool-warm mainstem which is a tributary to the Little Platte River. The remaining waterway is an unnamed tributary to the Mounds Branch. None of these waterways are designated as an ASNRI. Of the three waterways, one is proposed to be traversed via TCSB's for vehicle access and the remaining two waterways would not be traversed by vehicles.

Subsegment H03 contains one waterway within the proposed ROW, an unnamed tributary to the Mounds Branch. This waterway is not designated as an ASNRI. This waterway meanders in and out of the ROW, creating two waterway crossings within the ROW. Both waterway crossings would not be traversed by vehicles.

Subsegment H06 contains five waterways within the proposed ROW. This includes the Mounds Branch and four unnamed tributaries to the Mounds Branch. None of these waterways are designated as an ASNRI. Of the five waterways, three are proposed to be traversed via TCSB's for vehicle access and the remaining two crossings would not be traversed by vehicles.

Subsegment H07 contains two waterways within the proposed ROW, both of which are unnamed tributaries to the Little Platte River. None of these waterways are designated as an ASNRI. Both waterways are proposed to be traversed via TCSB's for vehicle access.

Subsegment H09 contains two waterways within the proposed ROW, both of which are unnamed tributaries to the Pecatonica River. None of these waterways are designated as an ASNRI. One waterway is proposed to be traversed via TCSB's for vehicle access and the other waterway would not be traversed by vehicles.

Subsegment I06 contains one waterway within the proposed ROW, an unnamed tributary to the Livingston Branch. This waterway is not designated as an ASNRI and would not be traversed with vehicles or equipment.

Subsegment I08 contains three waterways within the proposed ROW. These include the Livingston Branch and unnamed tributaries to the Livingston Branch. The Livingston Branch is classified as a warm water seepage stream and is a major tributary to the West Branch of the Pecatonica River. It contributes one-third of the base flow to the West Branch of the Pecatonica River. None of these waterways are designated as an ASNRI. The Livingston Branch meanders in and out of the ROW, creating a total of six waterway crossings within the ROW. Of the six waterway crossings, two are proposed to be traversed via TCSB's for vehicle access and the remaining four crossings would not be traversed by vehicles.

Subsegment I09 contains one waterway within the proposed ROW, an unnamed tributary to the Livingston Branch. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Subsegment K01 contains one waterway within the proposed ROW, an unnamed tributary to the Livingston Branch. This waterway is not designated as an ASNRI and would not be traversed with vehicles or equipment.

Subsegment L02 contains one waterway within the proposed ROW, an unnamed tributary to the Platte River. This waterway is not designated as an ASNRI and would not be traversed with vehicles or equipment.

Subsegment L04 contains one waterway within the proposed ROW, the Platte River. This waterway is not designated as an ASNRI and would not be traversed with vehicles or equipment.

For off-ROW access roads for Western-South, five waterways are proposed to be traversed via a TCSB for vehicle access and six waterways would be crossed via existing structures. None of these waterways are designated as ASNRI.

7.2.5.3. Summary of potential impacts

The proposed waterways impact by route alternative are summarized in Table 7-11 below.

Table 7-11 Waterways present within the proposed ROW of route alternatives within the Western Routing Area. Common subsegments have been included in each route alternative, as appropriate

Route Alternative	Waterways Present	ASNRI Waterways Present	Waterway Crossings Proposed	TCSBs Required	TCSBs Required over ASNRI	Off-ROW Access Roads TCSBs Required
Western-North	53	3	74	23	1	15
Western-South	75	2	88	49	1	5

7.2.6. Endangered resources

This section discusses the potential impacts to endangered resources that may be affected by construction or operation of the proposed route alternatives in the Western Routing area: Western-North and Western-South. A general discussion of endangered resources is presented earlier in Section 4.6.1.

Endangered resources include rare or declining species, high quality or rare natural communities, and animal concentration sites. Endangered resources are tracked via the state's NHI database which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the proposed ROW and a buffer of 1.0 mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

This section identifies the endangered resources that could be present within the Western Routing Area, the project's potential impacts on these resources, and the avoidance measures that should be implemented. This section does not cover endangered resources that, while they may be present in the area, would not be impacted by this project. Rare species are discussed individually or as taxa groups if there is a high level of concern. The information discussed in this section include information from existing sources within DNR including the NHI database, as well as external sources including landowners and surveys completed by the applicants.

For specific subsegments, an incidental take of state threatened or endangered animal species may occur as defined by Wis. Stat. § 29.604. Should this happen, an ITA would be required for construction to proceed on those subsegments. Instances where existing information indicates that additional assessment or consultation for would be needed to assess potential incidental take are also described in this EIS.

7.2.6.1. Birds

7.2.6.1.1 Western-North

Two state threatened and one special concern bird species have been recorded in the NHI database in the vicinity of Western-North. The Bell's vireo (THR) may have suitable shrubby habitat present along Subsegment D08 while the other two species may be present within upland wooded habitat along Subsegment D01. Therefore, if this route alternative is approved, additional bird surveys or time of year restrictions during the nesting season would be required.

The NHI database indicates several occurrences for the bald eagle, which is federally protected through the Bald and Golden Eagle Protection Act within the vicinity of Western-North, Subsegments D04 and D08. Two nest locations have the potential to be within the federal 660ft buffer. A landowner has indicated that a nest along Subsegment D04 is currently active although eagle surveys were not completed for this area; therefore, it is unknown if the other locations are currently active. If Western-North is approved, additional eagle surveys would be required. Per USFWS guidelines, it is a requirement to maintain a buffer of at least 660 feet between project activities and an active bald eagle nest. Work may be conducted closer if done outside of the nesting season (August through mid-January). If these guidelines cannot be followed, USFWS must be consulted for further assistance, prior to the start of construction. Other nest sites occur along both route alternatives, and it is recommended to have surveys completed in those areas to ensure nesting bald eagles are not impacted. In addition, it would be highly recommended that where bald eagle nests are found, bird diverters be installed to reduce the likelihood of these birds colliding with the line.

7.2.6.1.2 Western-South

Two state-listed and one special concern bird species have been recorded in the NHI database in the vicinity of Subsegment E01. Suitable habitat for these birds include upland woodlands which appears to be present along this route alternative. Therefore, if Western-South is approved, additional bird surveys or time of year restrictions during the nesting season would be required.

7.2.6.2. Mammals

7.2.6.2.1 Western-North

Four state threatened bat species (including one that is federally listed as threatened) along with a known bat hibernaculum have been documented in the vicinity of Western-North. These species can be found roosting in trees, bat houses, and buildings during the summer and hibernating in caves and mines from fall through spring. They forage primarily over open water and along edge habitats. Since Western-North is further than 0.25 miles from the hibernaculum, there are no federal requirements for the federally threatened species. For the state-listed species, they are covered under the Cave Bat Broad ITA which recommends that where suitable habitat occurs, presence/absence surveys be conducted and limited/no tree clearing take place during the species' maternity period (June 1–August 15).

7.2.6.2.2 Western-South

No rare mammals were documented in the NHI database within the vicinity of Western-South.

7.2.6.3. Herptiles

7.2.6.3.1 Western-North

A special concern snake species has been documented as occurring in the vicinity of Western-North, Subsegment D01. This species prefers a variety of upland habitats including forests, savannas, and bluff prairies all of which could be present along this route alternative. Possible recommended avoidance measures for these species may include conducting work in areas where the species does not overwinter during their inactive season, have a monitor onsite during the active season to relocate any individuals found, and/or installing taller herp exclusion fencing in areas of suitable habitat and conducting removals within the fenced area.

The Blanding's turtle, a special concern species at both the state and federal level, may be found along Segment I where suitable habitat is present. It is recommended that work take place outside of their active season within wetland and waterbodies shallower than three feet in depth and outside of the nesting season (May 20–October 15). Otherwise, installing herp exclusion fencing outside of these time periods in those habitats would be considered avoidance too.

The state endangered Blanchard's cricket frog may be present at many locations along this route alternative. Suitable habitat for both include wetlands and waterways and nearby uplands. Should this route alternative be chosen, cricket frog calling surveys would be required immediately prior to the start of project activities to determine where this species is located. Should work take place in suitable habitat where the frog is found, an ITA would be required.

7.2.6.3.2 Western-South

A special concern snake species has been documented as occurring in the vicinity of Western-South, Subsegment E16. This species prefers savanna and oak forest habitats which may be present along this route alternative. Possible recommended avoidance measures for these species may include conducting work in areas where the species does not overwinter during their inactive season, have a monitor onsite during the active season to relocate any individuals found, and/or installing taller herp exclusion fencing in areas of suitable habitat and conducting removals within the fenced area.

The Blanding's turtle, a special concern species at both the state and federal level, may be present along Subsegment D08 where suitable habitat is present. It is recommended that work take place outside of their active season within wetland and waterbodies shallower than three feet in depth and outside of the nesting season (May 20–October 15). Otherwise, installing herp exclusion fencing outside of these time periods in those habitats would be considered avoidance too.

The state endangered Blanchard's cricket frog and special concern pickerel frog both may be present at many locations along Western-South. Suitable habitat for both include wetlands and waterways and nearby uplands. Should this route alternative be chosen, cricket frog calling surveys would be required immediately prior to the start of project activities to determine where this species is located. Should work take place in suitable habitat where the frog is found, an ITA would be required.

7.2.6.4. Terrestrial invertebrates

7.2.6.4.1 Western-North

No rare terrestrial invertebrates were documented in the NHI database within the vicinity of Western-North.

7.2.6.4.2 Western-South

This route alternative intersects the Rusty Patched Bumble Bee High Potential Zone along Subsegment F02. While it looks like suitable habitat may be present within the tree line, it is limited and likely of low quality. This zone is a federally regulated zone and the applicants would want to consult with FWS regarding any recommendations or requirements for this subsegment.

One special concern butterfly species has been observed in the vicinity of Subsegment G08. Suitable habitat for this species includes open woodlands, barrens, savannas, and prairies which may be present along this route alternative although it appears this segment is mostly within an agriculture setting. If Western-South is ordered, a habitat assessment would be recommended and if suitable habitat is found, host plant surveys would be suggested. If host plants were located, it would be recommended that these individuals be avoided or that restoration include a native seed mix with the host plant species included.

One state threatened and three special concern snail species have been documented within the NHI Database near Subsegment E01. If suitable habitat would be disturbed, presence/absence surveys would likely be required for the state listed species and if found, and an ITA would be necessary. Further minimization measures would need to be determined at that time.

7.2.6.5. Fish and aquatic invertebrates

7.2.6.5.1 Western-North

The state threatened Ozark Minnow is present along this route alternative at various waterway crossings. To avoid impacts to these species, any work in the streams where suitable spawning habitat is present or that would cause siltation within the water would need to take place outside of the minnow's spawning season (May 1–August 10).

7.2.6.5.2 Western-South

The state threatened Ozark Minnow and special concern Mud Darter are known to be present at various waterway crossings along this route alternative. To avoid impacts to Ozark Minnow, any work in the stream where suitable spawning habitat is present or that would cause siltation within the water would need to take place outside of the species' spawning season (May 1-August 10). These same measures are recommended for the Mud Darter.

The state threatened Ellipse and special concern Mapleleaf mussel species may be present along this route alternative within various waterway crossings. For any work done on the bed of these waterways, further assessments be completed to determine if this species is present. If found, an ITA would be required and the mussels would need to be removed from that area and relocated to an upstream location.

Two special concern water beetle species are also known to be present within the various waterways crossed by this proposed ROW and may be impacted by project activities occurring below the ordinary high water mark. Strong erosion and siltation control measures are encouraged to minimize impacts.

7.2.6.6. Plants

Impacts to natural communities can ultimately change habitat conditions and make it difficult for rare plants to persist. Wisconsin's Endangered Species Law protects state-listed endangered and threatened plant species only on public lands, but utility (including transmission line projects), agriculture, forestry, and bulk sampling projects are exempted from this protection. Additional surveys and avoidance/minimization measures for rare plant species are encouraged and recommended. Potential avoidance measures may include conducting plant surveys to determine presence/absence and/or avoiding areas where known plants occur. Other measures, such as winter construction, use of mats to limit direct disturbance, or relocation, can minimize losses. DNR would also recommend that the applicants and landowners with rare species on their property develop a plan to protect these species.

7.2.6.6.1 Western-North

Seven special concern plant species occur in the vicinity of Western-North including a couple of species that have been found adjacent to the proposed ROW. Suitable habitat for these species includes woodlands, cliffs, and prairies, all of which can be found along this route alternative. Further review would be highly recommended to determine where habitat and species surveys should be conducted.

7.2.6.6.2 Western-South

The NHI database identified one state threatened and eight special concern plant species in the vicinity of Western-South. Suitable habitat for these species includes woodlands, cliffs, and prairies, all of which can be found along this route alternative. Further review would be highly recommended to determine where habitat and species surveys should be conducted.

7.2.6.7. Natural communities

Natural communities may contain rare or declining species and protection of these communities should be incorporated into the project design as much as possible. Given the predominance of private lands, it is likely that additional diverse, high quality, or rare natural community occurrences likely exist beyond those documented in the NHI database. Minimizing impacts to and incorporating buffers along the edges of these natural communities is recommended.

7.2.6.7.1 Western-North

Six prairie, woodland, and cliff natural communities have been documented as occurring within the vicinity of Western-North. In particular, Western-North runs immediately adjacent to a known pine relict and moist cliff communities along Subsegment D08. These natural communities likely contain many of the rare species mentioned previously and should be protected to the extent practicable. Minimization measures could include completing work under frozen ground conditions, implementing strict invasive species BMPs, and/or using a native prairie seed mix during the restoration process.

7.2.6.7.2 Western-South

Nine upland natural communities have been documented as occurring within the vicinity of Western-South, and they are all likely to be present within the proposed ROW. In particular, this proposed route alternative intersects with at least four of these communities and is adjacent to several others. These natural communities likely contain many of the rare species mentioned previously and should be protected to the extent practicable. Minimization measures could include completing work under frozen ground conditions and/or using a native prairie seed mix during the restoration process.

7.2.6.8. Summary of potential impacts

Tables 7-12 and 7-13 identify the general types and numbers of rare species, natural communities, and other features that were identified as potentially impacted within the Western Routing Area primarily based on information from the NHI database.

Table 7-12 Summary of endangered resources impacted along Western-North

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed, Candidate, or Species of Concern	Not Applicable
Birds	2	1			
Mammals	4		1		
Herptiles	1	3		1	
Terrestrial Invertebrates					
Fish/Aquatic Invertebrates	1				
Plants		7			
Natural Communities					6
Summary	8	11	1	1	6

Table 7-13 Summary of endangered resources along Western-South

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	2	1			
Mammals					
Herptiles	1	2		1	
Terrestrial Invertebrates	1	4	1		
Fish/Aquatic Invertebrates	2	4			
Plants	1	8			
Natural Communities					9
Summary	7	19	1	1	9

Overall, information from the NHI database indicate that Western-North would have fewer impacts to known rare species than Western-South; although, NHI data is lacking in both route alternatives as they primarily run through private lands where frequent surveys have not been completed. Western-North certainly has more rare forestland bird potentials and it would be highly recommended to conduct surveys along this route alternative, if ordered. The one concern Western-North has over Western-South are known bald eagle nests located very near the proposed ROW where collisions could occur. Western-South could have more impacts to terrestrial snails, aquatic species, plants, and natural communities. From a grassland/savanna species perspective, Western-North would be less impactful than the Western-South; although, as noted above it would be more permanently impactful for forest-dependent species. The grassland/savanna impacts from the proposed project may be temporary if the applicants implement a native seed mix in the ROW during the restoration phase and conduct vegetation maintenance that encourages and enhances native prairie species within the ROW.

7.2.7. Invasive species

The applicants had access to some, but not all, areas of the proposed project during the planning stage. Where the applicants had access to proposed routes during the 2017 growing season, observations of invasive plant species were noted when practicable. The general location and species observed were added to an overall evaluation of the risk of spreading invasive species, pests, or diseases as a result of project construction activities. Wetland delineations and vegetation mapping tasks were the source of most of these observations; however, a targeted survey of proposed route alternatives to identify invasive species was not done. Other invasive species may be present in the project area and a more thorough assessment of invasive species presence should be done prior to the start of construction, if approved.

In addition to the applicants' observations of invasive species in this routing area, Commission staff reviewed the project using the DNR Lakes and Aquatic Invasive Species Viewer. This database has some records of aquatic invasive species, but the lack of any observations should not be interpreted as meaning there are no invasive species in a given area. This routing area has records of Curly-leaf pondweed and Japanese hops where the proposed routes would cross the Grant River for both the western north and western south routes. The application states that work below the OHWM would be avoided to the extent practicable. Any machinery, equipment, or materials that are placed below the OHWM of a waterway should be decontaminated for invasive species before being used in another waterway in accordance with Wis. Admin. Code § NR 329.04(5).

The project area of southwestern Wisconsin has a range of plant pests that could affect trees and forestry operations such as oak wilt, emerald ash borer, and gypsy moths. See Section 4.6.2 for more discussion on these potential impacts to forests. The applicants state that standard BMPs to reduce the spread of these plant pests would be used during tree clearing operations. These BMPs include avoiding impacts to oak trees from April 1-July 15, and following guidelines to avoid spreading emerald ash borer and gypsy moths by leaving cut vegetation on site when possible.

A full list of invasive species that were recorded in the project area is provided in Section 4.6.4.3, and the invasive species recorded in this routing area are identified in the following sections. When invasive species are encountered, the applicants should implement the BMPs identified in Section 4.6.4.2 to minimize the spread of invasive species as a result of any activities conducted for the proposed project.

7.2.7.1. Western-North

For the Western-North route alternative, the application states that the following species were observed:

- Garlic mustard (Alliaria petiolata)
- Canada thistle (Cirsium arvense)
- Morrow's honeysuckle (Lonicera morrowii)
- Wild parsnip (Pastinaca sativa)
- Multiflora rose (Rosa multiflora)

7.2.7.2. Western-South

For the Western-South route alternative, the application states that the following species were observed:

- Garlic mustard (*Alliaria petiolata*)
- Canada thistle (*Cirsium arvense*)
- White mulberry (*Morus alba*)
- Wild parsnip (*Pastinaca sativa*)
- Black locust (R*obinia pseudoacacia*)
- Multiflora rose (R*osa multiflora*)
- Oriental bittersweet (*Celastrus orbiculatus)*

7.2.8. Archaeological and historic resources

The applicants completed several reviews in order to identify potential archaeological and historic resources within the Western Routing Area.[295] The reviews identified seven archaeological sites and five human burial sites in this routing area. Commission staff requested additional details from the applicants regarding potential impacts to resources as well as mitigation options.[296] Commission staff have also contacted the Ho-Chunk Tribal Historic Preservation Officer for comment regarding potential impacts to Native American burial mounds and have not received any additional information regarding potential impacts of the proposed project at this time.

7.2.8.1. Western-North

- **GT-0158 (Subsegment D08)** consists of a Paleoindian/Archaic period lithic artifact scatter intersected by Subsegment D08. The archaeological consultant has field surveyed but not field verified the site and recommended an additional survey.
- **GT 0779/BGT-0408 (Subsegment D04)** consists of a group of at least 16 uncatalogued Native American burial mounds. The site is within 575 feet of Subsegment D04. The site was not in the archaeological consultant review, but was brought to the attention of Commission staff with an EIS scoping comment from a member of the public.
- **GT-0792/BGT-0420 (Subsegment D04, Off-ROW Access Road)** consists of at least five bird effigies and five linear uncatalogued Native American burial mounds intersected by an access road that connects with Subsegment D04. The archaeological consultant recommended avoiding use of this access road.

7.2.8.2. Western-South

- **GT-0089 (Subsegment E19)** consists of an enclosure or earthworks adjacent to Subsegment E19. The archaeological consultant has field surveyed but not field verified the site and recommended an additional survey.
- **GT-0437/BGT-0187 (Subsegment E07)** consists of at least 16 uncatalogued conical Native American burial mounds within 25 feet of Subsegment E07. The archaeological consultant has field surveyed and field verified the site. They recommended an additional survey, protection, and avoidance of the site.
- **GT-0464 (Subsegment E10, Off-ROW Access Road)** consists of prehistoric and historic artifacts intersected by an access road that connects with Subsegment E10. The archaeological consultant recommended a complete survey of the site.
- **GT-0665 (Subsegment E16)** consists of the remains of a lead smelting furnace that was operated from 1850 through 1895 and is intersected by Subsegment E16. The archaeological consultant has field surveyed but not field verified the site. They recommended an additional survey of the site.
- **GT-0685 (Subsegment G06B)** consists of an isolated lithic artifact intersected by Subsegment G06B. The archaeological consultant has not field surveyed or field verified the site. They recommended an additional survey of the site.
- **GT-0687 (Subsegment G06B)** consists of a concentration of historic artifacts intersected by Subsegment G06B. The archaeological consultant has not field surveyed or field verified the site. They recommended an additional survey of the site.

---

[295] PSC REF#: 341912, 341878, 341879, 341880, 345377, 345378, 345379, 345380, and 355953
[296] PSC REF#: 343192, 345369, 346685, 350239, and 355945

- **GT-0782/BGT-0412 (Subsegment E07, Off-ROW Access Road)** consists of at least five bird, three linear, one effigy, and one conical catalogued Native American burial mounds intersected by an access route that connects with Subsegment E07. The archaeological consultant recommended avoiding use of this access road.
- **GT-0788/BGT-0417 (Subsegment E10)** consists of at least three uncatalogued Native American conical burial mounds intersected by Subsegment E10. The archaeological consultant has not field surveyed or field verified the site. They recommended an additional survey, protection, and avoidance of the site.
- **GT-0090 (Subsegment F02)** consists of Archaic period lithic artifacts that may comprise a prehistoric campsite intersected by Subsegment F02. The archaeological consultant has field surveyed but not field verified the site. They recommended an additional survey of the site.

7.2.8.3. Summary of potential impacts

Table 7-14 Summary of potential archaeological and historic resource impacts in the Western Routing Area

Route Alternative	Archaeological Sites	Human Burial Sites	Historic Buildings	Historic Districts
Western-North	1	2	0	0
Western-South	6	3	0	0
Off-ROW Access Roads	1	2	0	0

In accordance with Wis. Stat. § 44.40 and the PSC-SHPO Interagency Programmatic Agreement, Commission staff is consulting with SHPO regarding resources identified within this section of the proposed project. Any work conducted within human burial sites would need a Permit to Disturb a Human Burial as per Wis. Stat. § 157.70. To further minimize or avoid impacts to archaeological and historic resources in the project area, the applicants should implement the recommended actions identified for each site.

7.3. COMMUNITY RESOURCES AND POTENTIAL IMPACTS

7.3.1. Agriculture

The presence of a high-voltage transmission line can adversely affect farm operations and field productivity. Refer to Section 4.5.2, for a discussion of potential impacts associated with transmission line construction and operation in agricultural fields. Transmission lines can affect field operations, irrigation, aerial spraying, windbreaks, and future land uses. DATCP will present its analyses of the potential impacts of the proposed project to farmed fields in its AIS. See Section 1.3.3. for a discussion of the role of DATCP in this project.

According to the application, no clear evidence of drain tile lines along the segments was apparent from either aerial photography interpretation or field investigation. However, there are areas of farmland along each route alternative that contain hydric soils in close proximity to ditches, which suggests that drain tiles may exist in these locations. If drainage tiles do exist along an approved route, construction vehicle traffic could break them. During the final design process, the applicants should work with landowners to place structures so that impacts to drain tiles are minimized, to the extent practicable. Other agricultural practices that may be affected by this project include windbreaks, organic farms, and automated tractor use.

Windbreaks consist of rows of trees that can help reduce wind erosion by providing a barrier on the windward side of a field. Depending on soil conditions and supporting practices, a single row of trees protects for a distance downwind of approximately 10 to 12 times (or more) the height of the windbreak.

The removal of windbreaks because of transmission line construction, especially in agricultural soils highly susceptible to wind erosion, could result in reduced crop productivity due in part to a permanent loss of top soil and the potential for additional non-point pollution of downwind streams.

In recent years there has been discussion about the potential for construction projects to spread farm pests and diseases or to otherwise affect the health of farming operations. Concerns have been raised about Johne's disease, soybean cyst nematode, the spreading of ginseng diseases to plots reserved for future ginseng production, and pesticide contamination of soils on organic farms. Issues of biosecurity can be a concern to many farm operators.

Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly affect future crop yields. Soils may be mixed during the excavation of pole foundations or during the undergrounding of electrical lines. The excavation depth for transmission structure foundations can vary greatly, but in some projects may be more than 50 feet deep. Excavated parent material or subsoils should not be mixed with topsoils and spread on the surface of the ROW. Significant rutting can occur when soils become saturated or in areas of sensitive soils. Rutting might impact agricultural lands by increasing the mixing of soils, allowing topsoils to erode during rain events, and compacting soils. Compacted soils inhibit percolation of rainwater and, in turn, inhibit seed germination and crop root growth. The degree to which soils are compacted by heavy construction equipment again depends on the type of soil and its saturation level. Ineffective erosion controls may wash valuable topsoils downhill and impact wetlands and waterways. Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed.

Farms that practice organic farming would require specific protection measures during construction to avoid the spread of farm pests and diseases or to protect organic certifications. Additional issues for organic farms might be caused by the removal of tree buffers for new ROWs or the enlargement of existing ROWs. The removal of buffers might threaten a crop's organic status by increasing the potential for herbicide drift from adjacent fields. Biosecurity and organic farm impacts can be minimized by the applicants working with agricultural landowners well in advance of construction, giving advance notice of construction activities, and following through with agreed to protective measures.

The full width of the ROW would likely be cleared for construction of the proposed line, including properties currently planted with trees as part of plantations or tree farms. Under state statute (Section 4.4), landowners must be compensated for any crop damage caused by construction or maintenance of a high voltage transmission line. The applicants should work with tree farm and plantation landowners to minimize construction impacts and determine allowable post-construction use of the land within the easement.

Wisconsin Stat. § 182.017(7)(c) through (h) contains a list of landowner rights, many of which address issues important to farm fields, and these rights include required construction impact mitigation measures such as proper segregation of topsoils, post-construction restoration of the field, repair of damaged fences or drainage tile, payment for crop damage and others. A detailed discussion of landowners' statutory rights is included in Section 4.4.

In general, in advance of any construction for the project, the applicants would and should coordinate with each agricultural landowner regarding their farm operation including field facilities like drainage tiles, locations of farm animals and crops, current farm biological security practices, landowner concerns, and use of access routes. Potential impacts to each farm property along an ordered route would need to be identified and, where practicable, construction impact minimization measures would need to be agreed upon and implemented. Site-specific practices would need to vary according to the activities of the landowner/farm operator, the type of agricultural operation, the susceptibility of site-specific soils to compaction, the degree of construction occurring on the parcel, and the ability to avoid areas of potential concern.

Prime farmland is land that contains soils with certain characteristics that allow for high yields of a variety of commonly grown agricultural crops. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding. Prime farmland, as described here, is a categorization based on environmental factors. It is not a program, certification, or an easement category. The geologic history of the area played a large role in the formation of these farmlands.

Much of the land that is actively being farmed in the proposed ROW's of the project is comprised of NRCS-classified prime farmland. PSC staff reviewed GIS information to analyze and confirm the locations of prime farmland along the project routes.

Soil properties are only one of several criteria that are necessary for an area to be designated Prime farmland. Other considerations include:

- Land use – Prime farmland is designated independently of current land use, but it cannot include areas of water or urban or built-up land. Map units that are complexes or associations containing components of urban land or miscellaneous areas as part of the map unit name cannot be designated as prime farmland.
- Frequency of flooding – Some map units may include both prime farmland and land that is not prime farmland because of variations in flooding frequency.
- Water table – Some map units include both drained and undrained areas. Only the drained areas meet the prime farmland criteria.

7.3.1.1. Western-North

Approximately 43.2 percent of Western-North is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 254.77 acres of cropland and approximately 0.79 acres of specialty crops would be impacted by Western-North. One tree farm has been identified along Subsegment D08.

There are 14 agricultural buildings within 300 feet and 12 dairy operations within 0.5 miles of the centerline of Western-North. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents (Section 4.5.11).

There are two organic farms that have been identified along Subsegment D08.

7.3.1.2. Western-South

Approximately 56.5 percent of Western-South is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 504.95 acres of cropland and approximately 10.41 acres of specialty crops could be impacted by Western-South. This route alternative would impact the greatest amount of actively cropped land compared to any other proposed route alternative. One tree farm was identified along Subsegment E01 with approximately 0.5 acres that could be impacted by the proposed project.

There are 139 agricultural buildings within 300 feet and 23 dairy operations within 0.5 miles of the centerline of Western-South. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents (Section 4.5.11).

No organic farming operations have been identified along this route alternative.

7.3.1.3. Summary of potential impacts

Refer to the draft AIS that is being prepared by DATCP for additional information regarding impacts from the proposed project on agricultural land and landowners. Refer to Appendix G for DATCP's Summary of Analysis and Recommendations from the draft AIS that was prepared for the Cardinal-Hickory Creek Project.

Table 7-15 Agricultural impacts in the Western Routing Area

Route Alternative	Actively Cropped Land				Specialty Crops		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)
Western-North	171,801	88.8	165.97	254.77	0.06	0.73	0.79
Western-South	266,212	128.36	376.59	504.95	10.41	0.48	10.89

7.3.2. Land use plans

In general, residential uses are considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily because of potential adverse aesthetic effects. Greater potential for conflict with land use plans exists in areas of urban development, where existing and planned residential and commercial uses are more common. The potential for conflict is also present in areas undergoing land use change, such as where rural land is being converted to residential use.

Corridor sharing with different types of infrastructure (e.g. transmission lines and multi-lane highways) can mitigate impacts by causing incremental impacts instead of entirely new impacts associated with a new ROW corridor. Not all corridors that can be shared with a transmission line serve to lessen potential impacts, though. Places with narrow, canopy-covered local roads, winding rural roads, and residential areas supporting smaller lots may experience greater impacts from a new high-voltage transmission line.

7.3.2.1. Western-North

This proposed route alternative would follow an existing 138 kV transmission line as it proceeds northeast from Cassville. Land use plans for the towns of Cassville, South Lancaster, Ellenboro, and Liberty in Grant County show the areas crossed by the route to be "Exclusive Agriculture" districts. South of Lancaster, the route would cross an area designated as transitional agriculture, which indicates that future development is anticipated.

The city of Lancaster's plan shows a proposed north-south road ROW on the east side of Lancaster that would be crossed by the route. Transmission structures should be carefully positioned to avoid conflicting with the future road.

Continuing to the northeast along the existing transmission line ROW to Montfort, the route would lie within an agricultural district in the town of Clifton. At CTH E, it would cross what is shown to be a future commercial area in the town's plan.

7.3.2.2. Western-South

This proposed route alternative would follow an existing 138 kV transmission line as it proceeds eastward from Cassville. The area crossed by the route in the towns of Cassville and Potosi is designated an Exclusive Agriculture district. Existing agricultural areas would also be crossed in the towns of Waterloo and Harrison. The route would pass north of a residential area at the community of Burton in the town of Waterloo.

As the route would skirt the southern edge of the city of Platteville, north of USH 151, it would pass south of a planned residential area located west of Business USH 151. On either side of Business USH 151, the route (Subsegment F03) would border a "mixed use" district. About a half mile east of Business USH 151, the route would cross to the south of the USH 151 freeway and then continue eastward, through an agricultural area. The route would follow the south side of the USH 151 ROW for about 3,700 feet. The city's plan shows business and mixed uses planned for the north side of USH 151 in this area.

The route would cross an agricultural area in the northwest corner of the town of Elk Grove, Lafayette County. Lands crossed by the proposed route in the town of Belmont are designated as an agricultural conservation area. A large wind development area extends between USH 151 and the south town line, which would also be crossed. Proceeding north of USH 151 to the north town line, the route would primarily follow an existing 69 kV transmission line ROW.

Agriculture is the predominant land use in the town of Mifflin, Iowa County. The route would deviate from the existing transmission line corridor to avoid homes in the village of Rewey. It then would skirt a proposed commercial district on the south side of Welch Street before crossing a proposed residential district north of the street. Rejoining the existing transmission line north of Rewey, the route would lie across the highway from a planned commercial zone on the east side of CTH G. Subsegment H07 would parallel this zone for a half-mile. The route would then enter an agricultural area once again, as it continues northward.

The town of Clifton's plan shows a future commercial area along STH 80 between Livingston and the north town line, but otherwise designates the lands near the route as agricultural. Land crossed by the proposed route in the town of Wingville, Grant County is shown to be an exclusive agriculture district. North of Livingston, the route would follow STH 80, which forms the eastern town boundary.

7.3.3. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to homes, schools, daycares, hospitals, and other places where people frequently gather. Information for this section came from the tables submitted in the project application that categorize the number of residences and dwellings within specified distances of the proposed centerline of the new 345 kV line and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public and conducted numerous site visits along the proposed routes.

The proximity of properties to a high-voltage transmission line is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, magnetic fields, and other electrical phenomenon, and personal and public safety.

Commission staff recognizes that individuals and families have substantial financial, physical, and emotional investments in their homes and properties and that the discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes.

A generalized discussion of some of these issues is contained in Chapter 4 including:

- aesthetics (Section 4.5.1);
- electric and magnetic fields (Section 4.5.6);
- property values (Section 4.5.7);
- safety (Section 4.5.10);
- stray voltage (Section 4.5.11); and
- noise and light impacts (Section 4.5.13).

Appendix E contains a brief review of the potential health issues associated with electric and magnetic fields generated by transmission lines. Additionally, potential aesthetics and visual impacts in this routing area are discussed in Section 7.3.4 for several specific areas or properties along the proposed route and others that are recognized regionally or state-wide for their natural beauty.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of this high-voltage transmission line cannot be adequately addressed in this document, but a discussion of some special concerns that have been raised follows in Section 7.3.3.2.

7.3.3.1. Residential impacts

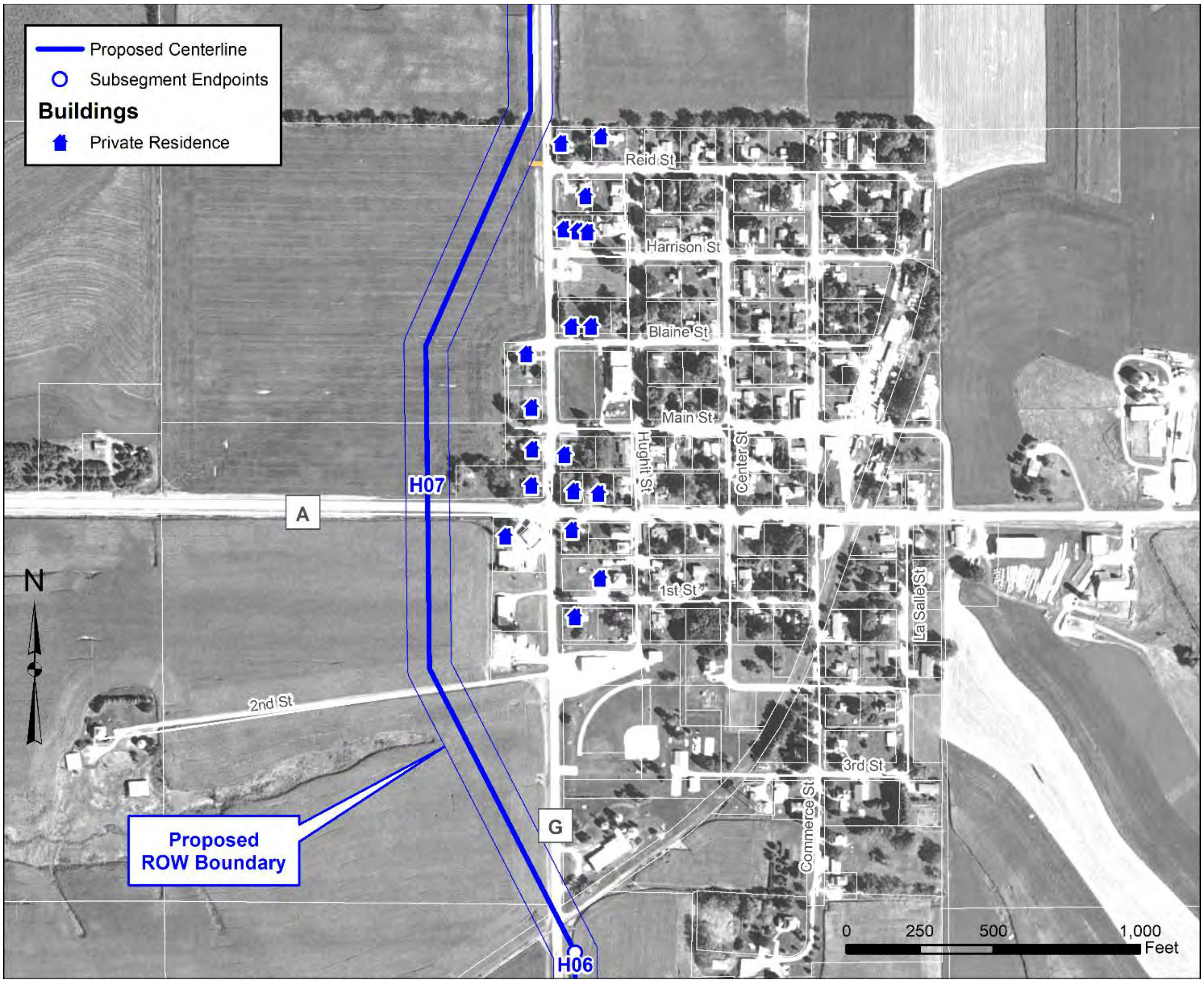
7.3.3.1.1 Western-North

There are at total of 14 residences located within 300 feet of the proposed centerline of Western-North. One residence is located within 101 to 150 feet, and thirteen residences within 151 to 300 feet. These residences are scattered along the proposed route in predominantly rural areas. There are no apartment units or apartment buildings within 300 feet of the proposed centerline.

7.3.3.1.2 Western-South

There are at total of 37 residences located within 300 feet of the proposed centerline of Western-South. Ten residences are located within 101 to 150 feet, and 27 residences within 151 to 300 feet. These residences are mostly scattered along the proposed route in predominantly rural areas. Subsegment H07 passes within close proximity of the village of Rewey (Figure 7-8). There are no apartment units or apartment buildings within 300 feet of the proposed centerline.

Figure 7-8 Proposed ROW along Subsegment H07 (Western-South) in the village of Rewey



7.3.3.1.3 Summary of potential impacts

Table 7-16 Number of residential structures within 300 feet of the proposed centerline along route alternatives in the Western Routing Area

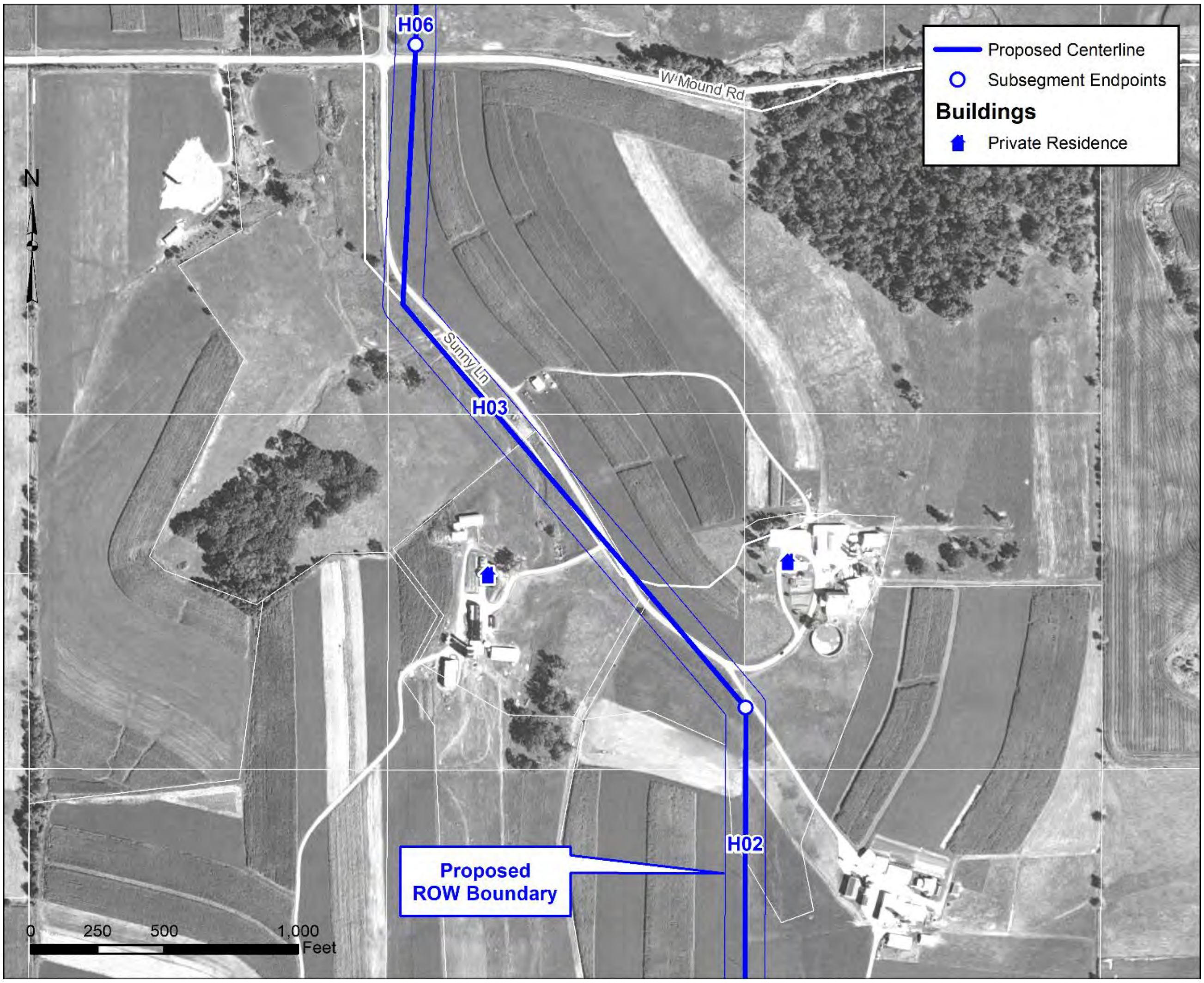
Route Alternative	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
Western-North	0	0	1	13	14
Western-South	0	0	10	27	37

7.3.3.2. Potentially sensitive populations and properties

According to data provided by the applicants, there appears to be no sensitive receptors such as schools, daycares, or hospitals within 300 feet of the proposed centerlines of the route alternatives within the Western Routing Area.

Commission staff received a comment that states concerns about the proposed line being located directly over an Amish country school along Sunny Lane in Platteville, Wisconsin (Figure 7-9). However, from desktop review of the area, the alignment does not appear pass directly over any buildings on Sunny Lane and Commission staff has not yet been able to locate the school.

Figure 7-9 Proposed ROW along Subsegment H03 (Western-South) on Sunny Lane in the city of Platteville



7.3.3.3. Electric and magnetic fields

Some background information and a general discussion of EMF is found in Section 4.5.6 and in Appendix E of this draft EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic field lines at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after the proposed line is placed in operation. The magnetic field profiles included in the application appear to be reasonably representative of the potential circuit configurations. Below are brief summaries of the estimated magnetic field levels for the proposed 345 kV transmission line along the various proposed segments along this portion of the proposed route. Commission staff are waiting on missing EMF information for Subsegments D10C and L05.

7.3.3.3.1 Western-North

Subsegments D01, D03, and D04

Continuing on from Subsegment A03, the proposed 345 kV line would remain in a double-circuit configuration with 138 kV line X-16 progressing generally to the northeast, moving south of the existing X-16 line location northwest of the intersection of STH 81 and Settlement Road, paralleling the existing alignment to the northeast until east of Hauger Lane, then transitioning back to the north side of the existing X-16 line. Eventually the double-circuited line would cross STH 81, Rattlesnake Road, CTH U, and other roads before moving to the south of the existing line X-16 near USH 61. East of USH 61, the double-circuit would once again to the north of the existing X-16 line while west of STH 129. The expected magnetic fields are tabulated below.

Table 7-17 Estimated magnetic fields for Subsegments D01, D03, and D04

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	302 A	349 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	61	71	66	65	76	77
100	5.29	6.11	16	16	19	19
200	1.33	1.54	4.6	4.5	5.1	5.2
300	0.59	0.68	2.0	2.0	2.3	2.3

Subsegment D05

Upon reaching STH 129, the X-16 line moves into the Lancaster substation, with the proposed 345 kV continuing briefly as a single-circuit extending to the northeast and crossing STH to the north of the Lancaster Substation. After this portion, the X-16 line would rejoin the proposed 345 kV line as a continuing double-circuit. The expected magnetic fields are tabulated below.

Table 7-18 Estimated magnetic fields for Subsegments D05

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	50	50	59	59
100	N/A	N/A	12	12	15	15
200	N/A	N/A	3.8	3.8	4.5	4.5
300	N/A	N/A	1.8	1.8	2.1	2.1

Subsegments D08 and D09A

The proposed 345 kV line would again be double-circuited with the 138 kV X-16 line, paralleling the X-16 alignment crossing roads including CTH A and west CTH E. At Laplatte Road, the double-circuit would cross to the south side of the existing X-16 alignment, while moving generally northeast to the proposed Hill Valley Substation. The expected magnetic fields are tabulated below.

Table 7-19 Estimated magnetic fields for Subsegments D08 and D09A

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	254 A	287 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	51	58	67	67	78	79
100	4.45	5.03	17	17	20	20
200	1.12	1.26	4.8	4.8	5.5	5.6
300	0.50	0.56	2.1	2.2	2.4	2.5

7.3.3.3.2 Western-South

Subsegments E01, E03, E04, E06, E07, E09, and E10

Continuing from Subsegment C04, the double-circuited configuration of the proposed 345 kV line and the 138 kV X-15 line continue approximately east, crossing STH 133 and other roads parallel to the existing line X-15. East of Chaffie Hollow Road, the double-circuit route extends south of the current X-15 line, while continuing parallel to the existing X-15 line. Upon reaching the east side of CTH N, the double-circuit crosses back to the north side of the existing X-15 line and crosses other roads, including CTH U. The expected magnetic fields are tabulated below.

Table 7-20 Estimated magnetic fields for Subsegments E01, E03, E04, E06, E07, E09, and E10

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	189 A	217 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	33	38	60	58	70	69
100	3.28	3.76	13	13	15	15
200	0.83	0.95	3.4	3.2	4.0	3.8
300	0.37	0.42	1.5	1.4	1.7	1.6

Subsegment E12

At Stage Coach Road, the 345 kV line would become a single-circuit when the 138 kV line X-15 ties in to the Potosi Substation, though X-15 will rejoin in the next subsegment. The expected magnetic fields are tabulated below.

Table 7-21 Estimated magnetic fields for Subsegment E12

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	50	50	59	59
100	N/A	N/A	12	12	15	15
200	N/A	N/A	3.8	3.8	4.5	4.5
300	N/A	N/A	1.8	1.8	2.1	2.1

Subsegments E13, E14, E16, E18, and E19

The proposed 345 kV returns to a double-circuited configuration, picking up the 138 kV line X-15 again. The route turns southeast and moves to the south of the existing X-15 line, then runs parallel to the existing X-15 line while crossing Buena Vista Lane and USH 61, before moving northeast and crossing to the north side of the existing X-15 line and maintaining a parallel course approximately due east, until reaching west of Southwest Road. At that point, X-15 will continue to the east on its own. The expected magnetic fields are tabulated below.

Table 7-22 Estimated magnetic fields for Subsegments E13, E14, E16, E18, and E19

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	182 A	208 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	32	37	60	58	70	69
100	3.16	3.61	13	13	15	15
200	0.80	0.91	3.5	3.3	4.0	3.9
300	0.36	0.41	1.5	1.4	1.7	1.7

Subsegments G01, F01, F02, F03, G06A, and G06B

As the X-15 line temporarily exits, the proposed 345 kV line proceeds as a single-circuit, moving south to the west of Southwest Road, then traveling east for approximately 1.8 miles crossing Southwest Road and CTH D, before turning south again. As the single-circuit turns south, it would cross USH 151 and move to the south side of College Farm Road, before turning east and crossing Pleasant Valley Road, then turning northeast to parallel USH 151 and crossing to the north side of the existing 138 kV line X-14. The expected magnetic fields are tabulated below.

Table 7-23 Estimated magnetic fields for Subsegments G01, F01, F02, G06A, and G06B

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	57	56	67	67
100	N/A	N/A	10	10	12	12
200	N/A	N/A	2.6	2.6	3.1	3.1
300	N/A	N/A	1.2	1.2	1.4	1.4

Subsegment G08

The proposed 345 kV line would again become a double-circuited arrangement, picking up the 138 kV line X-14 and moving east parallel to and north of the existing X-14, eventually crossing Ipswitch Road. The double-circuited line continues to the east, until the X-14 line breaks off and the 345 kV line continues as a single-circuit in the next subsegments. The expected magnetic fields are tabulated below.

Table 7-24 Estimated magnetic fields for Subsegment G08

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	125 A	135 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	29	31	61	60	71	71
100	2.49	2.69	14	14	16	16
200	0.62	0.67	3.7	3.6	4.2	4.2
300	0.28	0.30	1.6	1.6	1.8	1.8

Subsegments G09 and H01

The proposed 345 kV line continues north as a single-circuit configuration, crossing CTH XX and USH 51, proceeding cross-country until joining with an existing 69 kV line Y-105 in the next subsegment near Mitchell Hollow Road. The expected magnetic fields are tabulated below.

Table 7-25 Estimated magnetic fields for Subsegments G09 and H01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	57	56	67	67
100	N/A	N/A	10	10	12	12
200	N/A	N/A	2.6	2.6	3.1	3.1
300	N/A	N/A	1.2	1.2	1.4	1.4

Subsegments H02 and H03

At Mitchell Hollow Road, the proposed 345 kV line would join with the 69 kV line Y-105 to form a double-circuit arrangement that travels north to the south side of CTH B, move west to the east side of Heins Road, then move north again across CTH B, while gradually moving north and west to Sunnydale Lane. At Sunnydale Lane, the double-circuit would move north and west along Sunnydale Lane until intersecting with West Mound Road. The expected magnetic fields are tabulated below.

Table 7-26 Estimated magnetic fields for Subsegments H02 and H03

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	47 A	49 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	3.9	4.0	57	56	66	67
100	0.48	0.55	11	11	13	13
200	0.18	0.21	3.1	3.1	3.6	3.6
300	0.10	0.12	1.4	1.4	1.6	1.7

Subsegment H06

The line would continue north along Sunnydale Road and CTH G, until moving to the west on the south side of the village of Rewey. The expected magnetic fields are tabulated below.

Table 7-27 Estimated magnetic fields for Subsegments H06

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	47 A	49 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	3.7	4.4	72	78	81	90
100	1.15	1.36	12	12	14	15
200	0.55	0.65	3.8	4.0	4.4	4.7
300	0.36	0.43	1.9	2.0	2.2	2.4

Subsegments H07 and H09

The proposed 345 kV line would extend to the west of CTH G, then north, then east to get back to CTH G, briefly becoming a single-circuit as the 69 kV line Y-105 travels into Rewey to serve the village, then rejoin the proposed 345 kV line on the north side of the village for a double-circuit configuration. The double-circuit runs parallel to CTH G along the west side until Argall Road, before crossing to the east side of CTH G and running parallel to the existing alignment of line Y-105, continuing just to the north of the intersection with Bollant Road. The expected magnetic fields are tabulated below.

Table 7-28 Estimated magnetic fields for Subsegments H07 and H09

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	36 A	36 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	3.3	3.8	129	151	143	167
100	0.68	0.80	17	19	20	22
200	0.26	0.32	6.2	7.0	7.0	7.9
300	0.16	0.20	3.4	4.0	3.9	4.5

Subsegments I01, I02, I05, I06, and I07

After reaching Bollant Road, the proposed 345 kV line continues to be double-circuited with the 69 kV line Y-105 while traveling parallel to CTH E along its west side, then moving back to the east side of CTH E, generally traveling to the north and then west to parallel the current alignment of the existing Y-105. Upon reaching the intersection of CTH E and CTH XX with Enloe Road, the double-circuit line would move northwest, crossing to the north side of CTH E after turning west along CTH E. The expected magnetic fields are tabulated below.

Table 7-29 Estimated magnetic fields for Subsegments I01, I02, I05, I06, and I07

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	36 A	36 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	3.3	3.7	95	106	105	119
100	0.66	0.77	14	15	16	17
200	0.29	0.34	4.7	5.1	5.3	5.8
300	0.18	0.22	2.5	2.7	2.8	3.1

Subsegments I08 and I09

The proposed 345 kV line would continue north cross-country as a part of a double-circuit configuration with the existing 69 kV line Y-105 until reaching and crossing to the north side of CTH X and proceeding west until reaching the east side of STH 80. The expected magnetic fields are tabulated below.

Table 7-30 Estimated magnetic fields for Subsegments I08 and I09

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	57	56	66	67
100	N/A	N/A	11	11	13	13
200	N/A	N/A	3.0	3.0	3.5	3.5
300	N/A	N/A	1.3	1.3	1.6	1.6

Subsegments K01 and L01

The proposed 345 kV line continues as a double-circuit with the 69 kV line Y-105, continuing north along STH 80 until reaching a point south of the intersection of STH 80 and Ebenezer Road. The expected magnetic fields are tabulated below.

Table 7-31 Estimated magnetic fields for Subsegments K01 and L01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	36 A	36 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	4.2	5.5	161	191	177	211
100	1.34	1.72	21	23	23	26
200	0.66	0.84	7.6	8.8	8.5	9.8
300	0.44	0.55	4.4	5.1	4.8	5.7

Subsegments L02, L03, and L04

The proposed 345 kV line would continue as a single-circuit line to its final termination point at the proposed Hill Valley Substation, leaving the 69 kV Y-105 line to continue north along STH 80 and ending at the Eden substation. The expected magnetic fields are tabulated below.

Table 7-32 Estimated magnetic fields for Subsegments L02, L03, and L04

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	57	56	67	67
100	N/A	N/A	10	10	12	12
200	N/A	N/A	2.6	2.6	3.1	3.1
300	N/A	N/A	1.2	1.2	1.4	1.4

7.3.3.3.3 Common subsegments

Subsegments D10A for Western-North alternative

This subsegment is used to provide a tie in for the 138 kV line X-16 to the Hill Valley Substation for the Western-North route alternative. The expected magnetic fields are tabulated below.

Table 7-33 Estimated magnetic fields for Subsegment D10A for Western-North

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	254 A	287 A	610 A	602 A	715 A	717 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	51	58	67	67	78	79
100	4.45	5.03	17	17	20	20
200	1.12	1.26	4.8	4.8	5.5	5.6
300	0.50	0.56	2.1	2.2	2.4	2.5

Subsegments D10A and D10B for Western-South route alternative

These subsegments are used to provide a tie in for the 138 kV line X-16 to the Hill Valley Substation for the Western-South route alternative. The expected magnetic fields are tabulated below.

Table 7-34 Estimated magnetic fields for Subsegment D10A and D10B for Western-South

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	64 A	79 A	48 A	69 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	4.3	5.2	3.2	4.6
100	N/A	N/A	0.60	0.74	0.45	0.64
200	N/A	N/A	0.16	0.20	0.12	0.17
300	N/A	N/A	0.07	0.09	0.05	0.08

7.3.4. Aesthetics and visual impacts

The following discussion summarizes the aesthetic impacts of proposed project facilities according to their location within this section of the proposed project. This section includes the Western Routing Area from the village of Cassville in Grant County to the village of Montfort in Grant and Iowa Counties. There are two route options for this portion of the project.

- **Western-North** would head northeast from Cassville, passing the city of Lancaster before reaching the south side of Montfort.
- **Western-South** would travel east from Cassville to the south side of the city of Platteville before heading north past the villages of Rewey and Livingston until reaching the south side of Montfort.

7.3.4.1. Western-North

Western-North would consist of new double-circuit transmission line mostly within existing transmission ROW, generally though rural agricultural landscape. The route would head northeast from Cassville and pass southeast of Lancaster before continuing northeast to end at the Hill Valley Substation on the south side of Montfort.

The proposed route would cross through farmed hilly lands, with small forest scattered throughout, and many small to medium sized waterways. The presence of existing transmission infrastructure would limit the impact of a new line along this route. Some of the larger waterways crossed include Rattlesnake Creek, Beetown Branch, and the Grant River. People conducting recreational activities on these rivers, such as fishing, would experience an increased visual impact from the new lines to their scenic views and the aesthetic of nature in the area. Near Montfort, the route would follow along the Platte River for a roughly 8-mile stretch, increasing any existing visual or aesthetic impacts to the water resource. Any additional forest cleared for the project would also increase the visibility of the new line, as well as reduce the scenic aesthetic in the area.

The route would travel within about half of a mile of residential neighborhoods on the southeast side of Lancaster, and within 300 feet of neighborhoods on the south side of Montfort. People in these neighborhoods would experience new visual impacts from the addition of the transmission line. Numerous rural residences along segments of the route would also experience visual impacts from the proposed new line. The new line would increase the appearance of infrastructure development in the area. Additionally, the rural character and scenic aesthetics along this route would be altered.

7.3.4.2. Western-South

Western-South would be comprised of new double-circuit line mostly parallel to existing transmission ROW, through a generally rural agricultural landscape. The route would head east from Cassville, then pass south of Platteville, before continuing north past Rewey and Livingston, and finally ending at the Hill Valley Substation on the south side of Montfort.

The first part of the route would go from Cassville to Platteville (Subsegments E01, E03, E04, E06, E07, E09, E10, E12, E13, E14, E16, E18, E19, G01, F01, F02, F03, G06A, G06B, and G08). The proposed new line and support structures would be constructed mostly adjacent to or within existing transmission ROW. The route would travel through grasslands, forest, and agricultural lands as well as passing over many small waterways. Several larger rivers would also be crossed. The Grant River would be crossed five times by Subsegment E07, the Platte River would be crossed by Subsegment E16, and the Little Platte River crossed by Subsegment E19. The new line would cause increased visual impacts to people using the rivers for recreation. Any new ROW would likely require the removal of some forest during construction and later maintenance, which would increase the visibility of the line. Nearby residences, especially around neighborhoods on the south side of the city of Platteville, would likely experience new visual impacts from the transmission line.

The Great River Road National Scenic Byway would be crossed by this section of the route. The road is one of the longest scenic routes in the country that allows drivers to travel over 3000 miles from northern Minnesota to the Gulf of Mexico through ten states and hundreds of communities. As a scenic roadway, people travelling the route likely expect natural and scenic aesthetics. The applicants provided a photo simulation, which shows how the new transmission would affect the scenery of the byway[297]. The expansion of the transmission easement would create new visual impacts to drivers and alter the scenic aesthetics of the area.

The second part of this route would go from Platteville to Montfort (Subsegments G09, H01, H02, H03, H06, H07, H09, I01, I02, I05, I06, 107, I08, I09, K01, L01, L02, L03, L04, and D10C). New line and support structures would be constructed mostly adjacent to or within existing transmission ROW. The route would travel through grasslands, forest, and agricultural lands as well as passing over many small waterways. Forest within any new ROW would likely be cleared, which would increase the visibility of the new line.

While most of the route would follow within existing transmission ROW, sections of new ROW would be used around the villages of Rewey and Livingston. This new ROW would alter the scenic aesthetics and rural character of the area, as well as visually affect the residences within the two villages. There are also numerous rural residences located along the line that would experience visual impacts due to the proposed project.

Belmont Prairie State Natural Area and Pecatonica State Trail are located approximately 500 feet west of the proposed route (Subsegment H01), and both are used for year-round recreation. Public comments received during the EIS scoping period stated a concern that the proposed project would negatively affect the appeal these resources have to tourism. Most people using these resources would likely expect to experience a natural and scenic aesthetic. The applicants provided a photo simulation of the proposed project from the trail and natural area[298]. This simulation shows the new transmission line within visible range of the vantage point, which may be more affected during the winter season when less vegetation would be present.

Belmont Mound State Park is located approximately 1.5 miles west of the proposed route (Subsegment H02), and is used for year-round recreation. The park sits on an elevated point in the landscape, roughly 1,400 feet above sea level. An observation tower on the west side of the park is currently closed but is planned to be rebuilt. The view from the park may be impacted by the new transmission line, affecting the scenic aesthetics of the area.

7.3.5. Public lands and recreation areas

As indicated in Section 7.2.1, approximately three miles southwest of Platteville, near Maple Glen Lane, Subsegment E19 (Western-South) would pass through the Little Platte River Fishery Area.

Near the terminus of the Pecatonica State Trail in the town of Belmont, Subsegment H01 would intersect the trail just north of USH 151. If, in the future, the trail is extended west to the city of Platteville, the project may also cross the trail at Subsegment G09 (Western-South).

[297] PSC REF#: 347477
[298] PSC REF#: 347477

7.3.6. Airports and airstrips

The applicants identified public and private airports and heliports located within four miles of the proposed route centerlines and provided information on these airports and airstrips as part of the application. The FAA reviewed information provided by the applicants regarding potential structure heights, locations, and ground elevations for the proposed project and used this information to conduct an aeronautical study under the federal regulations to determine if the structures, as described, exceeds obstruction standards and/or would have an adverse interference effect on navigable airspace or air navigation facilities. The applicants provided the correspondence from the FAA on these determinations as Appendix H, Exhibit 3[299] of the application

In the Western Routing Area, there are two operating municipal airports near proposed routes alternatives including Lancaster Municipal Airport and Platteville Municipal Airport.

7.3.6.1. Western-North

The Lancaster Municipal Airport is located approximately 2.8 miles south of the proposed Western-North centerline. It is owned and managed by the city of Lancaster and is just east of STH 61, north of Airport Road. It has an approximately 3,500-foot asphalt runway with a north/south alignment. The FAA determined that none of the structures the applicants provided information on would be presumed hazards to the Lancaster Municipal Airport.

7.3.6.2. Western-South

The Lancaster Municipal Airport is located approximately 4.05 miles north of the proposed Western-South centerline. It is owned and managed by the city of Lancaster and is just east of STH 61, north of Airport Road. It has an approximately 3,500-foot asphalt runway with a north/south alignment. The FAA determined that none of the structures the applicants provided information on would be presumed hazards to the Lancaster Municipal Airport for either route alternative.

The Platteville Municipal Airport is located south of the city of Platteville. The airport has two asphalt runways, and is located west of STH 80 and east of Pleasant Valley Road. One runway is just under 4,000 feet and has a northwest/southeast alignment, and the second runway is approximately 3,600 feet and has a southwest/northeast alignment. It is owned and managed by the city of Platteville. The northwest corner of the nearest runway is located approximately 1.2 miles south of the proposed Western-South centerline.

The FAA determined that sixteen structures near the Platteville airport are presumed to be a hazard to air navigation with the information submitted by the applicants in March and April 2018. The structures that fall under this designation are located on route subsegments G06B and G08 (Western-South). The FAA offers height adjustments that would lead to a favorable determination of the structure not creating a hazard; however, some of the height adjustments may require additional engineering prior to construction. The application states that when a final route is selected, a new notice would be provided to the FAA with final design details for all structures that exceed notice criteria. At that point, the conditions of the FAA determinations would need to be observed, which could include lowering structure heights or marking and lighting one or more of the transmission structures and their wire spans. Some actions to mitigate impacts to airports and air navigation would likely increase the aesthetic impacts of the transmission line.

[299] The relevant set of correspondence is found in part 1 of 3 in Appendix H, Exhibit 3 (PSC REF#: 341407).

7.3.7. Communication facilities

An initial assessment[300] of the potential impact to communication facilities was conducted by Electrical Consultants, Inc. to determine whether a viable risk to communication operations was present. As discussed in Section 4.5.14, the primary types of potential interference with communication facilities include:

- AM broadcast antenna re-radiation,
- transferred voltages to communication facility grounding systems, and
- microwave line-of-sight signal degradation.

The initial assessment found a significant number of communication facilities within a 10-kilometer radius of the proposed route alternatives. If the project is approved, additional analyses (phase 2) would be expected to determine the operational status of these facilities, the likelihood of interference, and the appropriate range of mitigation measures.

A review of FCC database showed that no microwave radio antenna line-of-sight paths would be obstructed by the proposed transmission line structures in this routing area. If the project is approved, a field review prior to construction would confirm that there are no microwave line-of-sight path issues. If any issues would be found, the applicants would work with the licensee to mitigate the issue.

No AM stations were listed within 10 km of the Western-North route alternative.

One AM station, WPVL (1590 kHz), is located within 10 km of the Western-South route alternative. The study found that the proposed transmission line structure to AM radio station antenna separation and height meet FCC requirements to prevent distortions to AM coverage.

Communication facilities were found within 500 feet of the proposed route alternatives. A ground system inspection would need to be completed for each of these communication facilities to assure they meet OSHA grounding standards to avoid induced voltages causing problems with communications equipment and safety risks. Any facilities identified that do not meet OSHA requirements would need further investigation and mitigation.

7.3.8. Electric distribution facilities

7.3.8.1. Western-North

The Western-North route alternative does not appear to be any distribution lines that require removal and relocation.

7.3.8.2. Western-South

The Western-South route alternative has distribution lines owned by Alliant that would require relocation if it is approved. Existing distribution lines that are proposed for relocation are located in areas that may pose physical conflicts with the proposed route or where their proximity to one of the transmission lines might result in stray voltage concerns through NEV.

Due to concern over the impacts associated with stray voltage and its potential effect on confined animals (such as dairy cows), all routes were analyzed for areas where distribution lines might be located too close to the proposed transmission lines. There is a general consensus that distribution lines located less than 150 feet from a transmission line and running parallel to a transmission line for a continuous distance

[300] Appendix K, Exhibit 1 (PSC REF#: 341394).

greater than 1,000 feet can cause impacts to farms with confined animals. Further information on the cause, impact, and mitigation options of stray voltage or NEV is provided in Section 4.5.11.

Subsegment H02, the proposed 345 kV line would run parallel to CTH B and the existing distribution line for approximately 1,320 feet on the south side of the county highway. Two farms with animals are located on the north side of that county highway.

Subsegment H06 begins at the intersection of Sunnydale Road and West Mound Road. One mile of the proposed 345 kV line in this area would be parallel to both Sunnydale Road and the existing distribution line, located on the eastern side of the road. Two farms with grazing dairy cattle are located on the eastern side of that road. Also on H06, and parts of H09, where the proposed 345 kV line would be parallel to CTH G, approximately 3.2 miles of distribution line would need to be relocated. Multiple active dairy farms are adjacent to this road and the proposed route.

Subsegment H09 also follows CTH E, along with Subsegments I01, I02, and I05. The distribution line in this area runs parallel to CTH E, and the proposed 345 kV line would be running parallel to the existing distribution line for approximately two miles, with multiple dairy farms in the project area. CTH E turns east and Subsegments I06 and I07 would be parallel to an existing distribution line for approximately 2,700 feet. A farm is located on the south side of CTH E in this area.

Finally, Subsegments K01 and L01 would run parallel to STH 80 near the end of Western-South for approximately 2.2 miles. A distribution line also runs parallel to STH 80 in this area. Multiple operating farms are located on both sides of the road in this area.

If the Commission approved the project using the Western-South route alternative, all the distribution lines described above, approximately 9.2 miles in total, would need to be removed and relocated.

CHAPTER

8

8. Environmental Analysis: Eastern Routing Area

8.1. ROUTE ALTERNATIVE COMPARISONS

8.1.1. Detailed Route Descriptions

The Eastern Routing Area is located within Iowa and Dane Counties. The Eastern Routing Area is comprised of two main route alternatives:

- Eastern-North, and
- Eastern-South.

Either of these route alternatives would connect the route alternatives in the Western Routing Area (Western-North and Western-South) at the new Hill Valley Substation near Montfort, Wisconsin, to the route alternatives in the Dane County Routing Area near Cross Plains, Wisconsin. The Eastern-North route alternative generally travels 9 miles northeast from Montfort, and then 35 miles east cross-country through highly dynamic topographies in undeveloped lands to the village of Cross Plains. The Eastern-South route alternative generally travels 38 miles east along USH 18 from Montfort, through the village of Cobb, city of Dodgeville, village of Ridgeway, village of Blue Mounds, and village of Mount Horeb, and then 10 miles northeast to the village of Cross Plains. At the new Hill Valley Substation, both Eastern-North and Eastern-South would share common subsegments before branching off into two separate route alternatives.

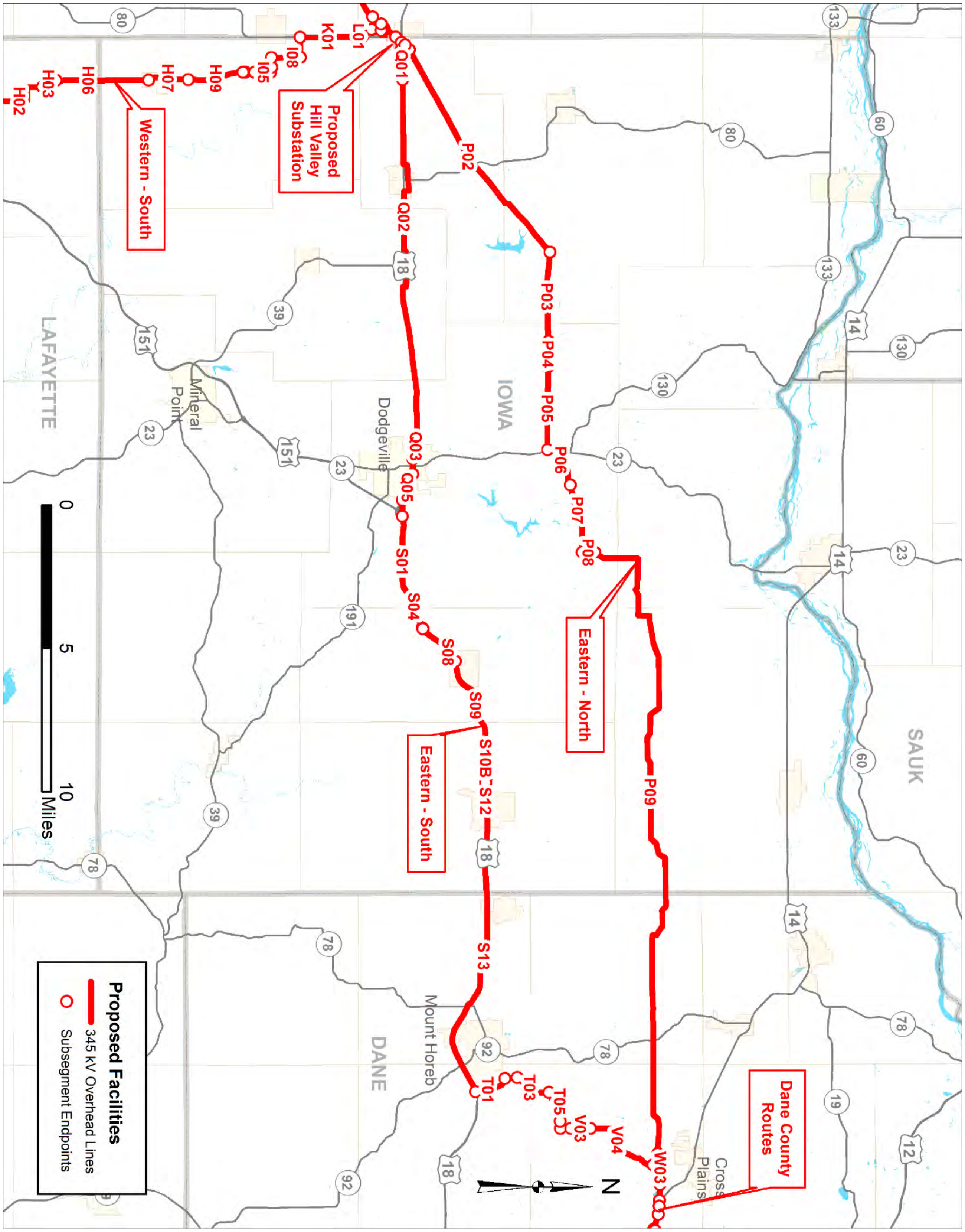
The route subsegments included in the Eastern Routing Area are identified in Table 8-1 (Figures 1.14-1.27, Appendix A).

Table 8-1 Eastern Routing Area route subsegments

Route Alternative	Route Subsegments
Common Subsegments*	N07 (138kV only), N01, N03, N04, N05, N06
Eastern-North*	P01, P02, P03, P04, P05, P06, P07, P08, P09, W01*, W02*
Eastern-South*	Q01, Q02, Q03, Q04, Q05, Q06, S01, S04, S05, S08, S09, S10A, S10B, S10C, S10D, S12, S13, T01, T02, T03, T04, T05, V01, V02, V03, V04, V05*, V06*

*Additional routes under consideration by RUS in the vicinity of Dodgeville, Barneveld, and Mount Horeb (Appendix C).

Figure 8-1 Eastern Routing Area



8.1.1.1. Eastern-North

Eastern-North would begin at the proposed Hill Valley Substation in the town of Wingville. From there, the proposed 345 kV line and 138 kV line presently known as X-16 (X-127) would exit the north side of the proposed Hill Valley Substation as single circuit lines and meet as subsegment **N01** just north of the substation. N01 would then extend 0.5 miles northeast in a double-circuit configuration with X-127, crossing STH 80 into the town of Eden. N01 is also used in the Eastern-South route.

N03 would then extend cross-country 0.3 miles northeast, passing within 1000 feet of a cluster of private residences and businesses in the village of Montfort. N03 is also used in the Eastern-South route.

X-127 would diverge from the double-circuit configuration with the 345 kV line, and extend 870 feet northeast along **N07** as a single-circuit line to the existing Eden Substation. N07 is also used in the Eastern-South route.

From the end of N03, **N04** would then extend 80 feet east as a single-circuit line to meet with the existing ATC 69 kV line (Y-138) on the south side of USH 18. N04 is also used in the Eastern-South route.

N05 would then extend 0.2 miles east along the south side of USH 18. N05 is also used in the Eastern-South route.

N06 would then extend 40 feet east. N06 is also used in the Eastern-South route.

P01 would then extend cross-country 0.3 miles north to where it would meet with existing ATC 138 kV line (X-17).

P02 would then extend cross-country 8.7 miles generally northeast, in a double-circuit configuration with X-17, crossing several roads and private driveways, and passing within proximities of less than 1,000 feet of several private residences. From west to east, P02 would cross Blue River Road, cross Willow Springs Road, and pass within 550 feet of a private residence. P02 would then cross a private driveway, cross Tower Road, and pass within 850 feet of a private residence. P02 would then pass within 850 feet of a private residence, pass within 550 feet of another private residence, and cross STH 80. P02 would then cross a private driveway, pass within 600 feet of a private residence, cross another private driveway, and cross CTH BH within 500 feet of a private residence. P02 would then pass within 400 feet of a private residence, cross a private driveway, pass within 200 feet of a private residence, and cross into the town of Highland. P02 would then cross Sunny Ridge Road, pass within 750 feet of a private residence, and cross a private driveway twice to where X-17 would continue northeast as a single-circuit line.

P03 would then extend cross-country 3.1 miles generally east, as a single-circuit line, crossing several roads and private driveways, and pass within proximities of less than 1000 feet of some private residences. From west to east, P03 would cross CTH Q, pass within 350 feet of a private residence, cross CTH II, and pass within 250 feet of another private residence. P03 would then cross a private driveway, pass within 560 feet of a private residence, cross into the town of Dodgeville, cross Miess Road, and pass within 850 feet of a private residence to where it meets CTH M.

P04 would then extend 0.4 miles east-northeast along the north side of CTH M, then extend 860 feet east-southeast, crossing a private driveway, and passing within 700 feet of a private residence. P04 would then extend 0.4 miles east, passing within 800 feet of a private residence, crossing a private driveway, diagonally crossing from the north side to the south side of CTH M, and crossing Otter Road.

P05 would then extend cross-country 2.9 miles east, passing within 850 feet of a private residence, passing within 550 feet of another private residence, crossing two private driveways within 700 feet of a private residence, and crossing James Road.

P06 would then extend 0.5 miles north along the west side of STH 23, passing within 200 feet of a private residence, then extend 0.5 west, crossing STH 23 and CTH ZZ, passing along the south side of CTH ZZ. P06 would then extend 0.3 miles northeast along the east side of CTH ZZ, passing within 200 feet of a private residence and within 300 feet of another private residence. P06 would then extend 0.4 miles east along the south side of CTH ZZ, crossing a private driveway, passing within 700 feet of a private residence, and crossing another private driveway. P06 would then extend 640 feet northeast along the southeast side of CTH ZZ, and cross a private driveway within 200 feet of a business.

P07 would then extend cross-country 0.9 miles east-northeast, passing within 650 feet of a private residence, passing 350 feet within of another private residence, crossing a private driveway, passing within 800 feet of a private residence, and crossing to the north side of CTH ZZ. P07 would then extend cross-country 0.4 miles, passing within 200 feet of a private residence, crossing a private driveway, and passing within 500 feet of another private residence. P07 would then extend cross-country 1.2 miles east, crossing a private driveway and Dyreson Road, passing within 750 feet of two private residences, passing within 500 feet of two more private residences, passing within 900 feet of another private residence, and crossing a private driveway to the west side of CTH Z.

P08 would then extend 0.4 miles north along the west side of CTH Z, passing within 150 feet of a private residence and business, crossing a private driveway, and passing within 150 feet of another private residence.

P09 would then extend 0.4 miles northeast, crossing CTH Z, then extend 1.2 miles north, passing within 800 feet of a private residence, passing within 900 feet of two more private residences, crossing into the town of Wyoming, crossing Far Look Road, and passing within 1000 feet of another private residence.

P09 would then extend 1.0 miles east, passing within 450 feet of a private residence. P09 would then extend 470 feet southeast, crossing to the south side of Far Look Road. P09 would then extend 0.2 miles northeast, passing within 300 feet of another private residence, and crossing CTH T. P09 would then extend 0.7 mile east, passing within 700 feet of a private residence, passing within 700 feet of another private residence, crossing into the town of Arena, and crossing to the east side of CTH T.

P09 would then extend 0.4 miles north along the east side of CTH T, crossing to the north side of CTH T where the road curves east. P09 would then extend 0.2 miles east, and then extend 0.8 miles along the north side of CTH T. P09 would then extend cross-country 0.5 miles east-northeast, and then extend 1.8 miles east, passing within 550 feet of a private residence. P09 would then extend 0.4 miles southeast, crossing a private driveway and CTH H, passing within 300 feet of a private residence, and passing within 600 feet of another private residence. P09 would then extend 0.7 miles east, and then extend 0.2 miles southeast. P09 would then extend 0.7 miles east, passing within 600 feet of a private residence, crossing Blue Ridge Road within 950 feet of a private residence, and passing within 750 feet of another two private residences. P09 would then extend cross-country 800 feet northeast, then extend 2.7 miles east, passing within 300 feet of a private residence, crossing CTH HH within 550 feet of two more private residences, and passing within 1000 feet of another private residence. P09 would then extend 0.3 miles northeast, crossing to the north side of Sweeney Road. P09 would then extend 0.4 miles east-northeast, crossing to the east side of CTH K. P09 would then extend 0.3 miles northeast, crossing Zwettler Road and passing within 800 feet of a private residence. P09 would then extend cross-country 1.7 miles, crossing into the town of Vermont.

P09 would then extend 0.2 miles southeast, then extend 0.6 miles east, passing within 150 feet of a private residence, crossing CTH F, passing within 750 feet of another private residence, and passing within 850 feet of another private residence. P09 would then extend cross-country 0.4 miles, and then extend 770 feet south.

P09 would then extend cross-country 8.1 miles generally east, crossing several roads and private driveways, and passing within proximities of less than 1000 feet of several private residences. From west to east, the rest of the P09 subsegment would cross Blue Mounds Trail, pass within 600 feet of a private residence, cross a private driveway, pass within 850 feet of a private residence, and pass within 350 feet of another private residence. P09 would then cross Dalby Drive, pass within 150 feet of a private residence, cross CTH JJ, pass within 350 feet of a private residence, pass within 850 feet of a church, and cross STH 78. P09 would then follow along Union Valley Road, pass within 450 feet of a private residence, cross Union Valley Road, and continue cross-country into the town of Cross Plains. P09 would then pass within 700 feet of three private residences, cross a private driveway, cross Garfoot Road, pass within 850 feet of a private residence, and pass within 300 feet of another private residence.

W01 would then extend 950 feet northeast along the north side of Stagecoach Road, passing within 1,000 feet of a private residence to where it would meet with the existing ATC 69 kV line (Y-62).

W02 would then extend 0.2 miles east along the north side of Stagecoach Road in a double-circuit configuration with Y-62 for one span until Y-62 breaks off to the south and terminates at the Stagecoach Substation. W02 would then extend 300 feet east, passing within 550 feet of a private residence, and crossing to the east side of CTH P where it would meet up with existing ATC 69 kV line (6927).

8.1.1.2. Eastern-South

Eastern-South would begin at the proposed Hill Valley Substation in the town of Wingville. From there, the proposed 345 kV line and 138 kV line presently known as X-16 (X-127) would exit the north side of the proposed Hill Valley substation as single circuit lines and meet as subsegment **N01** just north of the substation. N01 would then extend 0.5 miles northeast in a double-circuit configuration with X-127, crossing STH 80 into the town of Eden. N01 is also used in the Eastern-North route.

N03 would then extend cross-country 0.3 miles northeast, passing within 1000 feet of a cluster of private residences and businesses in the village of Montfort. N03 is also used in the Eastern-North route.

X-127 would diverge from the double-circuit configuration with the 345 kV line, and extend 870 feet northeast along **N07** as a single-circuit line to the existing Eden Substation. N07 is also used in the Eastern-North route.

From the end of N03, **N04** would then extend 80 feet east as a single-circuit line to meet with the existing ATC 69 kV line (Y-138) on the south side of USH 18. N04 is also used in the Eastern-North route.

N05 would then extend 0.2 miles east in a double-circuit configuration with Y-138 along the south side of USH 18. N05 is also used in the Eastern-North route.

N06 would then extend 40 feet east. N06 is also used in the Eastern-North route.

Q01 would then extend 1.0 miles east along the south side of USH 18, passing within 500 feet of a business, passing within 200 feet of two private residences, crossing a private driveway, and passing within 200 feet of another private residence. Q01 would then extend 360 feet northeast, diagonally crossing from the south side to the north side of USH 18, while crossing CTH XX, and passing within 200 feet of a private residence and a business.

Q02 would then extend 1.5 miles east along the north side of USH 18, crossing two private driveways, passing within 700 feet of a business, crossing a private driveway within 50 feet of a private residence, crossing another private driveway within 100 feet of a private residence, and then crossing another private driveway within 100 feet of a private residence. Q02 would then extend from the intersection of Anderson Lane and USH 18 1.5 miles east, passing within 250 feet of a private residence, crossing Edgington Road within 200 feet of a business, crossing two private driveways, passing within 150 feet of a private residence, passing within 100 feet of a private residence, crossing a private driveway, and passing within 150 feet of another private residence. Q02 would then extend 650 feet north along the west side of Bridge Road, continue 0.9 miles east through the north side of the town of Cobb, passing within 1,000 feet of several blocks of private residences and businesses, and extend 900 feet south back to the north side of USH 18.

Q02 would then extend 2.0 miles east, crossing a private driveway within 200 feet of a private residence, passing within 200 of another private residence, crossing into the town of Eden, crossing a private driveway within 100 feet of a private residence, crossing Cave Hollow Road into the town of Linden, passing within 200 feet of a private residence, crossing a private driveway within 100 feet of a private residence, and passing within 150 feet of three more private residences. Q02 would then extend 400 feet north-northeast, continue 1.2 miles within 1000 feet of several blocks of private residences in the unincorporated census-designated place of Edmund, then returns 580 feet south, crossing to the south side of USH 18.

The rest of Q02 would then continue 5.5 miles generally east along the south side of USH 18, in a double-circuit configuration with X-15, crossing several roads and private driveways, and passing within proximities of less than 1000 feet of several private residences. From west to east, the rest of Q02 would pass within 200 feet of a private residence, cross Sunny Slope Road, pass within 500 feet of another private residence, pass within 650 of three more private residences, and cross CTH CH. Q02 would then pass within 350 feet of a private residence, pass within a few feet of another private residence, cross CTH Q, cross a private driveway within 300 feet of a private residence, and cross into the town of Dodgeville. Q02 would then pass within 250 feet of a private residence, cross two private driveways, cross Survey Road within 600 feet of a private residence, cross a private driveway within feet of a private residence, pass within 200 feet of another private residence, and cross a private driveway and Lehner Road within 350 feet of a cluster of private residences.

Q03 would then extend 0.5 miles east-southeast along the south side of USH 18, passing within 1,000 feet of several businesses, and crossing into the city of Dodgeville.

Q04 would then extend 0.5 miles east, crossing STH 23, and passing within 1,000 feet of several private residences and a few businesses.

Q05 would then extend 1.0 miles curving southeast along the south side of USH 18 as a single-circuit line, as Y-138 diverges south to its current alignment, crossing Johns Street within 1000 feet of several private residences and a few businesses, and crossing Bennett Road back into the town of Dodgeville.

Q06 would then extend cross-country 0.5 miles east, diagonally crossing USH 18, west of the USH 151/USH 18 Interchange, to the north side of USH 18 on the east side of the interchange.

S01 would then extend 3.2 miles generally east along the north side of USH 18, crossing CTH Z, crossing a private driveway within 400 feet of a private residence, passing within 800 feet of two private residences, crossing CTH YZ, and passing within 1000 feet of a few private residences. S01 would then extend 700 feet east, diagonally crossing from the north side to the south side of USH 18, and passing within 180 feet of a private residence.

S04 would then extend 0.9 miles east-northeast along the south side of USH 18, crossing into the town of Ridgeway, and passing within 1000 feet of a private residence.

S05 would then extend 260 feet northeast, crossing CTH BB.

S08 would then extend 1.6 miles generally northeast, crossing a private driveway, crossing Cemetery Road, passing within 800 feet of a private residence, crossing Prairie Road, passing within 100 feet of a few private residences, and crossing into the village of Ridgeway.

S09 would then extend 3.6 miles generally east-northeast along the south side of USH 18, passing within 1000 feet of several private residences on the south side of the village of Ridgeway, crossing CTH H and Hi-Point Road, passing within 450 feet of a business and within 350 feet of a private residence, passing within 200 feet of another residence, crossing a private driveway, passing within 450 feet of a private residence, crossing W Brigham Road into the town of Brigham within 150 feet of a private residence, crossing a private driveway within 400 feet of a private residence, crossing a private driveway within 100 feet of another private residence, and crossing Thompson Drive.

S10A would then extend 400 feet east, crossing a private driveway.

S10B would then extend 0.8 miles east along the south side of USH 18, crossing CTH T, passing within 250 feet of a private residence, and crossing two private driveways.

S10C would then extend 820 feet east, passing within 150 feet of a private residence, and crossing a private driveway.

S10D would then extend 0.4 miles east, crossing into the village of Barneveld within 300 feet of a business, and passing within 400 feet within another business.

S12 would then extend 950 feet east-southeast, diverging from USH 18, and crossing an exit ramp. S12 would then extend 950 feet east, passing within a few businesses. S12 would then extend 950 east-northeast, returning to the south side of USH 18, crossing an entrance ramp.

S13 would then extend 10.5 miles generally east along the south side of USH 18, crossing several roads and private driveways, and passing within proximities of less than 1000 feet of several private residences and businesses. From west to east, S13 would cross Jones Street within 1000 feet of several private residences on the south side of the village of Barneveld. S13 would then cross back into the town of Brigham, cross CTH K, pass within 350 feet of a private residence, cross Meyer Drive within 450 feet of two private residences, cross Mounds View Road, cross into town of Blue Mounds, pass within 800 feet of a private residence, and cross E Brigham Road within 900 feet of a business and two private residences. S13 would then pass within 850 feet of five businesses, cross CTH F within 800 feet of a private residence, and shortly pass through the village of Blue Mounds back into the town of Blue Mounds. S13 would then pass within 500 feet of a private residence, cross Cave of the Mounds Road within 800 feet of three private residences, pass within 800 feet of a business, pass within 500 feet of a private residence, and cross Erbe Road within 400 feet of two private residences and a V. F. W. post. S13 would then pass within 400 feet of a private residence, pass within 500 feet of another two private residences, and pass directly over of a section of CTH E within 800 feet of another two private residences. S13 would then pass within 550 feet of two private residences, cross STH 78 within 1000 feet of another private residence, and cross Blue Mounds Street into the village of Mount Horeb. S13 would then pass within 1000 feet of about five dozen private residences on the south side of the village of Mount Horeb, and cross back into the town of Blue Mounds. S13 would then pass within 100 feet of a private residence, cross CTH JG within 800 feet of three private residences, cross into the town of Springdale, and cross STH 92 within 1000 feet of several homes in a subdivision in another southern section of the village of Mount Horeb. S13 would then pass within 900 feet of two businesses.

T01 would then extend 0.4 miles north, crossing USH 18, an exit ramp, and Ridgeview Road, and pass within 200 feet of a private residence. T01 would then extend cross-country 0.6 miles north-northwest, and then extend 0.2 miles northwest, passing within 500 feet of a private residence, to where it would meet with the existing ATC 69 kV line (Y-128).

T02 would then extend 0.4 miles north along the east side of Wally Road in a double-circuit configuration with Y-128, crossing CTH S, and passing along the east side of Witte Road within 350 feet of a private residence.

T03 would then extend cross-country 0.4 miles northeast, passing within 800 feet of a private residence, then extend 870 feet north-northeast, crossing into the town of Cross Plains and passing within 800 feet of two private residences. T03 would then extend 0.4 miles north.

T04 would then extend cross-country 0.3 miles northeast, passing within 850 feet of a private residence. T04 would then extend 0.3 miles north, passing within 700 feet of two private residences, and crossing to the north side of CTH J.

T05 would then extend 0.4 miles east along the north side of CTH J, crossing a private driveway within 600 feet of a private residence, and crossing another private driveway within 150 feet of a private residence. T05 would then extend 470 feet east-southeast, diagonally crossing from the north side to the south side of CTH J, then extend another 470 feet east-northeast, diagonally crossing back to the north side of CTH J, passing within 150 feet of a private residence. T05 would then extend 0.2 miles east, passing within 200 feet of a private residence.

V01 would then extend 0.3 miles east along the north side of CTH J, passing within 450 feet of a private residence.

V02 would then extend cross-country 0.4 miles north, passing within 400 feet of a private residence, and passing within 300 feet of another private residence.

V03 would then extend cross-country 0.3 miles north-northwest to the east side of Red Hawk Lane. V03 would then extend 0.3 miles north along the east side of Red Hawk Lane, passing within 400 feet of a private residence. V03 would then extend 780 feet north-northeast, crossing W Mineral Point Road, and passing within 600 feet of a private residence.

V04 would then extend cross-country 0.8 miles north, passing within 900 feet of a private residence, and passing within 800 feet of another private residence. V04 would then extend 0.2 miles northeast, then extend 0.6 miles east, crossing a private driveway within 300 feet of a private residence, and crossing Observatory Road. V04 would then extend 0.6 miles north-northeast, passing within 300 feet of a private residence, passing along the west side of a section of CTH P, and crossing a Hidden Valley Road within 500 feet of a private residence. V04 would then extend 590 feet northeast, diagonally crossing from the west side to the east side of CTH P, passing within 150 feet of a business and a private residence. V04 would then extend 720 feet north along the east side of CTH P, crossing three private driveways, and passing within 350 feet of two private residences. V04 would then extend cross-country 0.3 miles northeast, passing within 500 feet of a private residence and within 400 feet of another private residence. V04 would then extend 670 feet north-northeast, then extend 0.2 miles north, passing within 200 feet of a private residence, and crossing a private driveway.

V05 would then extend 340 feet north to where Y-128 would diverge across CTH P to terminate at the Stagecoach Substation.

V06 would then extend 0.2 miles north along the east side of CTH P as a single-circuit line, passing within 250 feet within a private residence, and crossing to the north side of Stagecoach Road where it would meet 6927 and the beginning of the Dane County routing area.

8.1.2. Proposed ROW in Eastern Routing Area

Table 8-2 Proposed route alternatives in the Eastern Routing Area. Associated metrics for the common subsegments are included in each route alternative, as appropriate.

Route Alternative	Length (miles)	Existing ROW Shared (acres)	New ROW (acres)	Total ROW (acres)	Percentage of Shared ROW
Eastern-North	46	136.94	698.02	834.96	16%
Eastern-South	48.72	422.67	454.47	877.14	48%

8.1.3. Unique constraints in the Routing Area

8.1.3.1. WisDOT concerns

A unique area that proposed a challenge for the applicants in route design occurs on Segment S10B (Eastern-South) along a stretch USH 18/151 just west of Barneveld. In this stretch there is land owned by The Prairie Enthusiasts that is encumbered by a conservation easement, placing restrictions on its use. Based on the applicant's investigation into the protected status of these lands, the applicants' have proposed to locate the transmission facilities within WisDOT ROW rather than The Prairie Enthusiasts' property. This would avoid both structure and overhang impacts to The Prairie Enthusiasts' property. If the transmission facilities were constructed within the WisDOT ROW, any structures would be located within the highway clear zone. This would likely require the extension of some existing guardrail to help shield any proposed structure locations.

In consultation with WisDOT, it would prefer that the transmission structures be located outside the USH 151 clear zone, if at all possible. Placing the structures inside the clear zone would present a safety hazard to the traveling public and require a certain level of safety mitigation, possibly in the form of new guardrail or extending the existing guardrail. This guardrail would result in additional maintenance responsibilities by WisDOT staff. The guardrail would serve to protect the traveling public from the transmission line structures. However, the new guardrail would also pose a risk of being hit by the traveling public. While the guardrail is designed to lower the severity of a crash versus hitting the transmission line structure, it still introduces a new obstruction in the clear zone.

If the proposed structures need to be placed in the clear zone and the applicants prove they cannot impact the conservancy lands through an environmental mitigation process, WisDOT would provide feedback on utility locations and mitigation for safety purposes. If this were the case, WisDOT would need to see proof the applicant has exhausted their opportunities to impact and mitigate the conservancy lands. The documentation provided by the applicants should include the process the applicants would have to go through and the agencies they would need to coordinate through with contacts from those agencies.

8.1.3.2. Avian risks in the Eastern Routing Area

This section discusses specific subsegments within the Eastern Routing Area that have been identified in the Avian Risk Review as having an elevated risk for avian impacts (Appendix F). Eastern-North has three areas identified as having the potential for increased avian collisions; whereas the review did not identify any areas along Eastern-South that pose increased risks for avian collisions (Figure 6, Appendix A). Refer to Table 8-3 below for areas of increased avian risk along Eastern-North. Commission staff are waiting on additional information about potential mitigation options from the applicants regarding the high risk areas identified in the Avian Risk Review.

All three areas identified within Eastern –North are along Subsegment P09. The first area, near the intersection with Mill Creek would span 2,979 feet. The proximity of Mill Creek, a pond, and wetland complex (identified as part of the NRCS Wetland Reserve Program) were all cited as reason for inclusion as an area of increased risk for avian collisions. The second area, along D09, would be 2,488 feet near its intersection with CTH K. The primary factor contributing to avian collision risk is a complex of Wetlands Reserve Complex wetlands. The third and final area would occur along the East Branch of Blue Mounds Creek. This area would span 1,416 feet due primarily to the presence of the Creek, nearby Wetland Reserve wetlands, and the Pleasant Valley Conservancy.

The Avian Risk Review did not identify proposed subsegments near the Pecatonica River Prairie IBA and the Military Ridge-York Prairie IBA as areas of increased avian collision risk. The review states that grassland bird species (relative to other bird groups) do not tend to be at an increased risk for colliding with overhead power lines and since the primary focus for these IBAs are grassland birds, the review does not call these areas out for increased collision risks. Commission staff are pursing more information regarding this assumption. Refer to Section 2.5.6 for more information on IBAs.

Table 8-3 Areas of increased avian risk along Eastern-North adapted from the Avian Risk Review for the Cardinal-Hickory Creek Project (Figure 3, Appendix F)

Route Subsegment(S)	Potential Avian Collision Risk Areas	Approx. Length (feet)	Characteristics and Factors Contributing to Avian Collision Risk
P09	Intersection with Mill Creek southeast to end of private drive	2,979	Mill Creek, pond, and wetlands (Wetlands Reserve Program)
P09	County Hwy K to edge of forest	2,488	Wetlands Reserve Program wetlands
P09	Area that spans waterway crossing and wetland complex	1,416	East Branch Blue Mounds Creek, wetlands (Wetlands Reserve Program), and Pleasant Valley Conservancy

8.1.3.3. Additional route under consideration by RUS

As stated in various sections of this EIS, there are additional route options under consideration for the proposed Cardinal-Hickory Creek project by RUS. Maps, impact tables, and costs for these project options have been incorporated into Appendix C of this EIS. The Commission received a comment from Michael and/or Michelle Dubis (an intervenor in this docket) regarding a particular route segment under consideration by RUS[301]. More specifically, they request that the Commission consider "Stagecoach-South" as a route alternative in the Eastern Routing Area. As identified in Appendix C, Stagecoach-South represents a route alternative to both Eastern-North and Eastern-South route alternatives where the proposed route alternatives would connect to the Dane County Routing Area near Cross Plains, Wisconsin (Dane County). The proposed subsegments that would be comparable to these other route subsegments under consideration by RUS are identified in Table 8-4.

Table 8-4 Route subsegments under consideration by RUS and the associated proposed subsegments in docket 5-CE-146 in this routing area

Proposed Route Alternative	Proposed Subsegments	Other route under consideration by RUS	Other route Subsegments
Eastern-North	W01, W02	Stagecoach-South	X01
Eastern-South	V05, V06	Stagecoach-South	X02

Environmental impact information associated with these subsegments under consideration by RUS can be found in Appendix C. Commission staff is preparing additional analysis for these subsegments currently under consideration by RUS.

[301] PSC REF#: 356689

8.1.4. Off-ROW Access Roads

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads or the ROW is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.2.5.1. Along the proposed routes, there are areas of steep topography that would make accessing via the ROW difficult or more impactful than the use of off-ROW roads.

The application states that the off-ROW access roads would typically be planned to 30 feet in width. There could be locations where the access road may need to be wider than 30 feet to accommodate certain topography and vehicles. If the project is approved, the applicants would refine off-ROW access routes during final construction planning. This planning stage would include landowner discussion and negotiations. The width of the off-ROW access routes is wider than that stated in other recent CPCN projects, and may cause more impacts to adjacent land and vegetation. Landowners may be able to negotiate which area is more impacted by the widening of existing routes to accommodate the proposed 30 feet width. After construction is completed, off-ROW access roads may be restored to pre-construction conditions or, depending on negotiations with the property owner, access roads constructed in upland areas may be left in place.

Table 8-5 Off-ROW access road impacts by route alternative[302]

Route Alternative	Number of Roads	Length (miles)	Area (acres)	Wetlands (acres)	Upland Forest (acres)	Grassland (acres)	Agriculture (acres)
Eastern-North	41	16.31	59.3	1.54	6.09	12.59	23.79
Eastern-South	35	4.15	15.09	0.04	0.84	2.79	15.18

8.1.4.1. Eastern-North

The Eastern-North route alternative would require the use of off-ROW access roads due to its crossing of the Driftless Area, an area with steep wooded slopes, deep valleys, and open ridgetops. This area is characterized by unglaciated ridge and valley topography that can prove challenging to access along the entire length of the ROW. Many of the hillsides are heavily forested, and in areas where the structures span forested valleys, there may not be a need to clear all woody vegetation from the ROW. Due to these landscape considerations, off-ROW access roads can reduce impacts on steeper slopes that would require massive forest clearance or grading to be useable for construction equipment.

In the Eastern North Route area, some of the off-ROW access routes would be in areas where farm lanes already exist. These lanes range in size and material composition and may need widening and additional aggregate material brought in to create stable routes for machinery. Other off-ROW access routes proposed follow field edges where farm machinery is able to access, but no farm tracks or roads are observed. These areas would require more substantial grading and use of access materials such as aggregate or construction matting to allow for safe access and use. Other areas proposed for off-ROW access routes include private drives, which would likely impact landowners that use those private drives to access their property. Safety restrictions when construction teams are working in those areas may limit other landowner access or require careful coordination of activities. Off-ROW access routes are also proposed in some areas of field and forest edges where topography is flat enough to allow access and there are not areas of wetlands that would require fill. These grasslands and forests would require vegetation

[302] Data compiled from Application, Appendix B, Table 8, updated in response to Data Request 4.72.

clearing and should include strict erosion control measures to prevent runoff and erosion due to new soil and vegetation disturbance.

In addition to vegetation clearing, limits to landowner access, and potential increase in erosion and runoff, there are potential impacts to soils and waterways as a result of the use of off-ROW access roads. The passage of heavy machinery along off-ROW routes would likely cause soil compression which can affect agricultural productivity (Section 4.5.2). This can be mitigated by the use of construction matting, access during frozen soil conditions, or thorough decompaction of soils after construction work is complete. Off-ROW access roads used on this route may require 14 waterway crossings. Some of the existing lanes and driveways that would be used already have culverts, allowing for waterway crossings if they are found able to support the proposed machinery. Other waterway crossings would require the use of a TCSB to facilitate passage of machinery and vehicles. The use of TCSBs and waterway crossings is described further in Section 4.6.6 of this DEIS. A number of threatened and endangered species or species of special concern are located in areas that would be crossed by proposed off-ROW access roads. Amphibians, reptiles, and invertebrates may be impacted by off-ROW access road construction or use. Section 8.2.6 of this DEIS describes ways to limit or mitigate impacts to rare species in the project route sections.

8.1.4.2. Eastern-South

Unlike the other route segments, the Eastern-South route alternative would most often use off-ROW access roads to allow for safe access along USH 18. The topography in this routing area is much more level with more gradual slopes and rolling hills compared to the steeper slopes of the northern and western sections. There are fewer forested slopes and more open agricultural fields in this route section. Where the route would run parallel to USH 18 there are areas where equipment access to the ROW from the highway would be restricted. There would also be areas of steep embankments and overpasses along the highway ROW. Both of these situations typically require the use of off-ROW access roads to allow for safe vehicle access and use during construction activities.

Many of the off-ROW access routes would be in areas where farm lanes already exist. These lanes range in size and material composition and may need widening and additional aggregate material brought in to create stable routes for machinery. Other off-ROW access routes proposed follow field edges where farm machinery is able to access, but no farm tracks or roads are observed. These areas would require more substantial grading and use of access materials such as aggregate or construction matting to allow for safe access and use. Other areas proposed for off-ROW access routes include private drives, which would likely impact landowners that use those private drives to access their property. Safety restrictions when construction teams are working in those areas may limit other landowner access or require careful coordination of activities. Off-ROW access routes are also proposed in some areas of field and forest edges where topography is flat enough to allow access and there are not areas of wetlands that would require fill. These grasslands and forests would require vegetation clearing and should include strict erosion control measures to prevent runoff and erosion due to new soil and vegetation disturbance.

In addition to vegetation clearing, limits to landowner access, and potential increase in erosion and runoff, there are potential impacts to soils and waterways as a result of the use of off-ROW access roads. The passage of heavy machinery along off-ROW routes would likely cause soil compression which can affect agricultural productivity (Section 4.5.2). This can be mitigated by the use of construction matting, access during frozen soil conditions, or thorough decompaction of soils after construction work is complete. Off-ROW access roads used on this route may require four waterway crossings. Some of the existing lanes and driveways that would be used already have culverts, allowing for waterway crossings if they are found able to support the proposed machinery. Other waterway crossings would require the use of a TCSB to facilitate passage of machinery and vehicles. The use of TCSBs and waterway crossings is described further in Section 4.6.6 of this DEIS. A number of threatened and endangered species or species of special concern are located in areas that would be crossed by proposed off-ROW access roads. A mammal and rare plants may be impacted by off-ROW access road construction or use. Section 8.2.6 of this DEIS describes ways to limit or mitigate impacts to rare species in the project route sections.

8.1.5. Laydown yards

During construction, laydown yards are utilized to minimize disturbance and provide suitable work surfaces for the temporary storage and staging of construction equipment and material. Laydown yards, also referred to as temporary staging areas, are used throughout construction to set up and store materials, job trailers, storage containers, portable toilets, dumpsters, construction mats, tools, equipment, etc. A typical laydown yard would be about 10 acres in size with a minimum of a 30-foot-wide driveway for ingress and egress; however, for the proposed project laydown yard size varies throughout the project area.

The typical construction activities that are involved in constructing laydown yards include the installation of erosion control measures, leveling of uneven surfaces, stripping and stockpiling of topsoil (if necessary), and installing (as needed) gravel, tracking pads, culvert(s), power, and fencing. This work is generally completed using equipment such as a bulldozer and dump trucks. The disturbance from any laydown yard would depend upon soil type and topography. Areas that are paved or have been previously graded and cleared of vegetation such as parking lots, old gravel pits, or fields are ideal locations for laydown yards.

Generally, the last step in the construction process would be to remove all items such as trailers, security fences, left over materials, storage containers, portable toilets, dumpsters, construction mats, tools, and equipment from the laydown yard. Depending on landowner preferences, laydown yards could be left in place or returned to prior conditions following construction activities.

The proposed laydown yards located within the Eastern Routing Area and the potential environmental impacts[303] associated with each proposed laydown yard are included in Table 8-6. The proposed laydown yards are included in the same figures of the proposed route alternatives in Appendix A, as referenced in the table below.

Refer to Section 2.1.5.3 for additional information on temporary workspaces that would also be utilized throughout the project area.

Table 8-6 Proposed laydown yards near Eastern Routing Area

Laydown Yard	Location	Size (acres)	Existing Land Use	Agricultural Land Cover (acres)	Grasslands Land Cover (acres)	Non-Forested Wetland Land Cover (acres)	Developed Land Cover (acres)	Appendix A Reference
LY-02	USH 18/Stockyard Road	12.79	Agricultural	12.20	0.59	0.00	0.00	Figures 1.06 & 1.14
LY-10	STH 80/ATC Property	20.59	Agricultural /proposed substation site option	20.59	0.00	0.00	0.00	Figures 1.06 & 1.14
LY-11	STH 80	8.70	Gravel Pit	7.77	0.93	0.00	0.00	Figure 1.15

303 PSC REF#: 345376

Laydown Yard	Location	Size (acres)	Existing Land Use	Agricultural Land Cover (acres)	Grasslands Land Cover (acres)	Non-Forested Wetland Land Cover (acres)	Developed Land Cover (acres)	Appendix A Reference
LY-12	Whitson Road/USH 18	5.36	Gravel Pit	0.00	0.00	0.00	5.36	Figure 1.21
LY-13	Survey Road/USH 18	10.23	Gravel Pit	0.00	0.00	0.00	10.23	Figure 1.22
LY-14	Industrial Drive/Ernie Drive	14.14	Gravel Pit	0.00	3.22	0.00	10.21	Figure 1.22
LY-16	STH 78/USH 18	9.96	Gravel Pit	0.00	0.86	0.00	9.10	Figure 1.25

Figure 8-2 Laydown yard LY-02 on USH 18 in the village of Montfort

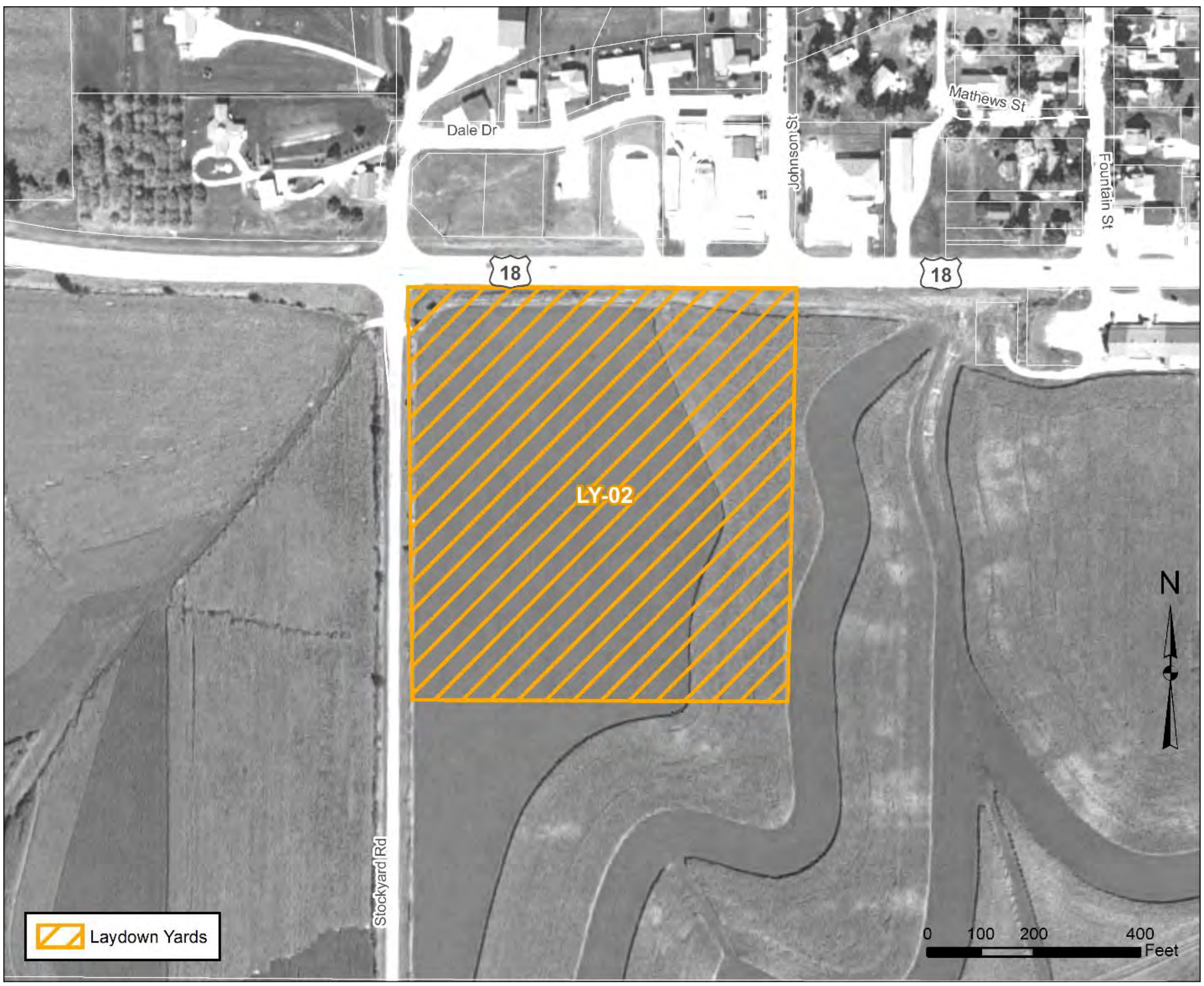


Figure 8-3 Laydown yard LY-10 on STH 80 in the proposed Hill Valley Substation site

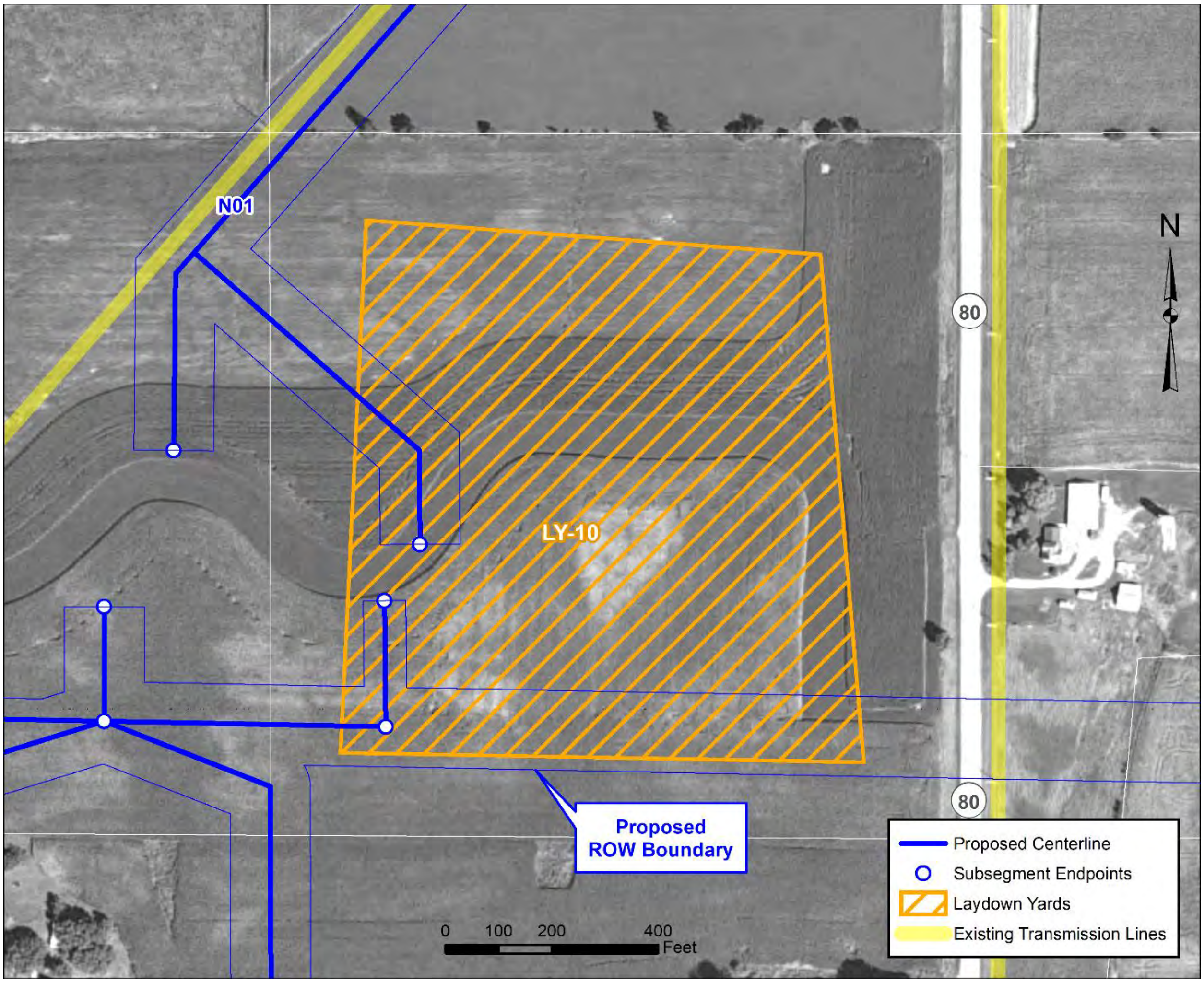


Figure 8-4 Laydown yard LY-11 on STH 80 in the town of Eden

Figure 8-5 Laydown yard LY-12 north of USH 18 in the town of Linden

Figure 8-6 Laydown yard LY-13 on USH 18 in the town of Dodgeville

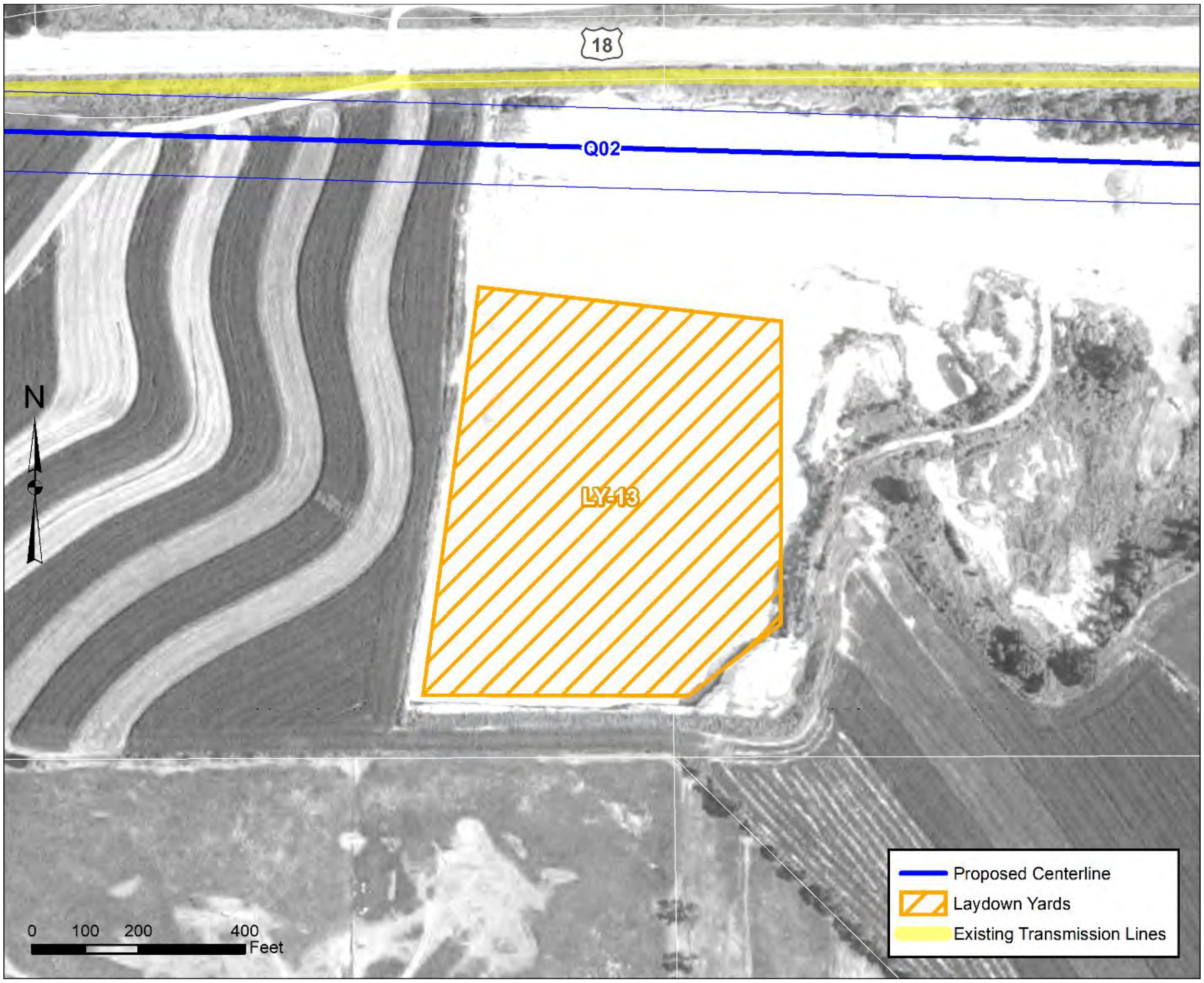


Figure 8-7 Laydown yard LY-14 north of USH 18 in the town of Dodgeville

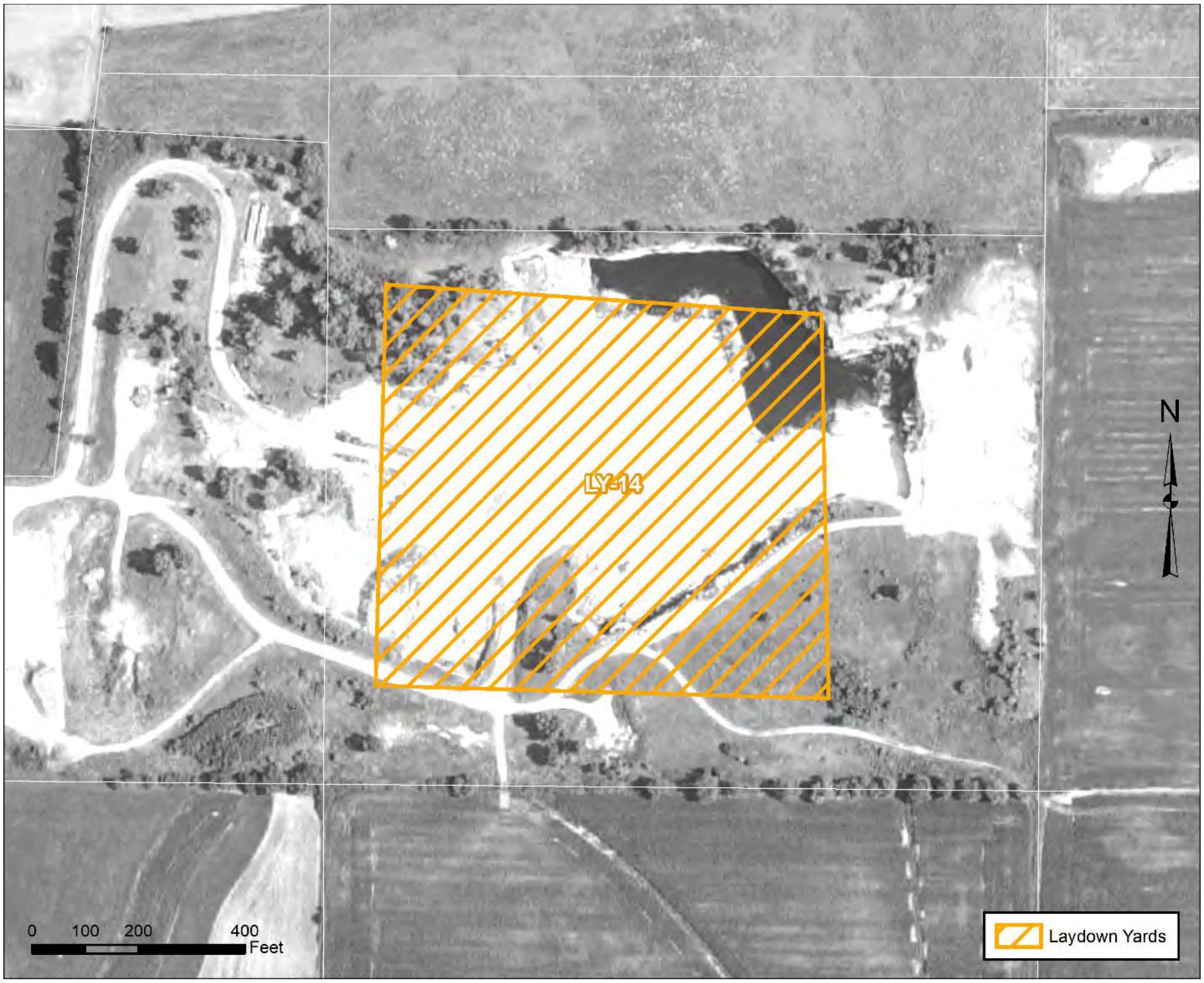


Figure 8-8 Laydown yard LY-16 north of USH 18 in the town of Blue Mounds

8.2. COMMUNITY RESOURCES AND POTENTIAL IMPACTS

8.2.1. Natural resource properties

This section discusses properties within the Eastern Routing Area of the project that are managed primarily for protecting natural resource habitat (Figure 9, Appendix A). These properties may include publicly-owned lands and also private lands covered by a conservation easement or agreement. There may be some overlap in this section with properties discussed in Section 8.3.5 because some properties serve multiple functions or have multiple designated uses. Note there may be additional conservation easements or agreements not included below that may exist within the project area. If any additional easement or agreements exist, they would be identified during the easement acquisition process if the project is approved.

In instances where impacts are anticipated to occur as a result of the project, the applicant should coordinate as early in the process as possible with the appropriate owner or manager of the property. Specifically, the applicant should attempt to identify landowner concerns, determine the probability and nature of impact, and, if possible work with the landowner to develop a mitigation strategy that would either lessen or eliminate potential impacts.

In cases where the proposed project would impact a property that was purchased with the aid of Land and Water Conservation (LAWCON) funds, a separate review involving WDNR and the contributing federal agencies must occur before any construction could occur. This program was established by Congress in 1965 to create parks and open spaces, protect wilderness, wetlands, and refuges, preserve wildlife habitat, and enhance recreational opportunities. The fund has two main components to serve as a federal program that funds the purchase of land and water areas for conservation and recreation purposes within the nation's four federal and management agencies – Forest Service, Fish and Wildlife Service, National Park Service, Bureau of Land Management; and to also serve as a state matching grants program that provides funds to states for planning, developing, and acquiring land and water areas for state and local parks and recreation areas. In cases where the proposed project would impact a property that was purchased with LAWCON funds, a separate review involving WDNR and the contributing federal agencies must occur before any construction could occur.

In general, Eastern-North could impact as many as 10 natural resources properties, whereas the Eastern-South has the potential to impact two properties.

8.2.1.1. Eastern-North

Subsegment P02 proposes to cross the Blackhawk Lake Wildlife Area (formerly known as the Blackhawk Lake Recreational Area), a 2,037-acre property owned by the DNR in Iowa County. This property includes the 220-acre Blackhawk Lake and 330 acres of recreational land are leased to Iowa County. The DNR manages roughly 1500-acres as a Wildlife Area. DNR manages the existing oak, walnut, and aspen species and restores areas of oak savanna. Grassland habitats, including restored and remnant prairies, are maintained using prescribed burning, haying, and other forms of share cropping. The DNR also works to control and remove invasive species.

Subsegment P02 proposes to directly cross approximately 2,600 linear feet of the Blackhawk Lake Wildlife Area. There is an existing single circuit transmission line located at Subsegment P02, which would be removed, and the proposed line would then be double-circuited in this location. This would likely require additional vegetation clearing, which should be minimized to the extent practicable.

Blackhawk Lake Wildlife Area has parcels purchased with LAWCON funds. The applicant has stated they would work with DNR staff to minimize resource and user impacts, which may include design or alignment changes, increasing span lengths or shifting structure locations to avoid sensitive habitats.

Subsegment P03 proposes to cross the Otter Creek Fishery Area, as well as a DNR easement on privately owned land, called the Blackhawk Hills Fish Management Easement. This easement is primarily for public access to Otter Creek, and is primarily used for fishing, but can also include hiking, wildlife viewing, and cross-country skiing during the winter months. There are current and future management activities conducted by DNR, such as stocking brown trout, bank stabilization, and invasive species control. The applicant has stated they would work with the easement holder to minimize impacts, which may include design or alignment changes, increasing span lengths or shifting structure locations to avoid sensitive habitats.

Subsegments P06 and P07 are proposed to pass within 100 feet of southern boundary of the Pleasant Ridge-Driftless Area, a 150-acre private easement owned and managed by the Driftless Area Land Conservancy. The prairie contains a large number of plant species and potentially contains land that has never been cultivated, pastured, or sprayed with herbicide. Although no direct physical impact to this property is anticipated, the applicants should notify the landowner and coordinate project construction near this parcel due to the highly sensitive nature of the habitat.

Approximately one mile east of the Pleasant Ridge-Driftless Area easement, Subsegment P07 would come within 100 feet of the northwest boundary of Governor Dodge State Park. Although no direct physical impacts are anticipated, park management as well as the general public, have voiced concern regarding potential aesthetic impacts to the view shed of the Park. The applicant should coordinate with park management to address impacts to visual resources.

Approximately three miles northeast of Governor Dodge State Park Subsegment P09 would pass within 150 feet of the 40 southern parcel of a private easement called the Coates Conservation Easement. Although no direct physical impact is anticipated, due to the sensitive nature of the easement and diversity of plant species, the applicant should coordinate with the easement owners.

Four miles to the east of the Coates Easement, Subsegment P09 would pass within 200 feet of another private easement. A portion on this easement contains a wetland which is owned and managed by the NRCS' wetland reserve program. Although no direct physical impact is anticipated, the applicant should coordinate potential project construction in this vicinity.

Approximately 10 miles east of the NRCS wetland, Subsegment P09 would intersect approximately 300 feet of a private conservation easement associated with an unnamed tributary of Vermont Creek. The applicant should coordinate all project activities with the property owner to avoid or minimize impacts to the property.

Subsegment P09 proposes to cross a DNR easement on privately owned land, called the Critical Area Stabilization, Flowage, and Wildlife Habitat Easement. The applicant has stated they will work with the easement holder to minimize impacts, which may include design or alignment changes, increasing span lengths or shifting structure locations to avoid sensitive habitats.

8.2.1.2. Eastern-South

Subsegment S10B proposes to cross a property encumbered with a Knowles-Nelson Stewardship Local Units of Government (LUG) Acquisition of Development Rights subprogram grant. The property name is Thomas Farm/Military Ridge Prairie Heritage Area and is owned by the Prairie Enthusiasts and the grantee is the Driftless Area Land Trust. If the project is approved and Eastern-South is selected, detailed review would be required to determine the extent to which the proposed route impacts grant-encumbered property.

Subsegment S13 proposes to cross a property encumbered with a Knowles-Nelson Stewardship Nonprofit Conservation Organization (NCO) Natural Area subprogram grant. The property name is Barneveld Prairie and is owned by and grantee is The Nature Conservancy. If the project is approved and Eastern-South is selected, detailed review would be required to determine the extent to which the proposed route impacts grant-encumbered property.

Table 8-7 Potential impacts to natural resource properties within the Eastern Routing Area

Route Alternative	Subsegment	Property	Owner/Manager	Potential impact
Eastern-North	P02	Blackhawk Lake Wildlife Area	DNR	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
	P02	Blackhawk Lake (recreation area within Blackhawk Lake Wildlife Area)	DNR with portions leased to Iowa County	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species, interrupted use of public recreation area

Route Alternative	Subsegment	Property	Owner/Manager	Potential impact
	P03	Otter Creek Fishery Area (including a WDNR easement on privately owned land, called the Blackhawk Hills Fish Management Easement)	DNR	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
	P06 and P07	Pleasant Ridge-Driftless Area	Owned and managed by the Driftless Area Land Conservancy	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
	P09	Coates Conservation Easement	Private	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
	P09	NRCS wetland complex	Owned and managed by NRCS (wetland reserve program)	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species, degradation of federally recognized high quality wetland
	P09	A private conservation easement associated with tributary of Vermont Creek	Private	Streambank erosion and sedimentation, loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
	P09	Critical Area Stabilization, Flowage, and Wildlife Habitat Easement	WDNR managed easement on privately owned land	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
Eastern-South	S10B	Thomas Farm/Military Ridge Prairie Heritage Area	The Prairie Enthusiasts and Driftless Area Land Trust (Grantee)	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species
	S13	Barneveld Prairie	The Nature Conservancy	Loss of vegetation from ROW construction, drift from herbicide spray, introduction of invasive plant species

8.2.2. Forested lands

General impacts to forested communities from high-voltage transmission lines are discussed in greater detail in Section 4.6.2. The discussion below focuses on forest resources and forested communities in the Eastern Routing Area and although impacts to forested wetlands are mentioned, refer to Section 8.2.4 for more information. Many of the tree species mentioned in this section would be considered incompatible vegetation by transmission owners and therefore would be actively eliminated within the proposed ROW. This would significantly alter, and permanently affect, the existing and future ecological communities within the proposed ROW. If trees are removed from the proposed ROW and the remaining vegetation is not actively managed to encourage an ecological community that effectively outcompetes[304] tree seedlings, the ROW could become dominated with fast growing incompatible vegetation that could quickly colonize the ROW and require significant effort and disturbance to remove. Refer to Section 4.6.5 for more information about vegetative assets in utility ROWs.

[304] For example, implementation of an IVM program accredited by the ROWSC.

Portions of each route alternatives within this routing area are sited along existing high-voltage transmission line corridors. If the applicants do not release the existing easements and continue to maintain the existing corridors as utility ROWs, even though transmission facilities would be double-circuited with the proposed Cardinal-Hickory Creek project, the quantification of impacts to forested areas provided by the applicants in its application would greatly underestimate the cumulative impacts forest resources and forest communities would experience if the Cardinal-Hickory Creek project was approved. The new Cardinal-Hickory Creek corridor would be, in some areas, much greater than the 150-foot-wide corridor identified in the application. Refer to Section 4.6.2.2 about the impacts associated with forest fragmentation.

The Eastern Routing Area is located within two ecological landscapes: the Western Coulees and Ridges[305] and the Southwest Savanna[306] (Figure 5, Appendix A).

- Eastern-North is primarily located within the Western Coulees and Ridges (Subsegments, P03, P04, P05, P06, P07, P08, P09, W01, and W02), with only a portion of it also located in the Southwest Savanna (Subsegments P01 and P02).
- Eastern-South is primarily located within the Southwest Savanna (Subsegments Q01, Q02, Q03, Q04, Q05, Q06, S01, S04, S05, S08, S09, S10A, S10B, S10C, S10D, S12, S13, T01, T02, T03, T04, T05, V01, V02, and V03), with only a portion of it also located in the Western Coulees and Ridges (Subsegments V04, V05, and V06).
- Common route subsegments within this routing area are located within the Southwest Savanna (Subsegments N01, N03, N04, N05, N06, and N07).

The Western Coulees and Ridges (primarily Eastern-North) used to contain the state's most extensive area of oak forest, oak openings, and oak woodland. The hardwood-dominated forests found in this landscape are more extensive than in other southern Wisconsin ecological landscapes; however, they have been dissected and interspersed with agricultural and residential areas. Forest cover is currently dominated by oaks and hickories, with maples and basswoods also making up a significant portion of the mature forest canopy. Bottomland hardwoods dominated by silver maple, swamp white oak, river birch, ashes, elms, and cottonwood are also common in this area, especially within the floodplains of the larger rivers in the area. Due to the steep topography found throughout this landscape, limited access, development, and cultivation along steep slopes have allowed them to stay heavily forested. Dry-mesic and mesic hardwood forests are common throughout this ecological landscape, and these oak-dominated hardwoods are well known for their high ecological, economic, aesthetic, and recreational importance. Sustainable management of these oak-dominated forests is very difficult considering that mature oak stands and their associated ecological communities are very difficult to restore once lost. This should be taken into consideration when evaluating the impacts the proposed project would have on the forest resources and forested communities in this area.

The Southwest Savanna (primarily Eastern-South) is currently dominated by agricultural crops with grasslands, forest, and residential areas making up the remaining 30% of this landscape. The lasting forests in this area are dominated by oak-hickory and maple-basswood cover types. Some open-grown oaks still exist in pastures and crop fields that are remnants of the oak savanna communities that used to be

---

305 Wisconsin Department of Natural Resources. 2015. *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management*. Chapter 22, Western Coulees and Ridges Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS-1131X 2015, Madison.

306 Wisconsin Department of Natural Resources. 2015. The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Chapter 20, Southwest Savanna Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS1131V 2015, Madison

common throughout this area. A savanna is generally considered a plant community where the mature tree canopy makes up less than 50% of vegetative cover, allowing grasses and other herbaceous vegetation to dominate these community types. The Southwest Savanna was historically dominated by fire-dependent communities such as prairies, oak savannas, oak woodlands, and oak forests that were scattered across the landscape by topography, slope, aspect, and soil characteristics. Much of this landscape has been extensively grazed, but never plowed; therefore, this area supports scattered, isolated remnant oak savanna and tallgrass prairie communities. White oak was historically the dominant species in savannas, woodlands, and some forests here; however, central hardwood species such as American elm, black walnut, and basswood have started to encroach on the oak-hickory cover types. The widespread practice of fire suppression and the conversion of prairie communities into agricultural production has led to the loss of almost all of Wisconsin's native oak savannas. Although contiguous forests are not common within this ecological landscape, the forested communities that do exist are home to distinctive and often times, rare species. This should be taken into consideration when evaluating the impacts the proposed project would have on the forest resources and forested communities in this area.

In addition to the trees that are located in more natural settings, trees are also vitally important to cities, villages, and towns; and similar to electricity and water, an urban tree canopy is considered a part of the infrastructure of the community providing valuable environmental, economic, and social benefits[307]. This routing area is located adjacent to communities including Montfort, Eden, Dodgeville, Cobb, Ridgeway, Blue Mounds, Barneveld, Mount Horeb, and Cross Plains.

The applicants' characterized the forested areas[308] within the proposed ROW of this routing area as primarily deciduous with some mixed deciduous/coniferous stands. Most of these stands consisted of pole-size and sawtimber logs, under private ownership used primarily for recreation. There are several properties within this routing area that have forested lands enrolled in MFL. The applicants' identified basswood, black walnut, ironwood, black cherry, American elm, sugar maple, green ash, and paper birch along with oaks, hickories, aspens, and pines as common in the overstory with American elderberry, sumac, *Ribes sp., Rubus sp.,* prickly ash, autumn olive, dogwood, hazelnut, and many others as being common in the understory. The species identified in this routing area are clearly more diverse than those identified for the other routing areas. This is likely due to the contiguous nature of the forested areas along Eastern-North within the Western Coulees and Ridges ecological landscape. As stated earlier, the topography in certain areas may prove challenging to access along the entire length of the ROW. Many of the hillsides are heavily forested, and in areas where the structures span forested valleys, there may not be a need to clear all woody vegetation from the ROW.

The applicants also identified several shrublands within this routing area. These shrublands are mostly along Segments P, Q, and S and contain several species such as American elderberry, multiflora rose, American elm, black cherry saplings, prickly ash, boxelder, honeysuckle, common buckthorn, and white mulberry. Shrublands are unique habitats that are often considered transitional ecological communities that are heavily used by wildlife. These areas are also likely targeted by transmission owners as containing incompatible species. Clearing of shrublands for construction, as well as during vegetation management cycles, should be monitored closely as these areas can be assets to transmission owners for outcompeting incompatible tree species (Refer to Section 4.6.5); however, if they are continually disturbed they can become more problematic to transmission owners if they are not managed correctly.

---

307 Urban and community forests, WDNR accessed at: https://dnr.wi.gov/topic/UrbanForests/.
308 Response to Data Request 4.50, Table 2 Environmental Inventory (PSC REF#: 353722)

8.2.2.1. Eastern-North

Along this route alternative, a total of approximately 366.4 acres of forested lands (355.1 acres of upland forest and 11.3 acres of forested wetland) would be impacted and permanently lost if this route alternative was constructed. There are 97 properties along this route alternative that have forested lands enrolled in MFL that could be impacted by the proposed project. Off-ROW access roads identified for this route alternative would clear approximately 6.10 acres of upland forest and 0.24 acres of forested wetland. Eastern-North would clearly have the greatest impact on forested lands compared to any other route alternative.

In general, the woody species identified by the applicants along this route alternative are clearly more diverse than those identified for the route alternatives. This is likely due to the contiguous nature of the forested areas along Eastern-North, within the Western Coulees and Ridges. Segment P is also home to the DNR Blackhawk Lake Wildlife Area, refer to Sections 8.2.1.1 and 8.3.5.1 for more information.

As noted in Section 8.2.6, four state threatened (including two federal species of concern) bird species have also been recorded in the vicinity of the Eastern-North; three of which require woodland habitat. If Eastern-North were ordered, it would further fragment existing forested areas which these species depend upon. In addition, there are a lot of unknowns regarding which rare bird species may be present along the proposed route alternatives. Therefore, it would be highly recommended to conduct forest bird surveys along Eastern-North, if ordered.

8.2.2.2. Eastern-South

Along this route alternative, a total of approximately 79.1 acres of forested lands (76.8 acres of upland forest and 2.3 acres of forested wetland) would be impacted and permanently lost if this route alternative was constructed. There are 3 properties along this route alternative that have forested lands enrolled in MFL that could be impacted by the proposed project. Off-ROW access roads identified for this route alternative would clear approximately 0.85 acres of upland forest

Eastern-South is also home to the Military Ridge State Trail (Segment T), refer to Section 8.3.5.2 for more information.

8.2.2.3. Summary of potential impacts

Table 8-8 Summary of proposed impacts to forested lands by route alternative in the Eastern Routing Area.

Route Alternative	Upland Forest (acres)	Forested Wetland (acres)	Total Forest Area (acres)	Off-ROW Upland and Wetland Forest Area (acres)	MFL Properties (count)
Eastern-North	355.1	11.3	366.4	6.34	97
Eastern-South	76.8	2.3	79.1	0.82	3

8.2.3. Grasslands

Many grasslands on these route sections are in existing utility line or road ROW. These types of grasslands often consist of non-native cool-season grasses and weedy plant species. They may be managed by regular mowing in the case of road ROWs, occasional mowing or brushcutting for utility ROWs, and some use of herbicides. Other grassland habitats crossed by the proposed routes include pastures and fallow fields, which likely have similar plant compositions. The routes also cross several prairies, areas that would have warm-season grasses such as little bluestem and a range of native forb species.

There may be areas of remnant prairie habitats not identified in the application. On site visits to other projects in this region of the state, Commission and DNR staff have come across areas of more diverse prairie vegetation in road ROWs, railroad embankments, and utility corridors than in other parts of the state. If the project is authorized, a review of grassland habitat in the approved ROW should determine if there are areas of remnant prairies prior to starting construction. If any prairie remnants are found, the applicants should adopt mitigation actions accordingly to avoid impacts to these ecologically valuable areas.

Impacts to any wet-grassland habitats are not covered in this section of the EIS, see Section 8.2.4 for impacts to these habitat types.

Expected impacts from construction activities would include direct damage to plants, the potential spread of invasive species, and the rutting or compaction of soils. Disruption to vegetation and soils on the slopes found in the Driftless Area can cause erosion and soil run-off. These impacts could be minimized through the use of matting, accessing the site during frozen conditions or during plant dormancy, and the use of BMPs to avoid spreading invasive species (Section 4.6.4.2.1). Identifying, marking and directly avoiding any areas of high plant diversity would likely be the most effective way of avoiding impacts. Any reseeding used during site restoration should use a mix of native species suitable to the area. Treatment of invasive species using non-specific herbicide application could impact native plant species. In areas where considerable work has gone into restoring or developing prairie habitats, any herbicide drift or non-specific application could have longer-term impacts on the success of any prairie conservation work.

8.2.3.1. Eastern-North

A total of 141.13 acres of grassland would be impacted by work done in the transmission ROW. Approximately 48.15 acres would be located in existing ROW, and approximately 92.98 acres of new grassland habitat would be impacted. An additional 12.83 acres of grassland habitat would be impacted due to the need for off-ROW access roads along this route.

This route would pass through Blackhawk Lake Recreation Area, where there is a large restored prairie. The prairie habitat is already crossed by the existing transmission line. Surveying, marking, and avoiding vehicle access in areas with very high diversity or rare plants would be the most effective way of avoiding impacts to this habitat. In areas where vehicle access cannot be limited, the applicants should avoid impacts to the restored prairie vegetation by using one of the impact mitigation techniques discussed above. Any vegetation management actions should be done after careful planning and agreement with the site land managers to reduce the risk of herbicide drift affecting the restored prairie areas.

A second area of dry prairie was identified by the applicants in its application on this route. This area of remnant prairie adjacent to STH 23 was identified as degraded, due to the occurrence of invasive plant species, likely from the road ROW.

A landowner comment stated that a property on the west side of CTH Z, (Subsegment P09) would be crossed by this route alternative. The landowner stated that the area to be crossed was an area planted with pollinator friendly seeds and referred to it as a prairie. Aerial imagery showed the area to look more like agricultural fields, but if this route was selected, more vegetation survey work should be done prior to construction in this area. The property owner immediately to the north also stated in a comment that they have restored prairie vegetation on land on the west side of CTH Z. Prior to crossing that parcel, the proposed route would cross to the east side of the road. The landowner expressed concern about herbicides drifting onto their prairie.

A landowner comment received stated that the same subsegment would cross a restored prairie between Foster and Stanfield Roads. The landowner is concerned construction work could damage this restored habitat. The landowner also stated that this property receives CRP payments.

8.2.3.2. Eastern-South

A total of 265.47 acres of grassland would be impacted by work done in the transmission ROW. Approximately 190.72 acres would be located in existing ROW, and approximately 74.75 acres of new grassland habitat would be impacted. An additional 2.8 acres of grassland habitat would be impacted due to the need for off-ROW access roads along this route.

Almost all of this route passes through the SWGSCA. This area is the focus of a partnership between the WDNR and other agencies, organizations and landowners that has a goal of improving grasslands, savannas, and streams. Part of this partnership includes the goal of DNR acquisition of parcels of suitable land, and nearby landowner participation in conservation programs. Also on this route is the Military Ridge Prairie Heritage Area (MRPHA), not mentioned by the applicants in the application, but discussed in several public comments. Information on the MRPHA was found on the Nature Conservancy and Prairie Enthusiasts websites, which lists it as a 95,000 acre grassland landscape containing more than 60 prairie remnants and identified as the highest priority for landscape-scale grassland protection by the DNR. This route would pass through the MRPHA from Ridgeway to Mount Horeb.

Other grasslands on this route that have the potential for higher quality habitat include the following:

A grassland on the south side of STH 18, east of the Eden substation. The NHI database identifies an area of dry prairie habitat in this area. The area appears to have one pasture and other row crop fields. The area is described by the applicants as a grazed pasture consisting of cool-season grasses.

The applicants identified an area described as a "weedy, low-quality prairie" on an abandoned railroad grade, adjacent to Olson Road, west of Edmund, Wisconsin on this route. They describe a sign referring to the "Sturdevant-Drysen Memorial Prairie". Commission staff were unable to find other documentation of this site and no other information was provided in the application. This may be a prairie remnant or restoration project.

Further east on USH 18, east of Survey Road, is a grassland along a small waterway consisting of a range of prairie species and some weedy or invasive species such as wild parsnip. Adjacent areas are planted with row crops. This area of USH 18 has many small areas of rock-cuts and dry grassland on the roadside that may have some prairie vegetation.

Not mentioned by the applicants in the application discussion of impacts to grasslands is The Nature Conservancy's Anderson-Barneveld Prairie, located south of STH 18 and east of Barneveld. The route would cross the northern part of this parcel, which was acquired through a Knowles-Nelson Stewardship Grant. Two parcels of land south of USH 18 and west of Barneveld are grasslands that have conservation easements with the Driftless Area Land Conservancy and Prairie Enthusiasts. In GIS data provided, it shows these parcels as having been purchased with a Knowles-Nelson Stewardship Grant. No mention of any of these parcels was made in the Grasslands section of the application; however, the applicants describes these parcels as having conservation easements in a different place in the application.

For all of the areas mentioned above, the applicants do not provide site specific information on what would be done to minimize, avoid, or mitigate damage to grassland habitats, and specifically, any areas of remnant prairies. Plant surveys during the growing season could identify work areas to be avoided, or where actions to protect vegetation and soils would be beneficial. If the project is approved, the Commission could direct the applicants to undertake a more rigorous study of remnant prairie habitat and identify clear ways to avoid impacts.

8.2.3.3. Common subsegments

Near the Eden substation, there are areas that would be common to either route selected. A total of 0.7 acres of grassland would be impacted. Approximately 0.62 acres is located in existing ROW, and approximately 0.08 acres of new grassland habitat would be impacted. Part of this common route passes through the SWGSCA described above.

8.2.3.4. Summary of potential impacts

Table 8.9 Summary of grassland impacts within the Eastern Routing Area

Route Alternative	Shared ROW (acres)	New ROW (acres)	Off-ROW Access Roads (acres)	Total Impact (acres)
Eastern-North	48.77	93.06	12.83	154.66
Eastern-South	191.34	74.83	2.8	268.97

8.2.4. Wetlands

General information about wetland resources and the potential short- and long-term potential impacts of constructing transmission line through and across wetlands can be found in Section 4.6.7.

8.2.4.1. Eastern-North

Proposed Subsegment P02 contains eight wetlands within the proposed ROW, totaling 2.13 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow and sedge meadow. Based on field investigations, five of the eight wetlands were identified as significant or high-quality, and one wetland designated as ASNRI. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 1.32 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.01 acres.

Proposed Subsegment P03 contains one wetland within the proposed ROW, a mixture of wet meadow and hardwood swamp, totaling 0.30 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. Based on field investigations, this wetland was identified as significant or high-quality and is also identified as ASNRI. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.11 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment P05 contains one wetland within the proposed ROW, a wet meadow, totaling 0.13 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.12 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment P07 contains one wetland within the proposed ROW, a wet meadow, totaling 0.07 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.07 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment P09 contains 22 wetlands within the proposed ROW, totaling 42.75 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow, sedge meadow, shallow marsh, farmed wetland, shrub-scrub, and hardwood swamp. Based on field investigations, nine of the 22 wetlands were identified as significant or high-quality, and five wetlands are identified as ASNRI. A total of 13 structures would be constructed in wetlands, resulting in 0.03 acres of permanent wetland impact. Temporary wetland impacts are anticipated to be 13.23 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 11.29 acres.

Off-ROW temporary wetland impacts are anticipated to be 1.54 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.24 acres. This would occur in five wetlands, classified as sedge meadow, farmed wetland, shallow marsh, shrub-scrub, hardwood swamp. Four of these wetlands are identified as ASNRI.

8.2.4.2. Eastern-South

Proposed Subsegment Q02 contains seven wetlands within the proposed ROW, totaling 1.75 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow, shallow marsh, shrub-scrub, and hardwood swamp. Based on field investigations, two of the seven wetlands were identified as significant or high-quality. One structure would be constructed in wetlands, resulting in 0.002 acres of permanent wetland impact. Temporary wetland impacts are anticipated to be 1.27 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.05 acres.

Proposed Subsegment Q04 contains one wetland within the proposed ROW, a mixture of wet meadow and shallow marsh, totaling 0.005 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.005 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment Q05 contains three wetlands within the proposed ROW, totaling 2.01 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow, sedge meadow, shallow marsh, and hardwood swamp. Based on field investigations, one of the three wetlands were identified as significant or high-quality. A total of one structure would be constructed in wetlands, resulting in 0.002 acres of permanent wetland impact. Temporary wetland impacts are anticipated to be 1.06 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.39 acres.

Proposed Subsegment S01 contains one wetland within the proposed ROW, a sedge meadow, totaling 0.02 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. Based on field investigations, this wetland was identified as significant or high-quality. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.019 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment S09 contains one wetland within the proposed ROW, a wet meadow, totaling 0.01 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. Based on field investigations, this wetland was identified as significant or high-quality. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.009 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.01 acres.

Proposed Subsegment S12 contains three wetlands within the proposed ROW, totaling 0.14 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow and shrub-scrub. None of these wetlands were identified as significant or high-quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.09 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment S13 contains 11 wetlands within the proposed ROW, totaling 2.12 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow, farmed wetland, shrub-scrub, and hardwood swamp. Based on field investigations, three of the 11 wetlands were identified as significant or high-quality, and two are designated as ASNRI. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.87 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 1.05 acres.

Proposed Subsegment T01 contains three wetlands within the proposed ROW, totaling 0.46 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow, farmed wetland, shallow marsh, and hardwood swamp. Based on field investigations, one of the three wetlands was identified as significant or high-quality, and one was designated as ASNRI. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.16 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.43 acres.

Proposed Subsegment T03 contains one wetland within the proposed ROW, a mixture of wet meadow and sedge meadow, totaling 0.30 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. Based on field investigations, this wetland was identified as significant or high-quality. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.10 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.23 acres.

Proposed Subsegment T05 contains one wetland within the proposed ROW, a wet meadow, totaling 0.06 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.06 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment V03 contains two wetlands within the proposed ROW, totaling 0.32 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are both classified as wet meadow. Neither of these wetlands were identified as significant or high-quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.11 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Off-ROW temporary wetland impacts are anticipated to be 0.04 acres due to the placement of construction matting. This would occur in 1 wetland of unknown type.

8.2.4.3. Summary of potential impacts

The wetlands present within each route alternative are summarized in Tables 8-10 and 8-11 below.

Table 8-10 Wetland habitat present within the proposed ROW of route alternatives within the Eastern Routing Area. Common subsegments have been included in each route alternative, as applicable.

Route Alternative	Forested Wetland			Non-Forested Wetland		Significant/High Quality Wetlands (count)
	Existing Shared ROW Not Cleared (acres)	Existing Shared ROW (acres)	New ROW (acres)	Existing Shared ROW (acres)	New ROW (acres)	
Eastern-North	0.06	0.06	11.24	1.84	32.24	15
Eastern-South	0.46	0.53	1.74	1.98	2.95	10

Table 8-11 Wetland impacts within the proposed ROW of route alternatives within the Eastern Routing Area. Common subsegments have been included in each route alternative, as applicable.

Route Alternative	Total Wetland Present (acres)	Temporary wetland impact (acres)	Permanent wetland impact (acres)	Wetland conversion (acres)
Eastern-North	45.38	14.85	0.03	11.30
Off-ROW Access Roads	Not provided	1.54	0.00	0.24
Eastern-South	7.25	3.75	0.004	2.16
Off-ROW Access Roads	Not provided	0.04	0.00	0.00

8.2.5. Waterways

General information about waterways and the potential short- and long-term potential impacts of constructing transmission line through and across waterways can be found in Section 4.6.6.

8.2.5.1. Eastern-North

Proposed Subsegment N03 (common to both Eastern-North and Eastern-South) contains one waterway, an unnamed tributary to the Platte River. This waterway is not a designated ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment P02 contains 15 waterways within the proposed ROW. These include Badger Hollow Creek, Narveson Creek, and the Blue River. Badger Hollow Creek is a spring fed stream which is a tributary to the Blue River. Narveson Creek is designated as a Class II trout stream for its entire stretch and is a principal tributary to Otter Creek. The Blue River is a designated Class II trout steam and an ERW for a portion of its stretch. This is a tributary to the Wisconsin River. The remaining 12 waterways are unnamed tributaries to the Blue River, Blackhawk Lake, and Narveson Creek. Two of these waterways are designated as an ASNRI. Several of these waterways meander in and out of the ROW, creating a total of 17 waterway crossings within the ROW. Of the 17 waterway crossings, 16 are proposed to be traversed via TCSB's for vehicle access and the other crossing would not be traversed by vehicles.

Proposed Subsegment P04 contains three waterways within the proposed ROW. These include Otter Creek and two unnamed tributaries to Otter Creek. Otter Creek is designated as a Class II trout stream for a portion of its stretch and is a tributary to the Wisconsin River. Otter Creek is a designated ASNRI. Of the three waterways, all are proposed to be traversed via TCSB's for vehicle access.

Proposed Subsegment P05 contains three waterways within the proposed ROW, all of which are unnamed tributaries to Norwegian Hollow Creek. None of these waterways are designated as an ASNRI. All three waterways are proposed to be traversed via TCSB's for vehicle access.

Proposed Subsegment P07 contains one waterway within the proposed ROW, an unnamed tributary to Twin Valley Lake. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment P09 contains 31 waterways within the proposed ROW. These include Mill Creek, Lowery Creek, White Hollow Creek, West Branch Blue Mounds Creek, East Branch Blue Mounds Creek, Vermont Creek, and Garfoot Creek. Mill Creek is a designated as a Class II trout stream for a portion of its stretch, while the remaining stretch is classified as a warm water sport fishery. It is a tributary to the Wisconsin River. Lowery Creek is a spring fed a tributary to the Wisconsin River that supports a warm water sport fishery for its lower 1.5 miles and is considered a Class II trout stream for much of the rest of its length. White Hollow Creek is a seepage fed tributary to Mill Creek and supports a cool water forage fishery but has potential as a Class II trout stream. The West Branch Blue Mounds Creek is a designated Class II trout stream and primary tributary to Blue Mounds Creek. The East Branch Blue Mounds Creek is a designated Class III trout stream and primary tributary to Blue Mounds Creek. Vermont Creek is a tributary to Black Earth Creek and a designated Class II trout stream. Garfoot Creek is a designated ERW waterway which is a tributary to Black Earth Creek. The remaining 24 waterways are unnamed tributaries to the aforementioned waterways. Five of these waterways are designated as an ASNRI. All 31 waterways are proposed to be traversed via TCSB's for vehicle access.

For off-ROW access roads for Eastern-North, seven waterways are proposed to be traversed via a TCSB for vehicle access and eight waterways would be crossed via existing structures. Three of these waterways are designated as ASNRI.

8.2.5.2. Eastern-South

Proposed Subsegment N03 (common to both Eastern-North and Eastern-South) contains one waterway, an unnamed tributary to the Platte River. This waterway is not a designated ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment Q01 contains one waterway within the proposed ROW, Badger Hollow Creek. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment Q02 contains 13 waterways within the proposed ROW. These include Pecatonica River, Sudan Branch, Laxey Creek, and Mineral Point Branch. The Pecatonica River is formed by the joining of the East and West Branch of the Pecatonica River. The Sudan Branch is a tributary to Mineral Point Branch and is also designated as a Class II trout stream for a portion of its stretch and a small mouth bass fishery for a portion. Laxey Creek is a cool-cold mainstem and cool-warm mainstem and a tributary to Mineral Point Branch. Mineral Point Branch is a tributary to the Pecatonica River that partially supports a warm water fishery. The remaining nine waterways are unnamed tributaries to the aforementioned waterways. Sudan Branch is designated as an ASNRI. All 13 waterways are proposed to be traversed via TCSB's for vehicle access.

Proposed Subsegment Q04 contains one waterway within the proposed ROW, an unnamed tributary to the Didge Branch. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment Q05 contains three waterways within the proposed ROW, all of which are unnamed tributaries to the Dodge Branch. None of these waterways are designated as an ASNRI. All three waterways are proposed to be traversed via TCSB's for vehicle access.

Proposed Subsegment Q06 contains one waterway within the proposed ROW, an unnamed tributary to the Dodge Branch. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment S01 contains three waterways within the proposed ROW, all of which are unnamed tributaries to the Dodge Branch. None of these waterways are designated as an ASNRI. All three waterways are proposed to be traversed via TCSB's for vehicle access.

Proposed Subsegment S09 contains six waterways within the proposed ROW, all of which are unnamed tributaries to Smith Conley Creek. None of these waterways are designated as an ASNRI. Of the six waterway crossings, three are proposed to be traversed via TCSB's for vehicle access and the remaining three crossings would not be traversed by vehicles.

Proposed Subsegment S12 contains three waterways within the proposed ROW, all of which are unnamed tributaries to the East Branch Pecatonica River. None of these waterways are designated as an ASNRI. All three waterways are proposed to be traversed via TCSB's for vehicle access.

Proposed Subsegment S13 contains 22 waterways within the proposed ROW. These include the East Branch Pecatonica River, Wouldiams-Barneveld Creek, Gordon Creek, West Branch Sugar River, Deer Creek, and Fryes Feeder. The East Branch Pecatonica River is a designated Class II trout stream for a portion of its stretch. The Wouldiams-Barneveld Creek is a spring fed stream and is designated as a Class II trout stream. Gordon Creek is also known as Big Spring Creek and is a designated Class II trout stream for a portion of its stretch and a small mouth bass fishery for a portion. The West Branch Sugar River is a designated Class II trout stream for a portion of its stretch and a warm water sport fishery for a portion. Both Deer Creek and Fryes Feeder are classified as Class II trout streams and ERW waterways. The remaining 16 waterways are unnamed tributaries to the aforementioned waterways. Six of these waterways are designated as an ASNRI. Several of these waterways meander in and out of the ROW, creating a total of 23 waterway crossings within the ROW. Of the 23 waterway crossings, 20 are proposed to be traversed via TCSB's for vehicle access and the remaining three crossings would not be traversed by vehicles.

Proposed Subsegment T01 contains one waterway within the proposed ROW, Schlapbach Creek. Schlapbach Creek is a spring fed tributary to the Sugar River. It is designated as an ERW and ASNRI waterway. This waterway is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment T03 contains three waterways within the proposed ROW, the West Branch of the Sugar River and two unnamed tributaries to the West Branch of the Sugar River. The West Branch of the Sugar River is designated as an ASNRI. All three waterways are proposed to be traversed via TCSB's for vehicle access.

Proposed Subsegment T05 contains one waterway within the proposed ROW, an unnamed tributary to the West Branch of the Sugar River. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment V03 contains one waterway within the proposed ROW, an unnamed tributary to the West Branch of the Sugar River. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment V04 contains two waterways within the proposed ROW, both unnamed tributaries to the West Branch of the Sugar River. Neither waterway is designated as an ASNRI and both are proposed to be traversed via TCSB's for vehicle access.

For off-ROW access roads for the Eastern Routing Area South route, one waterway is proposed to be traversed via a TCSB for vehicle access and four waterways would be crossed via existing structures. One of these waterways is designated as ANSRI.

8.2.5.3. Summary of potential impacts

The proposed waterways impact by route alternative are summarized in Table 8-12 below.

Table 8-12 Waterways present within the proposed ROW of route alternatives within the Eastern Routing Area. Common subsegments have been included in each route alternative, as applicable.

Route Alternative	Waterways Present	ASNRI Waterways Present	Waterway Crossings Proposed	**TCSB's** Required	**TCSB's** Required over ASNRI
Eastern-North	54	8	56	55	8
Off-ROW Access Roads	Not Provided	Not Provided	Not Provided	7	1
Eastern-South	62	12	63	57	10
Off-ROW Access Roads	Not Provided	Not Provided	Not Provided	4	1

8.2.6. Endangered resources

This section discusses the potential impacts to endangered resources that may be affected by construction or operation of the proposed route alternatives in the Eastern Routing Area: Eastern-North and Eastern-South. A general discussion of endangered resources is presented earlier in Section 4.6.1.

Endangered resources include rare or declining species, high quality or rare natural communities, and animal concentration sites. Endangered resources are tracked via the state's NHI database which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the proposed ROW and a buffer of 1.0 mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

This section identifies the endangered resources that could be present within the Western Routing Area, the project's potential impacts on these resources, and the avoidance measures that should be implemented. This section does not cover endangered resources that, while they may be present in the area, would not be impacted by this project. Rare species are discussed individually or as taxa groups if there is a high level of concern. The information discussed in this section include information from existing sources within DNR including the NHI database, as well as external sources including landowners and surveys completed by the applicants.

For specific subsegments, an incidental take of state threatened or endangered animal species may occur as defined by Wis. Stat. § 29.604. Should this happen, an ITA would be required for construction to proceed on those subsegments. Instances where existing information indicates that additional assessment or consultation for would be needed to assess potential incidental take are also described in this EIS.

8.2.6.1. Birds

The Pecatonica River IBA encompasses the upper reaches of the Pecatonica River watershed, a rolling landscape with a network of stream systems cutting through the hills (Figure 6, Appendix A). Formerly the core of the largest prairie in Wisconsin, the site is now largely agricultural. Significantly large areas of prairie pasture and pastured savanna have retained the landscape's extensive open aspect and importance to grassland and savanna bird populations. Native prairie remnants, wooded savanna, pastured floodplain and sedge meadow, and cropland also are present. This IBA is one of three focus areas targeted for grassland bird conservation in the WDNR's Southwest Grassland and Stream Conservation Area, a landscape-scale project aiming to protect functioning grassland, savanna, and stream ecosystems. It harbors some of the best grassland and savanna bird populations in the state, including upland sandpiper, red-headed woodpecker, willow flycatcher, Bell's vireo, brown thrasher, sedge wren, Henslow's sparrow, grasshopper sparrow, field sparrow, bobolink, and dickcissel. This IBA is bordered to the north by Eastern-South and STH 18 so while the proposed route would not bisect it, there still could be significant ecological features present that should be taken into consideration.

In addition, the Military Ridge-York Prairie IBA is also found along Eastern-South (Figure 6, Appendix A). This IBA is located in the midst of one of the most extensive open landscape in Wisconsin's Driftless Area, and features many streams, hills, ridges, and valleys with the Military Ridge along the northern boundary of the site which is where the proposed ROW is located. Once covered by prairie and oak savanna, this area is now largely agricultural, consisting of cropland, pasture, and idle grassland (mostly CRP fields). Smaller areas of woodland, savanna, shrub, and riparian habitats also are present. The area contains a significant concentration of prairie remnants on slopes and areas of thin soil that were never plowed. This IBA harbors some of the best grassland bird habitat remaining in the state. It is one of three focus areas targeted for grassland bird conservation in the WDNR's Southwest Grassland and Stream Conservation Area, a landscape-scale project aiming to protect functioning grassland, savanna, and stream ecosystems. Many priority grassland birds have high populations here, including Northern harrier, upland sandpiper, Henslow's sparrow, grasshopper sparrow, dickcissel, bobolink, Eastern meadowlark, and Western meadowlark. Various priority savanna species also breed here in high numbers: red-headed woodpecker; willow flycatcher; Bell's vireo; brown thrasher; and field sparrow. Short-eared owls occur regularly in winter. Similar to the above-mentioned IBA, the proposed route alternative is mostly located at the northern edge of this IBA and borders STH 18 so while there would be less fragmentation of grassland bird habitat, there still could be significant ecological features present that should be taken into consideration.

8.2.6.1.1 Eastern-North

Four state threatened (including two federal species of concern) bird species have been recorded in the NHI database in the vicinity of Eastern-North. One species is a grassland specialist while the other three require woodland habitat. Therefore, if Eastern-North is approved, additional bird surveys or time of year restrictions during the nesting season would be required. Reports of additional rare bird species not yet in the NHI database have been reported along Subsegment P06 and bird surveys would also be recommended here.

8.2.6.1.2 Eastern-South

Four state threatened (including two federal species of concern) and two special concern bird species have been recorded in the NHI database in the vicinity of this route alternative. All but one of the species are grassland dependent birds located near Subsegments S13-S09 and suitable habitat appears to be present along the route alternative. The other bird species are woodland dependent and suitable habitat is present along Subsegment V04. Therefore, if Eastern-South is approved, additional bird surveys or time of year restrictions during the nesting season would be required.

8.2.6.2. Mammals

8.2.6.2.1 Eastern-North

Three state threatened bat species (including one that is federally listed as threatened) along with a known bat hibernaculum have been documented in the vicinity of Eastern-North. These species can be found roosting in trees, bat houses, and buildings during the summer and hibernating in caves and mines from fall through spring. They forage primarily over open water and along edge habitats. Since Eastern-North is further than 0.25 miles from the hibernaculum, there are no federal requirements for the federally threatened species. For the state-listed species, they are covered under the Cave Bat Broad ITA which recommends that where suitable habitat occurs, presence/absence surveys be conducted and/or limited/no tree clearing take place during the species' maternity period (June 1-August 15).

There is one state special concern small mammal which has been documented to occur within the proposed ROW. This species is known to be found in dry open areas such as prairies and barrens which may be present within the ROW. Therefore, it is recommended that impacts to this habitat be minimized, especially during the breeding season from March-November.

8.2.6.2.2 Eastern-South

Four state threatened bat species (including one that is federally listed as threatened) along with two known bat hibernacula have been documented in the vicinity of Eastern-South. These species can be found roosting in trees, bat houses, and buildings during the summer and hibernating in caves and mines from fall through spring. They forage primarily over open water and along edge habitats. Since Eastern-South is further than 0.25 miles from the hibernacula, there are no federal requirements for the federally threatened species. For the state-listed species, they are covered under the Cave Bat Broad ITA which recommends that where suitable habitat occurs, presence/absence surveys be conducted and limited/no tree clearing take place during the species' maternity period (June 1-August 15).

There are also two state special concern small mammals which have been documented to occur within the proposed ROW. These species are known to be found in dry open to semi-open areas such as prairies and barrens which may be present within the ROW. Therefore, it is recommended that impacts to this habitat be minimized, especially during the collective breeding season from March-November.

8.2.6.3. Herptiles

8.2.6.3.1 Eastern-North

Two special concern snake species have been documented at various locations within the vicinity of Eastern-North. These species prefer a variety of upland habitats including forests, savannas, and bluff prairies all of which could be present along this route alternative. Possible recommended avoidance measures for these species may include conducting work in areas where the species does not overwinter during their inactive season, have a monitor onsite during the active season to relocate any individuals found, and/or installing taller herp exclusion fencing in areas of suitable habitat and conducting removals within the fenced area.

The Blanding's turtle, a special concern species at both the state and federal level, may be found along Segment I where suitable habitat is present. It is recommended that work take place outside of their active season within wetland and waterbodies shallower than three feet in depth and outside of the nesting (May 20-October 15). Otherwise, installing herp exclusion fencing outside of these time periods in those habitats would be considered avoidance too.

The state endangered Blanchard's cricket frog and special concern pickerel frog may be present at several locations along this route alternative. Suitable habitat for both include wetlands and waterways and nearby uplands. Should this route alternative be chosen, cricket frog calling surveys would be required immediately prior to the start of project activities to determine where this species is located. Should work take place in suitable habitat where the frog is found, an ITA would be required.

In addition, a state endangered reptile may be present within suitable habitat along Subsegment P09. It's difficult to say whether suitable habitat is present, so the applicants would be required to complete habitat assessments at this location if this route alternative is chosen. If present, an ITA would be required.

8.2.6.3.2 Eastern-South

Two special concern snake species have been documented as occurring in the vicinity of Subsegment E16. These species prefer open prairie and bluff habitats which may be present along this route alternative. Possible recommended avoidance measures for these species may include conducting work in areas where the species does not overwinter during their inactive season, have a monitor onsite during the active season to relocate any individuals found, and/or installing taller herp exclusion fencing in areas of suitable habitat and conducting removals within the fenced area. Of note, one of the snake species, the lined snake, is only known to occur in one location in Wisconsin which is located within a mile of the proposed ROW. It would be strongly encouraged to ensure impacts are minimized to the maximum extent practicable should suitable habitat be found along the route alternative.

The state endangered Blanchard's cricket frog and special concern pickerel frog both may be present at a few locations along this route alternative. Suitable habitat for both include wetlands and waterways and nearby uplands. Should Eastern-South be chosen, cricket frog calling surveys would be required immediately prior to the start of project activities to determine where this species is located. Should work take place in suitable habitat where the frog is found, an ITA would be required.

In addition, a state endangered reptile may be present within suitable habitat along Subsegments S01 and S04. While habitat appears limited, if present, an ITA would be required if this route alternative is selected.

8.2.6.4. Terrestrial invertebrates

8.2.6.4.1 Eastern-North

This route alternative intersects the Rusty Patched Bumble Bee High Potential Zone along Subsegments P02, P03, and P09 and suitable habitat appears to be present. This zone is a federally regulated zone and the applicants should consult with FWS regarding any recommendations or requirements for this area.

One state endangered and federal species of concern and three special concern butterfly and moth species have been observed in the vicinity of this route alternative. Suitable habitat for these species include open woodlands, barrens, savannas, and prairies which may be present along this route alternative. If Eastern-North is ordered, a habitat assessment would be required and if suitable habitat is found, host plant surveys would be needed. If host plants were located, an ITA would be likely as well as restoring the disturbed ROW with a native seed mix with the host plant species included.

One state special concern snail species have been documented within the NHI Database near Subsegment P06. If suitable habitat would be disturbed, it is recommended that work take place under frozen ground conditions to prevent impact to the species.

8.2.6.4.2 Eastern-South

This route alternative intersects the Rusty Patched Bumble Bee High Potential Zone along Subsegments S13, T01, T02, and T03 and suitable habitat appears to be present. This zone is a federally regulated zone and the applicants should consult with FWS regarding any recommendations or requirements for this subsegment.

Three state endangered (including two federal species of concern) and six special concern terrestrial invertebrates have been observed in the vicinity of this route alternative. Suitable habitat for these species include open woodlands, barrens, savannas, and prairies which may be present along this route alternative. If Eastern -South is ordered, a habitat assessment would be required and if suitable habitat is found, host plant surveys would be needed. If host plants were located, an ITA would be likely as well as restoring the disturbed ROW with a native seed mix with the host plant species included.

8.2.6.5. Fish and Aquatic invertebrates

8.2.6.5.1 Eastern-North

A special concern fish species is present along this route alternative at Otter Creek. To avoid impacts to these species, any work in the stream or that would cause siltation within the water would need to take place outside of the species' spawning season (May 10-July 10).

One special concern dragonfly species is known to be present within the various waterways crossed by this proposed ROW and may be impacted by project activities occurring below the ordinary high water mark. Strong erosion and siltation control measures are encouraged to minimize impacts.

8.2.6.5.2 Eastern-South

One special concern dragonfly species is known to be present within the various waterways crossed by this proposed ROW and may be impacted by project activities occurring below the ordinary high water mark. Strong erosion and siltation control measures are encouraged to minimize impacts.

8.2.6.6. Plants

Impacts on natural communities can ultimately change habitat conditions and make it difficult for rare plants to persist. Wisconsin's Endangered Species Law protects state-listed endangered and threatened plant species only on public lands, but utility (including transmission line projects), agriculture, forestry, and bulk sampling projects are exempted from this protection. Additional surveys and avoidance/minimization measures for rare plant species are encouraged and recommended. Potential avoidance measures may include conducting plant surveys to determine presence/absence and avoiding areas where known plants occur. Other measures, such as winter construction, use of mats to limit direct disturbance, or relocation, can minimize losses. DNR would also recommend that the applicants and landowners with rare species on their property develop a plan to protect these species.

8.2.6.6.1 Eastern-North

Five state endangered/threatened and two special concern plant species occur in the vicinity of Eastern-North including a couple of species that have been found adjacent to the proposed ROW. Suitable habitat for these species includes woodlands, cliffs, wetlands, and prairies, all of which can be found along this route alternative. Further review would be highly recommended to determine where habitat and species surveys should be conducted.

8.2.6.6.2 Eastern-South

The NHI database identified six state endangered/threatened (including one federally threatened species and one federal species of concern) and four special concern plant and lichen species in the vicinity of Eastern-South. Suitable habitat for these species includes woodlands, cliffs, and prairies, both of which can be found along this route alternative. Further review would be highly recommended to determine where habitat and species surveys should be conducted.

8.2.6.7. Natural Communities

Natural communities may contain rare or declining species and protection of these communities should be incorporated into the project design as much as possible. Given the predominance of private lands, it is likely that additional diverse, high quality, or rare natural community occurrences likely exist beyond those documented in the NHI database. Minimizing impacts to and incorporating buffers along the edges of these natural communities is recommended.

8.2.6.7.1 Eastern-North

Five upland and one wetland natural communities have been documented as occurring within the vicinity of Eastern-North. These natural communities likely contain many of the rare species mentioned previously and should be protected to the extent practicable. Minimization measures could include completing work under frozen ground conditions, implementing strict invasive species BMPs, and/or using a native prairie seed mix during the restoration process.

8.2.6.7.2 Eastern-South

Six upland natural communities have been documented as occurring within the vicinity of Eastern-South, and suitable habitat may be present along the proposed ROW. These natural communities likely contain many of the rare species mentioned previously and should be protected to the extent practicable. Minimization measures could include completing work under frozen ground conditions and/or using a native prairie seed mix during the restoration process.

8.2.6.8. Summary of potential impacts

Tables 8-13 through 8-14 identify the general types and numbers of rare species, natural communities, and other features that were identified as potentially impacted along Eastern-North and Eastern-South based on information, primarily from the NHI database.

Table 8-13 Summary of endangered resources impacted along Eastern-North

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed, Candidate, or Species of Concern	Not Applicable
Birds	4			2	
Mammals	3	1	1		
Herptiles	2	4		1	
Terrestrial Invertebrates	1	4	1	1	
Fish/Aquatic Invertebrates		2			
Plants	5	2			
Natural Communities					6
Summary	15	13	2	4	6

Table 8-14 Summary of endangered resources along Eastern-South

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed, Candidate, or Species of Concern	Not Applicable
Birds	4	2		2	
Mammals	4	2	1		
Herptiles	2	3			
Terrestrial Invertebrates	3	6	1	2	
Fish/Aquatic Invertebrates		1			
Plants	6	4		1	
Natural Communities					6
Summary	19	18	2	5	6

While the Eastern-South appears to have more impacts, the impacts are generally going to be temporary as this route alternative follows STH 18 for the majority of its length. Eastern-North has slightly fewer impacts, but it would further segment wooded habitat which could negatively impact the rare woodland species that may be present, especially birds. To that affect, with the woodland habitat present there are a lot of unknowns regarding what rare bird species may be present. Therefore, it would be highly recommended to conduct forest bird surveys along Eastern-North, if ordered.

Both route alternatives, but especially Eastern-South, have a mix of open grassland/savanna species; therefore, it would be an overall benefit to the existing grassland/savanna species if the applicants would implement a native seed mix in the ROW during the restoration phase and conduct vegetation maintenance that encourages and enhances native prairie species within the ROW.

8.2.7. Invasive species

The applicants had access to some, but not all, areas of the proposed project during the planning stage. Where the applicants had access to proposed routes during the 2017 growing season, observations of invasive plant species were noted when practicable. The general location and species observed were added to an overall evaluation of the risk of spreading invasive species, pests, or diseases as a result of project construction activities. Wetland delineations and vegetation mapping tasks were the source of most of these observations; however, a targeted survey of proposed route alternatives to identify invasive species was not done. Other invasive species may be present in the project area and a more thorough assessment of invasive species presence should be done prior to the start of construction, if approved.

In addition to the applicants' observations of invasive species in this routing area, Commission staff reviewed the project using the DNR Lakes and Aquatic Invasive Species Viewer. This database has some records of aquatic invasive species, but the lack of any observations should not be interpreted as meaning there are no invasive species in a given area. This routing area has Rusty crayfish recorded in the Sugar River which is located on the Eastern-South route alternative. The application states that work below the OHWM would be avoided to the extent practicable. Any machinery, equipment, or materials that are placed below the OHWM of a waterway should be decontaminated for invasive species before being used in another waterway in accordance with Wis. Admin. Code § NR 329.04(5).

The project area of southwestern Wisconsin has a range of plant pests that could affect trees and forestry operations such as oak wilt, emerald ash borer, and gypsy moths. See Section 4.6.2 for more discussion on these potential impacts to forests. The applicants state that standard BMPs to reduce the spread of these plant pests would be used during tree clearing operations. These BMPs include avoiding impacts to oak trees from April 1-July 15, and following guidelines to avoid spreading emerald ash borer and gypsy moths by leaving cut vegetation on site when possible.

A full list of invasive species that were recorded in the project area is provided in Section 4.6.4.4, and the invasive species recorded in this routing area are identified in the following sections. When invasive species are encountered, the applicants should implement the BMPs identified in Section 4.6.4.3 to minimize the spread of invasive species as a result of any activities conducted for the proposed project.

8.2.7.1. Eastern-North

For the Eastern-North route alternative, the application states that the following species were observed:

- Garlic mustard (*Alliaria petiolata*)
- Canada thistle (*Cirsium arvense*)
- Morrow's honeysuckle (*Lonicera morrowii*)
- Wild parsnip (*Pastinaca sativa*)
- Multiflora rose (*Rosa multiflora*)
- White mulberry (*Morus alba*)
- Bell's honeysuckle (*Lonicera bella,*)
- Amur honeysuckle (*Lonicera maackii,*)
- Tartarian honeysuckle (*Lonicera tatarica*)
- Spiny plumeless thistle (*Carduus acanthoides*)

- Common buckthorn (*Rhamnus cathartica*)
- Japanese barberry (*Berberis thunbergii*)
- Russian olive (*Elaeagnus angustifolia*)
- Crown vetch (*Coronilla varia*)
- Autumn olive (*Elaeagnus umbellata*)
- Cattail (*Typha angustifolia, T. X glauca*)
- Dame's rocket (*Hesperis matronalis*)
- Leafy spurge (*Euphorbia esula*)
- Teasel (*Dipsacus fullonum, D. laciniatus*)

8.2.7.2. Eastern-South

For the Eastern-South route alternative, the application states that the following species were observed:

- Garlic mustard (*Alliaria petiolata*)
- Black Locust (*Robinia pseudoacacia*)
- Dame's rocket (*Hesperis matronalis*)
- Eurasian manna grass (*Glyceria maxima*)
- Bell's honeysuckle (*Lonicera bella,*)
- Amur honeysuckle (*Lonicera maackii,*)
- Tartarian honeysuckle (*Lonicera tatarica*)
- Canada thistle (*Cirsium arvense*)
- Cattail (*Typha angustifolia*)
- Leafy spurge (*Euphorbia esula*)
- White mulberry (*Morus alba*)
- Wild parsnip (*Pastinaca sativa*)
- Multiflora rose (*Rosa multiflora*)
- Poison hemlock (*Conium maculatum*)
- Russian olive (*Elaeagnus angustifolia*)
- Common buckthorn (*Rhamnus cathartica*)
- Crown vetch (*Coronilla varia*)
- Spiny plumeless thistle (*Carduus acanthoides*)

8.2.8. Archaeological and historic resources

The applicants completed several reviews in order to identify potential archaeological and historic resources within the Eastern Routing Area[309]. The reviews identified twelve archaeological sites, two human burial sites, and five historic buildings. Commission staff requested additional details from the applicants regarding potential impacts to resources as well as mitigation options.[310] Commission staff have also contacted the Ho-Chunk Tribal Historic Preservation Officer for comment regarding potential impacts to Native American burial mounds and have not received any additional information regarding potential impacts of the proposed project at this time.

---

[309] PSC REF#: 341912, 341878, 341879, 341880, 345377, 345378, 345379, 345380, and 355953

[310] PSC REF#: 343192, 345369, 346685, 350239, and 355945

8.2.8.1. Eastern-North

- **AHI 236277 (Subsegment P09)** consists of the Meadowvale School in the town of Arena located less than 1000 feet from Subsegment P09 ROW. The architectural historian consultant recommended that the property would potentially be eligible for listing on the NRHP, however they believed it would not be affected by the proposed project.

- **DA-1083 (Subsegment P09)** consists of a prehistoric lithic artifact scatter intersected by Subsegment P09. The archaeological consultant has field surveyed but not field verified the site. They recommended an additional survey of the site.

- **IA-0067 (Subsegment P02)** consists of prehistoric earthworks intersected twice by Subsegment P02. The archaeological consultant has field surveyed but not field verified the site. They recommended an additional survey of the site.

- **Peat Farmstead and Wall (Subsegment P05)** consists of the remains of a farmstead and rock wall from the 1830s intersected by Subsegment P05. The site was not mentioned in the project application, but was brought to the attention of Commission staff with an EIS scoping comment from a member of the public.

8.2.8.2. Eastern-South

- **AHI 28412 (Subsegment Q04)** consists of the David J. and Maggie Jones House located about 250 feet from Subsegment Q04 and is a property listed on the NRHP. The architectural historian consultant recommended that the property would not be effected by the proposed project.

- **AHI 236276 (Subsegment Q04)** consists of the Farmers Savings Bank in the town of Linden located less than 500 feet from Subsegment Q04. The architectural historian consultant recommended that the property would potentially be eligible for listing on the NRHP, however they believed it would not be affected by the proposed project.

- **IA-0418 (Subsegment S09)** consists of the remains of a farm intersected by Subsegment S09 ROW. The archaeological consultant has field surveyed and field verified the site. They recommended an additional survey of the site.

- **IA-0438 (Subsegment S04)** consists of the remains of a mine within 40 feet of Subsegment S04. The archaeological consultant has not field surveyed or field verified the site. They recommended an additional survey of the site.

- **IA-0503 (Subsegment S09)** consists of a concentration of historic artifacts intersected by Subsegment S09. The archaeological consultant has field surveyed and field verified the site. They recommended an additional survey of the site.

- **IA-0506 (Subsegment S08)** consists of a concentration of historic artifacts intersected by Subsegment S08. The archaeological consultant has field surveyed but not field verified the site. They recommended an additional survey of the site.

- **IA-0504 (Subsegment S01)** consists of a prehistoric lithic artifact scatter intersected by Subsegment S01. The archaeological consultant has not field surveyed or field verified the site. They recommended an additional survey of the site.

- **AHI 89885 (Subsegment S10B)** consists of the Thomas Stone Barn located about 475 to 600 feet from Subsegment S10B and is a property listed on the NRHP. The architectural historian consultant recommended that the property would not be effected by the proposed project.

8.2.8.3. Summary of potential impacts

Table 8-15 Summary of potential archaeological and historic resource impacts in the Western Routing Area

Route Alternative	Archaeological Sites	Human Burial Sites	Historic Buildings	Historic Districts
Eastern-North	2	0	1	0
Eastern-South	5	0	3*	0

*Two of the sites are NRHP listed

In accordance with Wis. Stat. § 44.40 and the PSC-SHPO Interagency Programmatic Agreement, Commission staff is consulting with SHPO regarding resources identified within this section of the proposed project. Any work conducted within human burial sites would need a Permit to Disturb a Human Burial as per Wis. Stat. § 157.70. To further minimize or avoid impacts to archaeological and historic resources in the project area, the applicants should implement the recommended actions identified for each site.

8.3. COMMUNITY RESOURCES AND POTENTIAL IMPACTS

8.3.1. Agriculture

The presence of a high-voltage transmission line can adversely affect farm operations and field productivity. Refer to Section 4.5.2, for a discussion of potential impacts associated with transmission line construction and operation in agricultural fields. Transmission lines can affect field operations, irrigation, aerial spraying, windbreaks, and future land uses. DATCP will present its analyses of the potential impacts of the proposed project to farmed fields in its AIS. See Section 1.3.3. for a discussion of the role of DATCP in this project.

According to the application, no clear evidence of drain tile lines along the segments was apparent from either aerial photography interpretation or field investigation. However, there are areas of farmland along each route alternative that contain hydric soils in close proximity to ditches, which suggests that drain tiles may exist in these locations. If drainage tiles do exist along an approved route, construction vehicle traffic could break them. During the final design process, the applicants should work with landowners to place structures so that impacts to drain tiles are minimized, to the extent practicable. Other agricultural practices that may be affected by this project include windbreaks, organic farms, and automated tractor use.

Windbreaks consist of rows of trees that can help reduce wind erosion by providing a barrier on the windward side of a field. Depending on soil conditions and supporting practices, a single row of trees protects for a distance downwind of approximately 10 to 12 times (or more) the height of the windbreak. The removal of windbreaks because of transmission line construction, especially in agricultural soils highly susceptible to wind erosion, could result in reduced crop productivity due in part to a permanent loss of top soil and the potential for additional non-point pollution of downwind streams.

In recent years there has been discussion about the potential for construction projects to spread farm pests and diseases or to otherwise affect the health of farming operations. Concerns have been raised about Johne's disease, soybean cyst nematode, the spreading of ginseng diseases to plots reserved for future ginseng production, and pesticide contamination of soils on organic farms. Issues of biosecurity can be a concern to many farm operators.

Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly affect future crop yields. Soils may be mixed during the excavation of pole foundations or during the undergrounding of electrical lines. The excavation depth for transmission structure foundations can vary greatly, but in some projects may be more than 50 feet deep. Excavated parent material or subsoils should not be mixed with topsoils and spread on the surface of the ROW. Significant rutting can occur when soils become saturated or in areas of sensitive soils. Rutting might impact agricultural lands by increasing the mixing of soils, allowing topsoils to erode during rain events, and compacting soils. Compacted soils inhibit percolation of rainwater and, in turn, inhibit seed germination and crop root growth. The degree to which soils are compacted by heavy construction equipment again depends on the type of soil and its saturation level. Ineffective erosion controls may wash valuable topsoils downhill and impact wetlands and waterways. Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed.

Farms that practice organic farming would require specific protection measures during construction to avoid the spread of farm pests and diseases or to protect organic certifications. Additional issues for organic farms might be caused by the removal of tree buffers for new ROWs or the enlargement of existing ROWs. The removal of buffers might threaten a crop's organic status by increasing the potential for herbicide drift from adjacent fields. Biosecurity and organic farm impacts can be minimized by the applicants working with agricultural landowners well in advance of construction, giving advance notice of construction activities, and following through with agreed to protective measures.

The full width of the ROW would likely be cleared for construction of the proposed line, including properties currently planted with trees as part of plantations or tree farms. Under state statute (Section 4.4), landowners must be compensated for any crop damage caused by construction or maintenance of a high voltage transmission line. The applicants should work with tree farm and plantation landowners to minimize construction impacts and determine allowable post-construction use of the land within the easement.

Wisconsin Stat. § 182.017(7)(c) through (h) contains a list of landowner rights, many of which address issues important to farm fields, and these rights include required construction impact mitigation measures such as proper segregation of topsoils, post-construction restoration of the field, repair of damaged fences or drainage tile, payment for crop damage and others. A detailed discussion of landowners' statutory rights is included in Section 4.4.

In general, in advance of any construction for the project, the applicants would and should coordinate with each agricultural landowner regarding their farm operation including field facilities like drainage tiles, locations of farm animals and crops, current farm biological security practices, landowner concerns, and use of access routes. Potential impacts to each farm property along an ordered route would need to be identified and, where practicable, construction impact minimization measures would need to be agreed upon and implemented. Site-specific practices would need to vary according to the activities of the landowner/farm operator, the type of agricultural operation, the susceptibility of site-specific soils to compaction, the degree of construction occurring on the parcel, and the ability to avoid areas of potential concern.

Prime farmland is land that contains soils with certain characteristics that allow for high yields of a variety of commonly grown agricultural crops. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding. Prime farmland, as described here, is a categorization based on environmental factors. It is not a program, certification, or an easement category. The geologic history of the area played a large role in the formation of these farmlands.

Much of the land that is actively being farmed in the proposed ROW's of the project is comprised of NRCS-classified prime farmland. PSC staff reviewed GIS information to analyze and confirm the locations of prime farmland along the project routes.

Soil properties are only one of several criteria that are necessary for an area to be designated Prime farmland. Other considerations include:

- Land use – Prime farmland is designated independently of current land use, but it cannot include areas of water or urban or built-up land. Map units that are complexes or associations containing components of urban land or miscellaneous areas as part of the map unit name cannot be designated as prime farmland.
- Frequency of flooding – Some map units may include both prime farmland and land that is not prime farmland because of variations in flooding frequency.
- Water table – Some map units include both drained and undrained areas. Only the drained areas meet the prime farmland criteria.

8.3.1.1. Eastern-North

Approximately 31.4 percent of Eastern-North is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 259.12 acres of cropland and approximately 4.06 acres of specialty crops would be impacted by Eastern-North. Tree farms have been identified along Subsegments P03, P08, and P09.

There are 87 agricultural buildings within 300 feet and 9 dairy operations within 0.5 miles of the centerline of Eastern-North. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Section 4.5.11.

There are three organic farms that have been identified along Subsegments P03, P05, and P08.

8.3.1.2. Eastern-South

Approximately 41.3 percent of Western-South is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 362.34 acres of cropland would be impacted by Western-South. There are no specialty crops located along this proposed route that Commission staff or the applicants are aware of.

There are 189 agricultural buildings within 300 feet and 24 dairy operations within 0.5 miles of the centerline of Eastern-South.

There are two organic farms that have been identified along Subsegment Q02, and one along Subsegment S08.

8.3.1.3. Summary of potential impacts

Refer to the Draft Agricultural Impact Statement that is being prepared by DATCP for additional information regarding impacts from the proposed project on agricultural land and landowners. Refer to Appendix G for DATCP's Summary of Analysis and Recommendations from the Draft Agricultural Impact Statement that was prepared for the Cardinal-Hickory Creek Project.

Table 8-16 Agricultural impacts in the Eastern Routing Area

Route Alternative	Actively Cropped Land				Specialty Crops		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)
Eastern-North	242,875	44.82	214.30	259.12	0.18	3.88	4.06
Eastern-South	257,250	79.76	282.58	362.34	0.0	0.0	0.0

8.3.2. Land use plans

In general, residential uses are considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily because of potential adverse aesthetic effects. Greater potential for conflict with land use plans exists in areas of urban development, where existing and planned residential and commercial uses are more common. The potential for conflict is also present in areas undergoing land use change, such as where rural land is being converted to residential use.

Corridor sharing with different types of infrastructure (for example, transmission lines and multi-lane highways) can mitigate impacts by causing incremental impacts instead of entirely new impacts associated with a new ROW corridor. Not all corridors that can be shared with a transmission line serve to lessen potential impacts, though. Places with narrow, canopy-covered local roads, winding rural roads, and residential areas supporting smaller lots may experience greater impacts from a new high-voltage transmission line.

8.3.2.1. Eastern-North

The proposed route would follow an existing 138 kV line as it extends northeast from Montfort. Next to the Eden Substation, the route would run adjacent to an industrial parcel. The town of Eden shows agricultural land use in its plan for the rest of the route in the town.

In the town of Highland, the route would cross conservancy land associated with the Blackhawk Lake Recreation Area, as it follows the existing transmission line. Other lands it would cross in the town are agricultural. About 8.5 miles northeast of Montfort, the route would leave the existing transmission line corridor to proceed directly east on a new, cross-country corridor.

The proposed route lies entirely within an agricultural district in the town of Dodgeville, skirting the northern edge of Governor Dodge State Park. Agricultural districts are shown along the proposed route in the towns of Wyoming and Arena. Agricultural preservation area predominates in the towns of Vermont and Cross Plains in Dane County. The town of Vermont has also designated "ridgetop protection areas" to preserve the natural beauty and rural character of the town. Residential construction in these areas is controlled to limit heights and visibility from neighbors, roads, and other ridgetops. Several of these areas are crossed by the proposed route as it proceeds, cross-country, over hill and valley. The route would follow Stagecoach Road for its easternmost half mile.

8.3.2.2. Eastern-South

Rural areas of this proposed route typically pass through lands designated to continue in agricultural use.

The route would follow an existing 69 kV transmission line eastwards from the Eden Substation property. The town of Eden plan shows predominantly agricultural use along the route. Several small locations along USH 18 between Montfort and Cobb are designated as commercial land uses.

Subsegment Q02 would pass through the village of Cobb on a former railroad ROW. Most of the developed area of Cobb lies south of this ROW, and consists of a mix of parkland, residential, commercial, and institutional land. A manufacturing plant and the Eden town hall lie north of the proposed subsegment, on either side of STH 80. Undeveloped land near the proposed segment in the village is agricultural.

Near the community of Edmund in the town of Linden, Subsegment Q02 would again depart from USH 18 as it would follow the existing transmission line, skirting to the north the residences of the community. The town's plan shows that residential development could expand to the north of the route.

As the route would continue eastward along USH 18 through the city of Dodgeville, the city's land use plan shows commercial/industrial development occurring on undeveloped land adjacent to the highway. Existing commercial/industrial uses are located on the developed lands adjacent to the highway. Adjacent to the east side of Dodgeville, the town of Dodgeville's plan shows commercial and rural development areas on the north side of the highway and an urban development area on the south side. East of the junction of USH 18/151 is a half-mile stretch of rural development area along the proposed route. Another rural development area is crossed by the proposed route for about a mile on the eastern edge of the town.

Just west of the village of Ridgeway, the route would lie on the opposite side of the USH 151 expressway from an approximately one-quarter-mile-wide strip of land bordering the western boundary of the village, which is designated for residential development in the town of Ridegway's land use plan. Before entering the village limits of Ridgeway, the route would pass the Ridgeway town hall and cross the edge of a planned commercial-business zone. The route would deviate from the USH 18/151 expressway ROW in this area to pass south of a group of homes just within the village limits. The route (Subsegment S08) then would rejoin the highway, passing through an area designated for future commercial development in the village's land use plan. Continuing along the highway, the route would lie on the northern edge of another area, one-eighth mile wide, along the eastern edge of the village that is shown as future residential in the town's plan. The route would then enter an agricultural area once again.

In the town of Brigham, the proposed route primarily crosses lands designated prime agricultural areas or rural lands, as the route would continue to follow USH 18/151. Just west of the village of Barneveld, the route would lie on the northern edge of a commercial district that contains the Deer Valley Golf Course. As the route would pass through Barneveld, it would encounter commercial areas west of Jones Street and residential areas east of the street. At the eastern edge of the town, a commercial overlay district lies on the opposite side of the highway from the proposed route.

In Dane County, the route would cross the southern part of the Village of Blue Mounds. An existing industrial area and planned Highway Business districts are found near CTH Z, where it would cross USH 18/151.

Along the Mount Horeb bypass, the transmission line would be located on the south side of the freeway. Planned and existing residential areas are located on the north side of the highway. On the south side of the highway, a planned industrial and business park is located on both sides of STH 78. A future general industrial district is located at Sand Rock Road. A school district-owned parcel is on the east side of CTH JG. A planned business area is designated for the area north of USH 18/151, near its junction with Business USH 18/151, at the east end of Mount Horeb.

Just east of this junction, the route would turn north, crossing this planned business area and an adjacent planned neighborhood before leaving the planned growth area of Mount Horeb and entering rural agricultural areas once again. Northeast of Mount Horeb, the route would join the ROW of an existing 69 kV transmission line and follow it for 1.7 miles before leaving it to proceed on new ROW to avoid some existing homes. At CTH J the route would rejoin the 69 kV ROW and follow the highway for a mile before it would turn to the north to continue to follow the existing transmission line.

In the town of Cross Plains, the proposed route crosses an agricultural preservation district as it generally proceeds north to Stagecoach Road.

8.3.3. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to homes, schools, daycares, hospitals, and other places where people frequently gather. Information for this section came from the tables submitted in the project application that categorize the number of residences and dwellings within specified distances of the proposed centerline of the new 345 kV line and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public and conducted numerous site visits along the proposed routes.

The proximity of properties to a high-voltage transmission line is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, magnetic fields, and other electrical phenomenon, and personal and public safety.

Commission staff recognizes that individuals and families have substantial financial, physical, and emotional investments in their homes and properties and that the discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes.

A generalized discussion of some of these issues is contained in Chapter 4 including:

- aesthetics (Section 4.5.1);
- electric and magnetic fields (Section 4.5.6);
- property values (Section 4.5.7);
- safety (Section 4.5.10);
- stray voltage (Section 4.5.11); and
- noise and light impacts (Section 4.5.13).

Appendix E contains a brief review of the health issues associated with electric and magnetic fields generated by transmission lines. Additionally, potential aesthetics and visual impacts in this routing area are discussed in Section 8.3.4 for several specific areas or properties along the proposed route and others that are recognized regionally or state-wide for their natural beauty.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of this high-voltage transmission line cannot be adequately addressed in this document, but a discussion of some special concerns that have been raised follows in Section 8.3.3.2.

8.3.3.1. Residential impacts

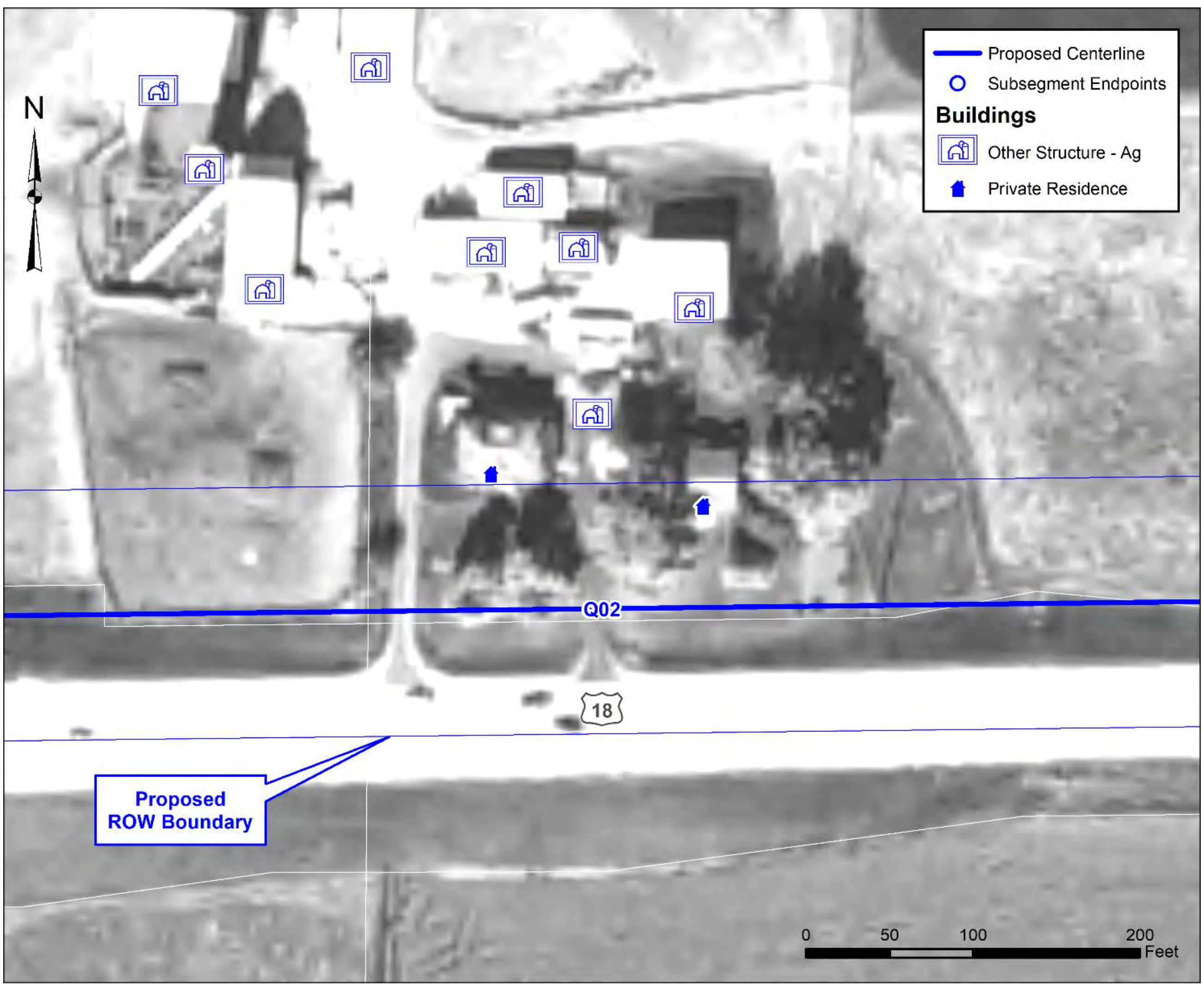
8.3.3.1.1 Eastern-North

There are a total of 18 residences located within 300 feet of the proposed centerline of Eastern-North. One residence is located within 51 to 100 feet. Six residences are located within 101 to 150 feet, and eleven residences within 151 to 300 feet. These residences are scattered along the proposed route in predominantly rural areas. There are no apartment units or apartment buildings within 300 feet of the proposed centerline.

8.3.3.1.2 Eastern-South

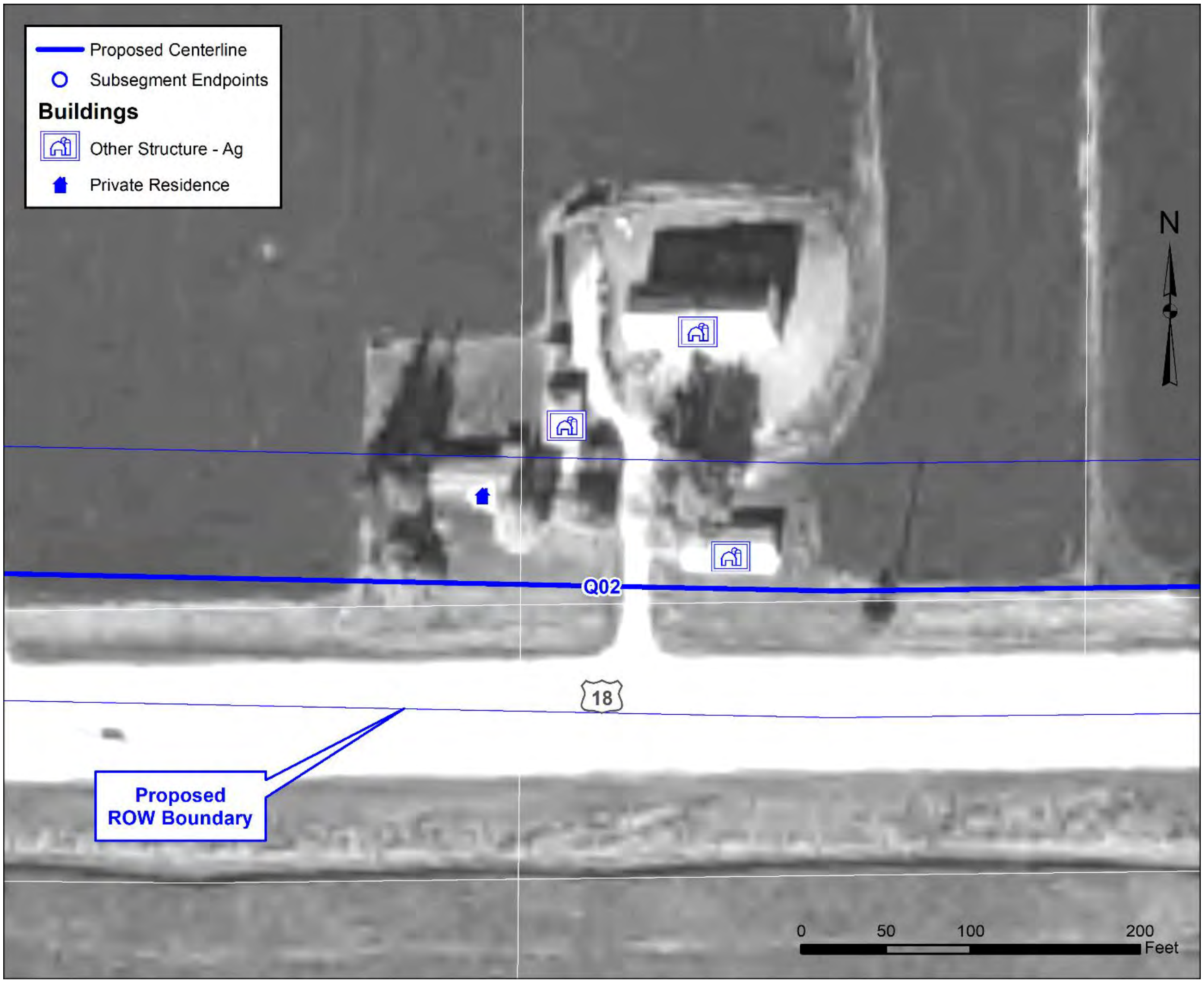
There are at total of 89 residences located within 300 feet of the proposed centerline of Eastern-South. Two residences are located within 25 feet of Subsegment Q02 (Figure 8-9). These two residences are located on the same property along USH 18 between the communities of Montfort and Cobb. Placement of the proposed transmission facilities on Subsegment Q02 would result in significant impacts to the landowners, including the removal of century old trees that have great intrinsic value to the property owners. In addition, these landowners' residences would be in extremely close proximity to the proposed high-voltage transmission lines.

Figure 8-9 Proposed ROW along Subsegment Q02 (Eastern-South) near two residences between Montfort and Cobb



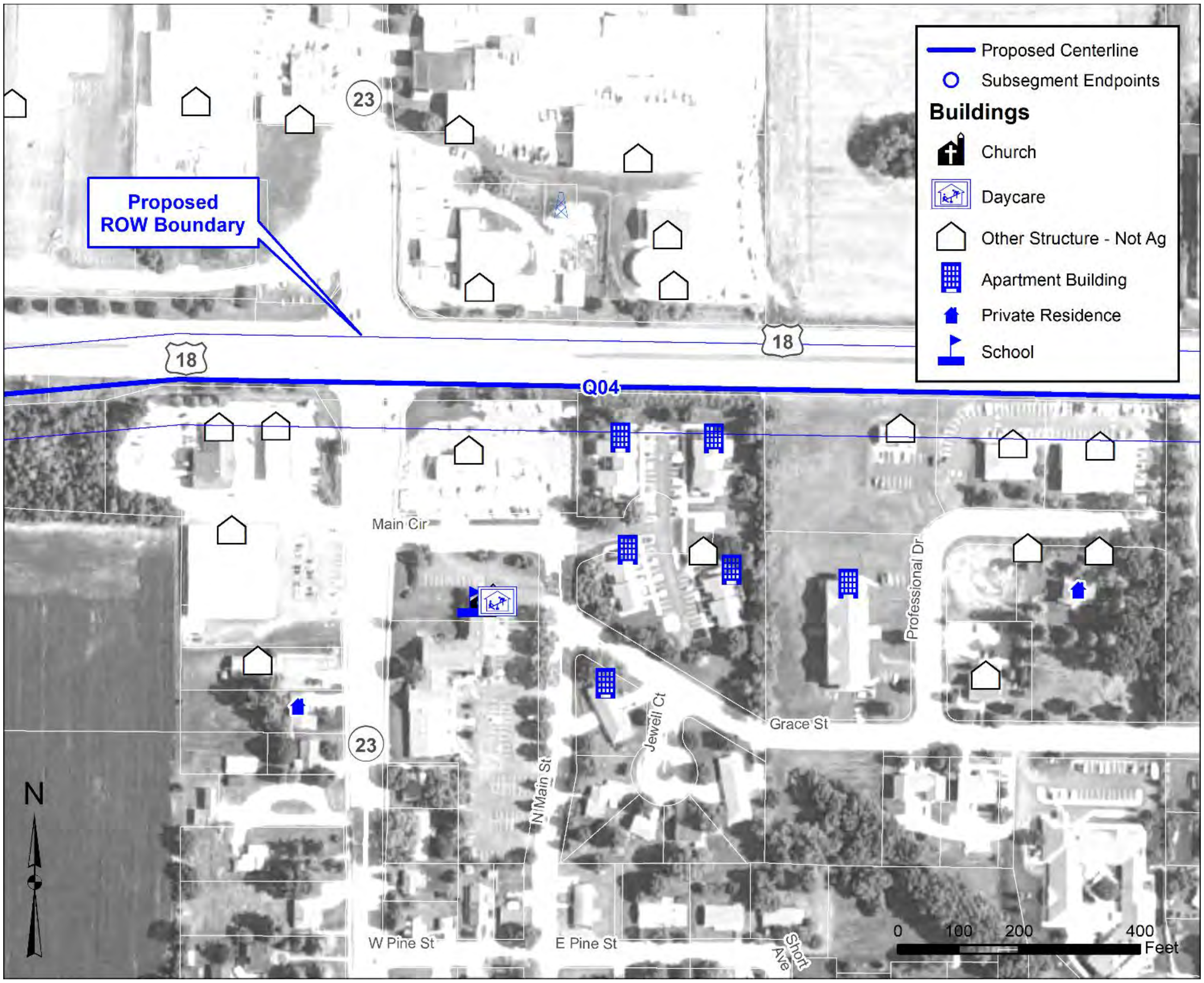
The applicant has been in contact with the property owners regarding realignment across the road which may relieve some impacts to these residences as well as one nearby neighbor. The neighboring residence currently lies within 25 to 50 feet of Subsegment Q02 (Figure 8-10). The neighbors residing on this short stretch of Subsegment Q02 are currently working with each other and ATC to formulate an agreeable realignment if Eastern-South would be ordered.

Figure 8-10 Proposed ROW along Subsegment Q02 (Eastern-South) near a residence between Montfort and Cobb



Eleven residences are located within 51 to 100 feet, and sixteen residences are located within 101 to 150 feet, and 59 residences within 151 to 300 feet of the proposed ROW centerline. These residences are mostly scattered along USH 18 and the proposed route in predominantly rural areas. There are 8 apartment buildings with a total of 74 units within 300 feet of the proposed ROW centerline within this routing alternative. Most of these apartment buildings are located in the city of Dodgeville (Figure 8-11).

Figure 8-11 Proposed ROW along Subsegment Q04 (Eastern-South) in the City of Dodgeville



8.3.3.1.3 Summary of potential impacts

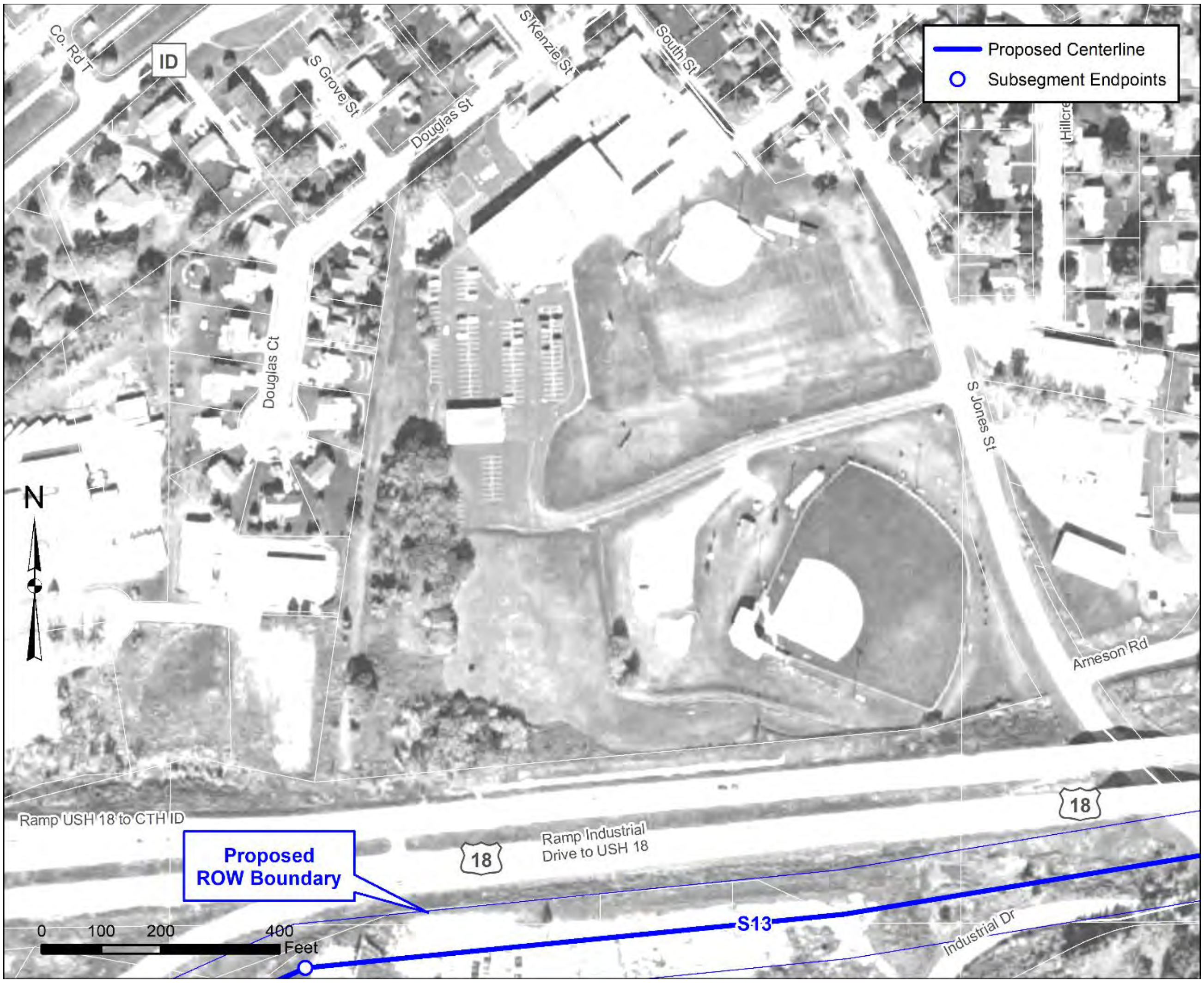
Table 8-17 Number of residential structures within 300 feet of the proposed centerline along route alternatives in the Eastern Routing Area

Route Alternative	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
Eastern-North	0	1	6	11	18
Eastern-South	3 houses and 4 apt. units	11 houses and 32 apt. units	16	59 houses and 38 apt. units	89 houses and 74 apt. units

8.3.3.2. Potentially sensitive populations and properties

According to data provided by the applicants, there are no sensitive receptors such as schools, daycares, or hospitals within 300 feet of the proposed centerlines of the route alternatives within the Eastern Routing Area. However, Barneveld High School's southern property line is just over 300 feet away from Subsegment S13 (Figure 8-12).

Figure 8-12 Proposed ROW along Subsegment S13 (Eastern-South) near Barneveld High School



8.3.3.3. Electric and Magnetic Fields

Some background information and a general discussion of EMF is found in Section 4.5.6. and in Appendix E of this EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic field lines at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after a new line is placed in operation. The magnetic field profiles included in the application appear to be reasonably representative of the potential circuit configurations. Below are brief summaries of the estimated magnetic field levels for the proposed 345 kV transmission line along the various proposed segments along this portion of the proposed route.

8.3.3.3.1 Common Subsegments

Subsegment N01

The proposed 345 kV line would be joined by the 138 kV line X-127 (formerly called X-16), exiting the north side of the proposed Hill Valley Substation, moving to the northeast and paralleling the existing X-16 alignment (offset by 40 feet for constructability). The first two spans would have the proposed

345 kV line, before being double-circuited with the X-127 line. The double-circuit would proceed until reaching the east side of STH 80. The expected magnetic fields are tabulated below.

Table 8-18 Estimated magnetic fields for Subsegment N01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	254 A	287 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	43	48	45	44	58	56
100	4.4	5.0	10	10	13	13
200	1.1	1.3	2.9	2.9	3.6	3.6
300	0.50	0.56	1.3	1.3	1.6	1.6

Subsegment N03

The proposed 345 kV line continues in a double-circuited configuration with the 138 kV line X-127 (formerly X-16), moving northeast and paralleling the existing X-16 alignment. The subsegment would continue until reaching the south side of USH 18. The expected magnetic fields are tabulated below.

Table 8-19 Estimated magnetic fields for Subsegment N03

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	254 A	287 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	43	48	45	44	57	56
100	8.9	10	10	10	13	13
200	1.1	1.2	3.6	4.0	4.2	4.6
300	0.48	0.55	1.3	1.4	1.6	1.7

Subsegments N04, N05, and N06

The proposed 345 kV line would turn to the east along the south side of USH 18 for one span as a single-circuit arrangement, while the X-127 (formerly X-16) segment continues to the northeast in Subsegment N07. After the one span distance, the proposed 345 kV line would double-circuit with the existing 69 kV line Y-138 and continue east along the south side of USH 18. The expected magnetic fields are tabulated below.

Table 8-20 Estimated magnetic fields for Subsegments N04, N05, and N06

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	254 A	287 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	43	48	45	44	57	56
100	8.9	10	10	10	13	13
200	2.0	2.6	3.6	4.0	4.2	4.6

300	0.75	0.97	1.3	1.4	1.6	1.7

Subsegment N07

This subsegment would be used to join the existing 138 kV line (X-127, formerly designated X-16) in a single-circuit extension into the Eden Substation, after separating from the proposed 345 kV line, while using existing ROW. The expected magnetic fields are tabulated below.

Table 8-21 Estimated magnetic fields for Subsegment N07

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	254 A	287 A	64 A	79 A	48 A	69 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	44.4	50.2	5.1	6.1	6.0	6.9
100	4.4	5.0	3.1	3.8	3.5	4.2
200	1.1	1.2	0.5	0.6	0.5	0.6
300	0.5	0.5	0.2	0.2	0.2	0.2

8.3.3.3.2 Eastern-North

Subsegment P01

The proposed 345 kV line would proceed in a single-circuit configuration to the north across USH 18 until reaching the 138 kV line X-17, at which point it would begin subsegment P02. The estimated magnetic fields are tabulated below.

Table 8-22 Estimated magnetic fields for Subsegment P01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	41	39	54	51
100	N/A	N/A	7.4	7.1	9.8	9.3
200	N/A	N/A	2.0	1.9	2.6	2.5
300	N/A	N/A	0.89	0.86	1.2	1.1

Subsegment P02

The proposed 345 kV line would be double-circuited with the existing 138 kV line X-17, paralleling the existing X-17 alignment (offset by about 40 feet for constructability) and moving generally northeast for approximately 8.7 miles. At the end of the subsegment, the X-17 line would exit and the proposed line would continue on as a single-circuit. The estimated magnetic fields are tabulated below.

Table 8-23 Estimated magnetic fields for Subsegment P02

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load

Current	191 A	201 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	32	34	45	55	51	62
100	3.3	3.5	6.4	8.8	6.5	9.2
200	0.84	0.88	1.3	2.0	1.2	2.0
300	0.37	0.39	0.51	0.82	0.42	0.79

Subsegment P03

The proposed 345 kV line would continue approximately eastward as a single-circuit line, cross-country. The estimated magnetic fields are tabulated below.

Table 8-24 Estimated magnetic fields for Subsegment P03

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	41	39	54	51
100	N/A	N/A	7.4	7.1	9.8	9.3
200	N/A	N/A	2.0	1.9	2.6	2.5
300	N/A	N/A	0.89	0.86	1.2	1.1

Subsegment P04

The proposed 345 kV line would continue approximately eastward as a single-circuit line, cross-country. An existing distribution line would join for part of the subsegment and leave. The estimated magnetic fields are tabulated below.

Table 8-25 Estimated magnetic fields for Subsegment P04

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	2 A	2 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	0.56	0.56	41	40	55	52
100	0.15	0.15	7.4	7.1	9.8	9.3
200	0.07	0.07	2.0	1.9	2.6	2.5
300	0.05	0.05	0.89	0.86	1.2	1.1

Subsegment P05

The proposed 345 kV line would continue approximately eastward as a single-circuit line, cross-country with subsegment ending on the west side of STH 23. The estimated magnetic fields are tabulated below.

Table 8-26 Estimated magnetic fields for Subsegment P05

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load

Current	N/A	N/A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	41	39	54	51
100	N/A	N/A	7.4	7.1	9.8	9.3
200	N/A	N/A	2.0	1.9	2.6	2.5
300	N/A	N/A	0.89	0.86	1.2	1.1

Subsegment P06

The proposed 345 kV line would continue approximately north as a single-circuit line, paralleling the west side of STH 23, before crossing STH 23 and proceeding approximately northeast near CTH ZZ. Existing distribution lines would come in and exit along the length of the subsegment. The estimated magnetic fields are tabulated below.

Table 8-27 Estimated magnetic fields for Subsegment P06

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	26 A	44 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	0.52	0.69	41	39	54	52
100	1.6	2.2	8.1	8.1	11	10
200	1.9	2.5	2.0	2.0	2.7	2.5
300	0.44	0.58	0.93	0.93	1.2	1.2

Subsegment P07

The proposed 345 kV line would continue approximately east as a single-circuit line until reaching the west side of CTH Z, then turning north for the next subsegment. Existing distribution lines would come in and exit along the length of the subsegment. The estimated magnetic fields are tabulated below.

Table 8-28 Estimated magnetic fields for Subsegment P07

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	18 A	23 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	0.52	0.69	41	39	54	51
100	1.6	2.2	7.5	7.5	9.8	9.5
200	0.63	0.83	2.0	2.0	2.7	2.5
300	0.29	0.38	0.93	0.91	1.2	1.2

Subsegment P08

The proposed 345 kV line would continue approximately north as a single-circuit line, paralleling the west side of CTH Z. Existing distribution lines would come in and exit along the length of the subsegment. The estimated magnetic fields are tabulated below.

Table 8-29 Estimated magnetic fields for Subsegment P08

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	6 A	8 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	0.52	0.69	41	39	54	51
100	2.1	2.8	6.7	6.4	9.0	8.4
200	0.38	0.51	1.9	1.9	2.5	2.4
300	0.20	0.26	0.92	0.91	1.2	1.2

Subsegment P09

The proposed 345 kV line would continue approximately north as a single-circuit line, crossing CTH Z. Upon crossing, the proposed 345 kV line would travel cross country generally east, until nearing the intersection of Celestial Circle and Stagecoach Road. Existing distribution lines would come in and exit along the length of the subsegment. The estimated magnetic fields are tabulated below.

Table 8-30 Estimated magnetic fields for Subsegment P09

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	5 A	6 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	1.1	1.3	41	39	54	51
100	0.32	0.39	7.8	7.6	10	9.8
200	0.16	0.20	2.1	2.1	2.8	2.7
300	0.11	0.13	0.99	0.97	1.3	1.3

Subsegment W01

The proposed 345 kV line would continue approximately northeast as a single-circuit line until reaching a point near the intersection of Celestial Circle and Stagecoach Road. In the next proposed subsegment, an existing 69 kV line Y-62 would join the line. The estimated magnetic fields are tabulated below.

Table 8-31 Estimated magnetic fields for Subsegment W01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	41	39	54	51
100	N/A	N/A	7.4	7.1	9.8	9.3
200	N/A	N/A	2.0	1.9	2.6	2.5
300	N/A	N/A	0.89	0.86	1.2	1.1

Subsegment W02

The proposed 345 kV line would have an existing 69 kV line Y-62 underbuilt for one span, before terminating at the Stagecoach substation. The proposed 345 kV line then continues east across CTH P. The estimated magnetic fields are tabulated below.

Table 8-32 Estimated magnetic fields for Subsegment W02

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	166 A	211 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	15	19	17	19	20	22
100	1.8	2.3	5.5	5.6	6.8	6.8
200	0.44	0.56	1.9	1.8	2.4	2.4
300	0.20	0.25	0.90	0.91	1.2	1.1

8.3.3.3.3 Eastern-South

Subsegment Q01

The proposed 345 kV line would continue to be double-circuited with the existing 69 kV line Y-138, running eastward approximately parallel to the south side of USH 18, before crossing to the north side of the highway near County Road XX. The expected magnetic fields are tabulated below.

Table 8-33 Estimated magnetic fields for Subsegment Q01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	94 A	114 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	1.5	1.9	28	31	34	37
100	6.3	7.9	7.6	7.9	9.7	9.8
200	2.0	2.6	2.4	2.6	3.0	3.1
300	0.75	0.97	1.1	1.3	1.4	1.5

Subsegment Q02

The proposed 345 kV line would continue to be double-circuited with the existing 69 kV line Y-138, running eastward and paralleling the north side of USH 18 until reaching the west side of Bridge Road, the moving north to the north of the village of Cobb, then moving south again east of Cobb to again parallel the north side of USH 18. Upon reaching Olson Road, the double-circuit would move north and then east, until moving south and to the south side of USH 18 upon reaching Sinbad Road. The double-circuit would then travel largely along the south side of the highway, paralleling it until the subsegment would end to the east of Lehner Road. Existing distribution lines would come in and exit along the length of the subsegment. The expected magnetic fields are tabulated below.

Table 8-34 Estimated magnetic fields for Subsegment Q02

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	94 A	114 A	306 A	295 A	406 A	385 A

Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	8.3	10	38	43	45	50
100	1.6	2.1	8.1	8.5	10	10
200	0.70	0.90	2.6	2.7	3.2	3.3
300	0.45	0.58	1.2	1.3	1.5	1.6

Subsegment Q03

The proposed 345 kV line continues as a double-circuit with the 69 kV line Y-138, which jumps off to a standalone switch structure tapping the Lands End Substation. The double-circuit would continue east on the south side of USH 18. An existing distribution line would come in and exit along the length of the subsegment. The estimated magnetic fields are tabulated below.

Table 8-35 Estimated magnetic fields for Subsegment Q03

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	94 A	114 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	4.3	5.1	38	43	45	50
100	1.0	1.2	6.7	6.8	8.7	8.6
200	0.46	0.59	1.9	2.0	2.5	2.5
300	0.30	0.38	1.0	1.1	1.3	1.3

Subsegment Q04

The proposed 345 kV line continues as a double-circuit with the 69 kV line Y-138, moving along the north side of the city of Dodgeville. At the end of the proposed subsegment, the 69 kV line Y-138 and the line would continue as a single-circuit in the next subsegments. The estimated magnetic fields are tabulated below.

Table 8-36 Estimated magnetic fields for Subsegment Q04

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	61 A	72 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	6.3	7.4	15	17	18	20
100	0.74	0.88	5.8	5.7	7.7	7.4
200	0.18	0.21	2.1	2.0	2.7	2.6
300	0.08	0.09	0.98	0.93	1.3	1.2

Subsegments Q05 and Q06

The proposed 345 kV line continues as a single-circuit line, paralleling the south side of USH 18, before crossing the highway to the east of Bennett Road. The estimated magnetic fields are tabulated below.

Table 8-37 Estimated magnetic fields for Subsegments Q05 and Q06

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	41	39	54	51
100	N/A	N/A	7.4	7.1	9.8	9.3
200	N/A	N/A	2.0	1.9	2.6	2.5
300	N/A	N/A	0.89	0.86	1.2	1.1

Subsegment S01

The proposed 345 kV line would continue as a single-circuit segment, paralleling the north side of USH 18/151, before crossing to the south side of the highways to the east of Venden Road. An existing distribution line would come in and exit along the length of the subsegment. The estimated magnetic fields are tabulated below.

Table 8-38 Estimated magnetic fields for Subsegment S01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	1 A	1 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	0.23	0.23	41	39	54	52
100	0.11	0.11	7.4	7.1	9.8	9.3
200	0.04	0.04	2.0	1.9	2.6	2.5
300	0.03	0.03	0.89	0.86	1.2	1.1

Subsegments S04 and S05

The proposed 345 kV line continues as a single-circuit segment, paralleling the south side of USH 18/151. An existing distribution line would come in along the length of the subsegments. The estimated magnetic fields are tabulated below.

Table 8-39 Estimated magnetic fields for Subsegment S04 and S05

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	2 A	3 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	0.06	0.09	41	40	54	52
100	0.10	0.14	7.4	7.2	9.8	9.3
200	0.31	0.47	2.0	2.0	2.7	2.6
300	0.19	0.29	0.91	0.88	1.2	1.2

Subsegment S08

The proposed 345 kV line continues as a single-circuit segment, paralleling the south side of USH 18/151. Existing distribution lines would come in and exit along the length of the subsegment. The estimated magnetic fields are tabulated below.

Table 8-40 Estimated magnetic fields for Subsegment S08

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	6 A	8 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	0.06	0.09	41	40	55	52
100	0.10	0.14	7.4	7.2	9.8	9.3
200	0.31	0.47	2.0	2.0	2.7	2.5
300	0.67	0.98	1.4	1.6	1.5	1.7

Subsegments S09, S10A, S10B, S10C, and S10D

The proposed 345 kV line continues as a single-circuit segment, paralleling the south side of USH 18/151. Existing distribution lines would come in and exit along the length of the subsegment. The estimated magnetic fields are tabulated below.

Table 8-41 Estimated magnetic fields for Subsegments S09, S10A, S10C, and S10D

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	102 A	108 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	1.8	2.2	43	41	56	54
100	2.9	3.6	11	11	14	14
200	21	26	23	29	26	31
300	3.9	4.9	4.2	5.2	4.7	5.8

Subsegment S12

The proposed 345 kV line would continue in a single-circuit configuration, following the south side of USH 18/151 and remaining north of the ramps to Industrial Drive. The estimated magnetic fields are tabulated below.

Table 8-42 Estimated magnetic fields for Subsegment S12

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	42	40	55	53
100	N/A	N/A	9.1	8.7	12	11
200	N/A	N/A	2.5	2.4	3.3	3.2
300	N/A	N/A	1.1	1.1	1.5	1.4

Subsegment S13

The proposed 345 kV line would continue to the east, still paralleling the south side of the USH 18/151 in a mostly single-circuit configuration. At one point a double-circuit configuration with the existing 69 kV transmission Y-136 line would occur, while at another time a distribution line would also be present. The subsegment would continue until reaching the east side of CTH ID, before turning north across USH 18/151 and continuing to the north cross country. The largest estimated magnetic fields for this combination of configurations are tabulated below.

Table 8-43 Estimated magnetic fields for Subsegment S13

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	49 A	61 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	27	34	42	41	55	53
100	3.8	4.7	7.4	7.6	9.8	9.3
200	1.7	2.2	2.9	3.2	3.5	3.7
300	1.1	1.4	1.7	1.9	1.9	2.1

Subsegment T01

East of CTH ID, the proposed 345 kV line would continue as a single-circuit north across USH 18/151 and move north cross country until reaching the existing 69 kV line Y-128 just south of CTH S and Wally Road, near a connection to the Mount Horeb substation. The estimated magnetic fields are tabulated below.

Table 8-44 Estimated magnetic fields for Subsegment T01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	41	39	54	51
100	N/A	N/A	7.4	7.1	9.8	9.3
200	N/A	N/A	2.0	1.9	2.6	2.5
300	N/A	N/A	0.89	0.86	1.2	1.1

Subsegment T02

The proposed 345 kV line continues approximately to the north after becoming a double-circuit arrangement with the existing 69 kV line Y-128, paralleling the route of the existing Y-128 line and also having some distribution lines along the subsegment. The estimated magnetic fields are tabulated below.

Table 8-45 Estimated magnetic fields for Subsegment T02

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	122 A	162 A	306 A	295 A	406 A	385 A

Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	4.4	5.4	22	27	25	31
100	5.5	7.1	5.5	6.5	7.0	7.2
200	1.8	2.3	2.4	2.5	3.0	3.0
300	1.1	1.4	1.4	1.5	1.7	1.8

Subsegment T03

The proposed 345 kV line continues in its double-circuited configuration with the existing 69 kV line Y-128, proceeding northeast, then north. At the end of the subsegment, the Y-128 temporarily leaves before returning later in the proposed route. The estimated magnetic fields are tabulated below.

Table 8-46 Estimated magnetic fields for Subsegment T03

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	122 A	162 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	14	18	18	21	22	25
100	1.4	1.9	4.9	4.7	6.5	6.1
200	0.36	0.48	1.7	1.6	2.3	2.1
300	0.16	0.21	0.80	0.77	1.1	1.0

Subsegment T04

The proposed 345 kV line would continue for a short distance as a single-circuit configuration, moving northeast then north until crossing over to the north side of CTH J. The estimated magnetic fields are tabulated below.

Table 8-47 Estimated magnetic fields for Subsegment T04

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	41	39	54	51
100	N/A	N/A	7.4	7.1	9.8	9.3
200	N/A	N/A	2.0	1.9	2.6	2.5
300	N/A	N/A	0.89	0.86	1.2	1.1

Subsegments T05 and V01

The proposed 345 kV line would continue to the east mostly along the north side of CTH J, proceeding as a double-circuit with the 69 kV Y-128 line which rejoins during these proposed subsegments as well as a distribution line. Subsegment T05 would move temporarily to the south side of CTH J before returning to the north side during its route. The estimated magnetic fields are tabulated below.

Table 8-48 Estimated magnetic fields for Subsegment T05 and V01

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	122 A	162 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	1.4	1.8	18	21	22	25
100	7.8	10	5.9	6.3	7.3	7.6
200	1.0	1.3	2.6	2.6	3.2	3.3
300	0.42	0.51	1.2	1.2	1.5	1.5

Subsegment V02

The proposed 345 kV line continues in the double-circuit configuration with the 69 kV Y-128 line, turning north cross country to parallel the existing Y-128 path, along with a distribution line. The estimated magnetic fields are tabulated below.

Table 8-49 Estimated magnetic fields for Subsegment V02

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	122 A	162 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	9.4	12	18	22	23	26
100	1.8	2.3	5.6	5.4	7.4	7.0
200	0.61	0.77	2.1	2.1	2.7	2.6
300	0.36	0.45	1.1	1.1	1.4	1.3

Subsegment V03

The proposed 345 kV line continues in the double-circuit configuration with the 69 kV Y-128 line, angling to the northwest towards Red Hawk Lane, moving north, then moving back to the northeast and crossing over Mineral Point Road. Existing distribution lines also occur during portions of the proposed subsegment. The estimated magnetic fields are tabulated below.

Table 8-50 Estimated magnetic fields for Subsegment V03

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	122 A	162 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	14	18	18	22	23	26
100	1.8	2.3	5.6	5.4	7.4	7.0
200	0.61	0.77	2.1	2.1	2.7	2.6
300	0.36	0.45	1.1	1.1	1.4	1.3

Subsegment V04

The proposed 345 kV line would continue in the double-circuit configuration with the existing 69 kV Y-128 line, moving north from Mineral Point Road, then slightly northeast, then east crossing Observatory Road, then continue approximately northeast before crossing over CTH P near Hidden Valley Road. On the east side of CTH P, the double-circuit would continue north and east. The entire proposed subsegment path closely parallels the path of the existing Y-128 line. A distribution line coexists with the double-circuit for some of the proposed subsegment path. The estimated magnetic fields are tabulated below.

Table 8-51 Estimated magnetic fields for Subsegment V04

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	122 A	162 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	14	18	18	21	22	25
100	1.4	1.9	4.9	4.7	6.6	6.1
200	0.36	0.48	1.7	1.6	2.3	2.1
300	0.16	0.21	0.80	0.77	1.1	1.0

Subsegment V05

The proposed 345 kV line continues in a double-circuit configuration with the existing 69 kV Y-128 line moving northwards towards Stagecoach Road, at which point the Y-128 leaves and crosses over to the left side of CTH P, ending in the Stagecoach Substation at the end of the proposed subsegment. The estimated magnetic fields are tabulated below.

Table 8-52 Estimated magnetic fields for Subsegment V05

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	122 A	162 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	14	18	18	21	22	25
100	1.4	1.9	4.9	4.7	6.5	6.1
200	0.36	0.48	1.7	1.6	2.3	2.1
300	0.16	0.21	0.80	0.77	1.1	1.0

Subsegment V06

The proposed 345 kV line continues north in a single-circuit configuration to the north side of Stagecoach Road. The estimated magnetic fields are tabulated below.

Table 8-53 Estimated magnetic fields for Subsegment V06

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	N/A	N/A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	N/A	N/A	41	39	54	51

100	N/A	N/A	7.4	7.1	9.8	9.3
200	N/A	N/A	2.0	1.9	2.6	2.5
300	N/A	N/A	0.89	0.86	1.2	1.1

8.3.4. Aesthetics and visual impacts

The following discussion summarizes the aesthetic impacts of proposed project facilities according to their location within this section of the proposed project. This section includes the Eastern Routing Area from the village of Montfort in Grant and Iowa Counties to the village of Cross Plains in Dane County. There are two main route options for this portion of the project.

- **Eastern-North** would head northeast from Montfort to reach the west side of Cross Plains.
- **Eastern-South** would travel east from Montfort, passing through the north side of the villages of Cobb and Edmund, then the city of Dodgeville, as well as the south sides of the villages of Ridgeway, Blue Mounds, and Mount Horeb before turning north to end south of Cross Plains.

Several subsegments of the Eastern Routing Area would be commonly used for both Eastern-North and Eastern-South (Subsegments N01, N03, N04, N05, N06, and N07). These subsegments would link the proposed Hill Valley Substation with the existing Eden Substation. These segments would travel through agricultural landscape and grassland in new transmission ROW. This ROW would cause new visual impacts and potentially disturb the existing landscape during construction and afterwards for maintenance. Rural residences outside of Montfort, in addition to urban neighborhoods on the southeast side of the village, would be visually impacted by the new lines. Overall, these segments would affect the agricultural character and scenic aesthetics of the area.

8.3.4.1. Eastern-North

Eastern-North would begin near the east side of Montfort at the new Eden Substation. The first section would proceed a short distance north from USH 18 through new transmission ROW (Subsegment P01). From there, the route would head northeast parallel to existing transmission ROW to a point north of the Blackhawk Lake Wildlife Area (Subsegment P02).

These segments would pass through a hilly rural agricultural landscape with grassland, forest, and many small waterways. New transmission ROW or the expansion of existing ROW would increase the visibility of the transmission line, especially when additional forest would be cleared. Numerous rural residences as well as residential neighborhoods on the east side of Montfort would experience new or increased visual impacts along this route.

Subsegment P02 of the proposed route would cross over approximately half of a mile of land within the Blackhawk Lake Wildlife Area (formerly known as the Blackhawk Lake Recreational Area). Comments received during the EIS scoping period expressed concern for the impact the new transmission line would have on the aesthetics of the area. The wildlife area is used for year-round recreational activities, has DNR-managed forest and oak savanna, restored and remnant prairies, as well as stocked game for hunting. People using the area are likely to expect a natural setting and scenic aesthetic. The proposed project would increase the existing transmission line impact by changing the current single circuit line with new double circuit line, expanding the ROW width, and replacing the lower wooden H-frame structures with taller, steel single-pole structures. These changes would result in the loss of additional forest and thereby increase the visual footprint of the proposed project.

From this point onward, the route would leave all existing transmission ROW and create new ROW heading east over grassland, forest, agricultural land, and many small waterways (Subsegments P03, P04, P05, P06, P07, P08, and P09). This new ROW would have a large impact on the existing aesthetics throughout this portion of the proposed route. New transmission line features would be introduced to an otherwise mostly natural and undeveloped landscape. The scenic aesthetics along this route would likely be heavily impacted due to lack of pre-existing development. Construction would remove vegetation within the new ROW and remain cleared for maintenance of the line. Many rural residences would experience visual impacts from the new line. Larger waterways include Otter Creek and Mill Creek. People using these resources for recreation activities, such as fishing, would experience new visual impacts to the scenic aesthetic of the area.

Subsegment P07 of the proposed route would be constructed along the northern edge of Governor Dodge State Park. Comments during the EIS scoping period stated concern that the project would affect the aesthetics of the park. People use the park for year-round recreational activities and it contains over 5,000 acres of steep hills, bluffs, and valleys in a mostly undeveloped, scenic environment. The applicants conducted photo simulations from the park[311]. One simulation photo was taken farther away from the project area, while the other was taken closer to the project but from a lower elevation within the park. Due to the park's high elevation, the view from the park may be impacted by a new transmission line.

Comments during the EIS scoping period stated concern that the proposed project would affect American architect Frank Lloyd Wright's estate known as Taliesin, as well as the American Players Theatre near Spring Green. These buildings may not be impacted by the proposed project, which would be located roughly three miles to the south.

Eastern-North would create new transmission ROW through rural, more natural landscape that has seen little to no existing development. The new line would introduce visual impacts to the rural residences along the route. Construction and maintenance of the new ROW would cause a great amount of disturbance to natural areas. The scenic aesthetic along this route would be greatly impacted by new transmission line.

8.3.4.2. Eastern-South

Eastern-South would connect the proposed project from the Eden Substation in Montfort to Cross Plains. This route would begin east of Montfort within new transmission ROW on the south side of USH 18 (Subsegment Q01). It would then switch to existing ROW on the north side of the highway and head eastward around the north sides of Cobb and Edmund until reaching Dodgeville (Subsegment Q02, Q03, Q04, Q05, and Q06).

From Montfort to Dodgeville, this portion of the route would be mostly within existing transmission ROW; therefore, the line would increase existing visual impacts, rather than introduce completely new effects. The additional transmission infrastructure would increase the impacts from existing transmission infrastructure along the route. Residential neighborhoods on the east side of Montfort as well as within Cobb and Edmund would experience additional visual impacts from the new line. People using the highway would also see an increase in the level of visual impacts. It is likely that the new transmission line would also affect the scenic aesthetic in these areas.

From Dodgeville heading eastward to Mount Horeb, the proposed route would use new transmission ROW. The route would first travel along the north side of USH 151, then switch to the south side of the highway, where it would remain until reaching Mount Horeb (Subsegments S01, S04, S05, S08, S09, S10A, S10B, S10C, S10D, S12, S13, and T01).

The proposed project would have a great impact on the visual scenery along this portion of the route, since there is no existing transmission infrastructure present. Additionally, because these areas of the route

[311] PSC REF#: 347477

are relatively heavily populated, as well as the circumstance that USH 18/151 is a major travel route through the region, the introduction of new transmission infrastructure would affect the view and aesthetics for a large number of people who are both residents and visitors to the area.

The communities of Ridgeway, Barneveld, Blue Mounds, and Mount Horeb would experience high levels of new visual impacts as a result of this proposed route. No existing transmission infrastructure is currently present near these communities; therefore, people would likely be greatly affected by the addition of new lines and structures. Comments received from these communities during the EIS scoping period stated concern for the impact the project would have to tourism, property values, and the scenic character of the region. Mount Horeb, including several of the community's local parks and conservation areas, would be particularly heavily impacted by the proposed route. New transmission ROW would be constructed on the east, south, west, and north sides of the village. Other rural residences along the route would also experience new visual impacts from the proposed line. The rural landscape and scenic aesthetic in this area would be greatly affected.

The Military Ridge State Trail is a year-round recreational resource that runs along the north side of USH 18/151 between Dodgeville and Mount Horeb. The trail includes several observation platforms for people to experience scenic views of the surrounding landscape. The proposed route would be in close proximity to the trail for approximately 20 miles and directly intersect the trail twice (Subsegments S01 and T01). In some cases, forest adjacent to the trail would be cleared for construction and maintenance of the proposed project. Overall, users of the trail would experience large visual impacts from the new transmission line, which would greatly affect the scenic aesthetics of the area.

The proposed route would travel approximately half of a mile south of Blue Mound State Park (Subsegment S13). This park is used for year-round recreational activities, and, according to the DNR website, encompasses the highest point in southern Wisconsin to offer spectacular views of the surrounding region. The applicants provided a photo simulation from an observation deck within the park.[312] The new transmission line would be visible from the park, causing visual impacts and affecting the scenic aesthetic of the area.

Ridgeway Pine Relict State Natural Area is located near Ridgeway, approximately half of a mile north of the proposed route (Subsegment S08). Comments received during the EIS scoping period expressed concern that the aesthetics of the natural area would be impacted by a new transmission line. The area contains several natural features, especially cliffs and forest, and is available to the public year-round. The proposed project may be visible from higher elevations within the natural area; if so, the visual impacts would affect the scenic aesthetic of the area.

Barneveld Prairie State Natural Area is located near Barneveld, approximately half of a mile south of the proposed route (Subsegment S12). Comments received during the EIS scoping period expressed concern that the aesthetics of the natural area would be impacted by the new transmission line. The area contains several natural features, especially prairie grassland, and is available to the public year-round. The proposed project may be visible from within the natural area, which is likely since its landscape is generally open. The area also contains a building listed on the National Register of Historic Places. Potential visual impacts from a new transmission line would affect the scenic aesthetics of the area.

From Mount Horeb to Cross Plains, the route would continue northwards along mostly existing transmission ROW; however, new ROW would be used to avoid several existing farm structures (Subsegments T02, T03, T04, T05, V01, V02, V03, V04, V05, and V06). The route would travel through

[312] PSC REF#: 347477

agricultural land, grassland, forest, and over several small waterways. Although existing transmission infrastructure is present along most of this route, the proposed project would increase the existing visual impact, especially if forest is cleared for expanded or new ROW. The new line would affect the rural character and scenic aesthetics along this route.

8.3.5. Public lands and recreation

In cases where the proposed project would impact a property that was purchased with the aid of Land and Water Conservation (LAWCON) funds, a separate review involving WDNR and the contributing federal agencies must occur before any construction could occur. This program was established by Congress in 1965 to create parks and open spaces, protect wilderness, wetlands, and refuges, preserve wildlife habitat, and enhance recreational opportunities. The fund has two main components; to serve as a federal program that funds the purchase of land and water areas for conservation and recreation purposes within the nation's four federal and management agencies – Forest Service, Fish and Wildlife Service, National Park Service, Bureau of Land Management; and to also serve as a state matching grants program that provides funds to states for planning, developing, and acquiring land and water areas for state and local parks and recreation areas.

8.3.5.1. Eastern-North

Subsegment P02 proposes to cross the Blackhawk Lake Wildlife Area (formerly known as the Blackhawk Lake Recreational Area), a 2,037-acre property owned by the DNR in Iowa County. This property includes the 220-acre Blackhawk Lake and 330 acres of recreation are leased to Iowa County. Iowa County operates a campground, hiking trails, and beach area within these 300 acres. Recreational uses within the Wildlife Area include but are not limited to hunting, trapping, hiking, cross country skiing, snowshoeing, birding, fishing, and boating.

Subsegment P02 proposes to directly cross approximately 2,600 linear feet of the Blackhawk Lake Wildlife Area. There is an existing single circuit transmission line located at Subsegment P02, which would be removed, and the proposed line would then be double circuited in this location. This would likely require additional vegetation clearing, which should be minimized to the extent practicable.

8.3.5.2. Eastern-South

Military Ridge State Trail is located on the Eastern Routing Area South route and is a 40-mile-long trail that connects Dodgeville to Madison. The trail runs along the southern border of Governor Dodge and Blue Mound State Parks through several landscape types. Most of the trail is crushed limestone and has a variety of users year-round, including bicyclists, walkers/runners and snowmobilers. There are several observation platforms for viewing wildlife and other natural landscapes.

The proposed project is in proximity to the Military Ridge State Trail for approximately 20 miles, from Subsegment S01 east of Dodgeville to Subsegment T01 east of Mount Horeb. With the exception of two direct crossings of the trail at Subsegments S01 and T01, the proposed project is located on the south side of STH 18/151 and the trail is located on the north side of STH 18/151. The trail has multiple parcels that were purchased with LAWCON funds.

To minimize impacts to trail users, construction on and near the trail should be limited to the late fall. Construction matting should also be used to minimize impacts to the trail surface. Vegetation clearing should be limited to the extent practicable. The applicant should work with the DNR trail coordinator and applicable DNR staff to minimize impacts, which may include design or alignment changes, increasing span lengths or shifting structure locations to avoid sensitive habitats.

The Military Ridge State Trail has parcels purchased with LAWCON funds. The applicant has stated they would work with DNR staff to minimize resource and user impacts, which may include design or alignment changes, increasing span lengths or shifting structure locations to avoid sensitive habitats.

8.3.6. Airports and airstrips

The applicants identified public and private airports and heliports located within four miles of the proposed route centerlines and provided information on these airports and airstrips as part of the application. The FAA reviewed information provided by the applicants regarding potential structure heights, locations, and ground elevations for the proposed project and used this information to conduct an aeronautical study under the federal regulations to determine if the structures, as described, exceeds obstruction standards and/or would have an adverse interference effect on navigable airspace or air navigation facilities. The applicants provided the correspondence from the FAA on these determinations as Appendix H, Exhibit 3[313] of the application

In the Eastern Routing Area, there are four private airports, one private airport/helipad, and one private heliport within four miles of either route alternative. There are no public airports located within four miles of either eastern route options

8.3.6.1. Eastern-North

In the Eastern Routing Area, there are two private airports and one private airport/helipad within four miles of the Eastern-North.

Southwind private airport is located approximately 1.9 miles north of the proposed Eastern-North route centerline. It is privately owned and managed in northwestern Iowa County just south of Hunter Hollow Road. It appears to have two turf runways, one approximately 1,800 feet long with a northwest/southeast alignment, and a second one that is approximately 1,200 feet long with a southwest/northeast alignment.

Forseth Field private airport is located approximately 1,800 feet south of the proposed Eastern-North route centerline. It is privately owned and managed, located just north of CTH T between CTH H and Coon Rock Road. The turf runway appears to be approximately 2,500 feet in a roughly east/west alignment.

Hallick Farm private airport is located in Black Earth, just north of the proposed Eastern-North route centerline. It is privately owned and managed, located south of Blue Mounds Trail and west of CTH JJ. There is a concrete helipad, 40 x 40-feet, located approximately 0.4 miles from the proposed route centerline, as well as a turf runway that is approximately 1,550 feet in length in a northwest/southeast alignment. The nearest corner of that runway appears to be approximately 1,600 feet north of the proposed route centerline.

Although the FAA notice criteria used for public airports is not typically applied to private airports, the applicants applied the same requirements when evaluating the route corridors and the potential for impacts. When using this criteria in the analysis, Forseth Field and Hallick Farm were found to have the potential for structure height concerns. If the project is approved, the applicants have stated that they would coordinate with appropriate local officials, WisDOT Bureau of Aeronautics, and airport operators to mitigate possible conflicts with local private airports.

313 The relevant set of correspondence is found in part 1 of 3 in Appendix H, Exhibit 3 (PSC REF#: 341407).

8.3.6.2. Eastern-South

There are two different private airports and one different private helipad within four miles of Eastern-South.

The Upland Hills Health Heliport is a private medical helipad located on the southern edge of Dodgeville. It is located approximately 1.4 miles south of the Eastern-South route centerline. This helipad is an asphalt surface approximately 39 x 39-feet.

Atkins Ridge private airport is located in western Dane county, just east of CTH Z, approximately two miles north of Daleyville. It is privately owned and managed, and has one turf runway approximately 2,400 feet long in a north/south alignment. The closest end of the runway is approximately four miles south of the Eastern-South route centerline.

The final airport listed is Docken Field private airport, just south of Mt. Horeb. This has a turf runway approximately 1,800 feet long with a northwest/southeast alignment. In the application and on some aerial imagery, it appears that the runway is not being maintained and has been replaced with agricultural crops. If still in use, it would be approximately 0.4 miles south of the Eastern-South route.

Although the FAA notice criteria used for public airports is not typically applied to private airports, the applicants applied the same requirements when evaluating the route corridors and the potential for impacts. When using this criteria in the analysis, Docken Field (if still in use) was found to have the potential for structure height concerns. If the project is approved, the applicants have stated that they would coordinate with appropriate local officials, WisDOT Bureau of Aeronautics, and airport operators to mitigate possible conflicts with local private airports.

8.3.7. Communication facilities

An initial assessment[314] of the potential impact to communication facilities was conducted by

Electrical Consultants, Inc. to determine whether a viable risk to communication operations was present. As discussed in Section 4.5.14, the primary types of potential interference with communication facilities include:

- AM broadcast antenna re-radiation,
- transferred voltages to communication facility grounding systems, and
- microwave line-of-sight signal degradation.

The initial assessment found a significant number of communication facilities within a 10-kilometer radius of the proposed route alternatives. If the project is approved, additional analyses (phase 2) would be expected to determine the operational status of these facilities, the likelihood of interference, and the appropriate range of mitigation measures.

A review of FCC database showed that no microwave radio antenna line-of-sight paths would be obstructed by the proposed transmission line structures in this routing area. If the project is approved, a field review prior to construction would confirm that there are no microwave line-of-sight path issues. If any issues would be found, the applicants would work with the licensee to mitigate the issue.

No AM stations were listed within 10 km of the Eastern-North route alternative.

---

[314] Appendix K, Exhibit 1 (PSC REF#: 341394).

One AM radio station, WDMP (810 kHz) is located within 10 km of the Eastern-South route alternative. The study found that the proposed transmission line structure to AM radio station antenna separation and height meet FCC requirements to prevent distortions to AM coverage.

Communication facilities were found within 500 feet of the proposed project routes. A ground system inspection would need to be completed for each of these communication facilities to assure they meet OSHA grounding standards to avoid induced voltages causing problems with communications equipment and safety risks. Any facilities identified that do not meet OSHA requirements would need further investigation and mitigation.

8.3.8. Electric distribution facilities

In the Eastern Routing Area, there are distribution lines owned by Alliant and MGE that would require relocation if the proposed project is approved along either route. Existing distribution lines that are proposed for relocation are located in areas that may pose physical conflicts with the proposed route or where their proximity to one of the transmission lines might result in stray voltage concerns through NEV.

Due to concern over the impacts associated with stray voltage and its potential effect on confined animals (such as dairy cows), all routes were analyzed for areas where distribution lines might be located too close to the proposed transmission lines. There is a general consensus that distribution lines located less than 150 feet from a transmission line and running parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts to farms with confined animals. Further information on the cause, impact, and mitigation options of stray voltage or NEV is provided in Section 4.5.11.

All distribution modifications required as a result of the ordering of this project would be made by the distribution owners, including distribution line design, relocation, burial, and any associated permitting.

8.3.8.1. Eastern-North

If the Eastern-North route alternative would be approved, approximately 3.6 miles of distribution lines would need to be removed and relocated. Almost all of these lines would be owned by Alliant, apart from a final section owned by MGE. From the western end of the Eastern-North route alternative, the first area where a relocation would necessary is on Route Segment P03, near CTH Q. Approximately 0.3 miles of distribution line running cross-country near a farm would be impacted.

Subsegment P04, approximately 0.4 miles of the proposed 345 kV line would run parallel to CTH M and an existing distribution line on the south side of the road. A farm is immediately to the north of the highway in this area. At the end of Subsegment P05, approximately 0.2 miles of 345 kV line would be parallel to James Road and an existing distribution line. Multiple farms are located within a mile of this area.

Subsegment P06 would have the proposed 345 kV line run parallel to CTH ZZ. Along this road, the distribution line is on the south, then the north side of the road. Approximately 0.7 miles of distribution line would be relocated if this route would be authorized.

It appears that Subsegment P08 is one area where the proposed 345 kV transmission line would necessitate the movement of the existing distribution line. The existing distribution line on the east side of the road would be less than 150 feet from the proposed transmission line for over 2,200 feet, near two operating farms. ATC does not indicate in the application that this area of distribution line would be moved. ATC did state that they considered this area of distribution line, and others on Subsegments P06 and P07 to be co-located for the purpose of NEV analysis[315]. The response also stated that where a subsegment has an identified CAFO, stray voltage testing would be conducted and if currents were found to be above the level of concern in docket 05-EI-115 mitigation would occur.

Subsegment P09 has three areas where distribution lines would be required if the Eastern-North route would be authorized. A 0.2 mile section on the east side of CTH Z, a 1.4 mile section on the south side of CTH T and a 0.2 mile section on the east side of CTH K are all areas where the proposed 345 kV line would be parallel to county highways and existing distribution lines. The area is dotted with agricultural properties and farms within a half mile of the proposed route.

Subsegment W01 is near the end of this route. This subsegment is 0.2 miles long and the entire length would necessitate the removal and relocation of a parallel distribution line along the north side of Stagecoach Road.

If the Commission approved the project using the Eastern-North route alternative, all the distribution lines described above, approximately 3.6 miles in total, would need to be removed and relocated.

8.3.8.2. Eastern-South

The majority of affected distribution lines along this route alternative are owned by Alliant. Beginning on the western end of the route, Subsegment Q02 has four areas where the proposed transmission line would be adjacent to distribution lines. The first two of these areas start at the beginning of Q02 for three miles along USH 18 to Bridge Road, then from east of Cobb another two miles along USH 18 to Olson Road. There would be a short section relocated along Sinbad Road, as the new transmission line would go around the north side of Edmund, Wisconsin. A final section on Subsegment Q02 would be 5.5 miles in length along USH 18 from Edmund to the west side of Dodgeville. Continuing around USH 18 near Dodgeville, a 0.2-mile length of Subsegment Q04 would parallel existing distribution lines and the highway.

Route Segment Q01 appears to be less than 150 feet away from a parallel distribution line for a distance of approximately 5,600 feet, near operating farms. The application did not indicate that this area of distribution line would be moved. ATC did state later on that they considered this area of distribution line to be co-located for the purpose of NEV analysis[316]. The response also stated that where a segment has an identified CAFO, stray voltage testing would be conducted and if currents were found to be above the level of concern in docket 05-EI-115 mitigation would occur.

The next area of distribution lines affected would be along Subsegment S01 just east of Dodgeville. Approximately 0.3 miles of distribution line west of an operating farm and adjacent to USH 18 would be affected if the proposed 345 kV line would be approved in this area.

After traveling cross-country, Subsegment T02 would be parallel to two smaller roads, Wally Road and Witte Road, for approximately 0.4 miles, as well as a distribution on the west side of those roads. There appears to be two operating farms in that area.

Subsegments T05 and V01 would be located parallel to CTH J for almost one mile. An existing distribution line runs on the south side of that highway. The application states that approximately 0.6 miles of distribution line in this area would need to be relocated.

[315] Response to Data Request 7.10 (PSC REF#:359116).
[316] Response to Data Request 7.10 (PSC REF#:359116).

Subsegments V04 and V06, near the end of this routing area, have short sections where the proposed 345 kV line would be parallel to CTH P and distribution lines owned by MGE. Approximately 0.2 miles would be affected on Subsegment V04 and another 0.2 miles affected along Subsegment V06.

If the Commission approved the project using the Eastern-South route alternative, all of the distribution lines described above, approximately 13.3 miles in total, would need to be removed and relocated.

CHAPTER

9

9. Environmental Analysis: Dane County Routing Area

9.1. ROUTE ALTERNATIVE COMPARISONS

9.1.1. Detailed Route Descriptions

The Dane County Routing Area is located entirely within Dane County. This routing area connects the Eastern Routing Area near Cross Plains, Wisconsin to the Cardinal Substation near Middleton, Wisconsin. The Dane County Routing Area starts near Cross Plains, Wisconsin and travels 2.2 miles generally east along common subsegments until Cleveland Road where it separates into two route alternatives near Black Earth Creek for 1.5 miles, these route alternatives are:

- Black Earth Creek-North, and
- Black Earth Creek-South.

From here it travels 0.7 miles east along common subsegments until it terminates at the existing Cardinal Substation in Middleton, Wisconsin.

The route subsegments included in the Dane County Routing Area are identified in Table 9-1 (Figure 1.27, Appendix A).

Table 9-1 Dane County Routing Area route subsegments

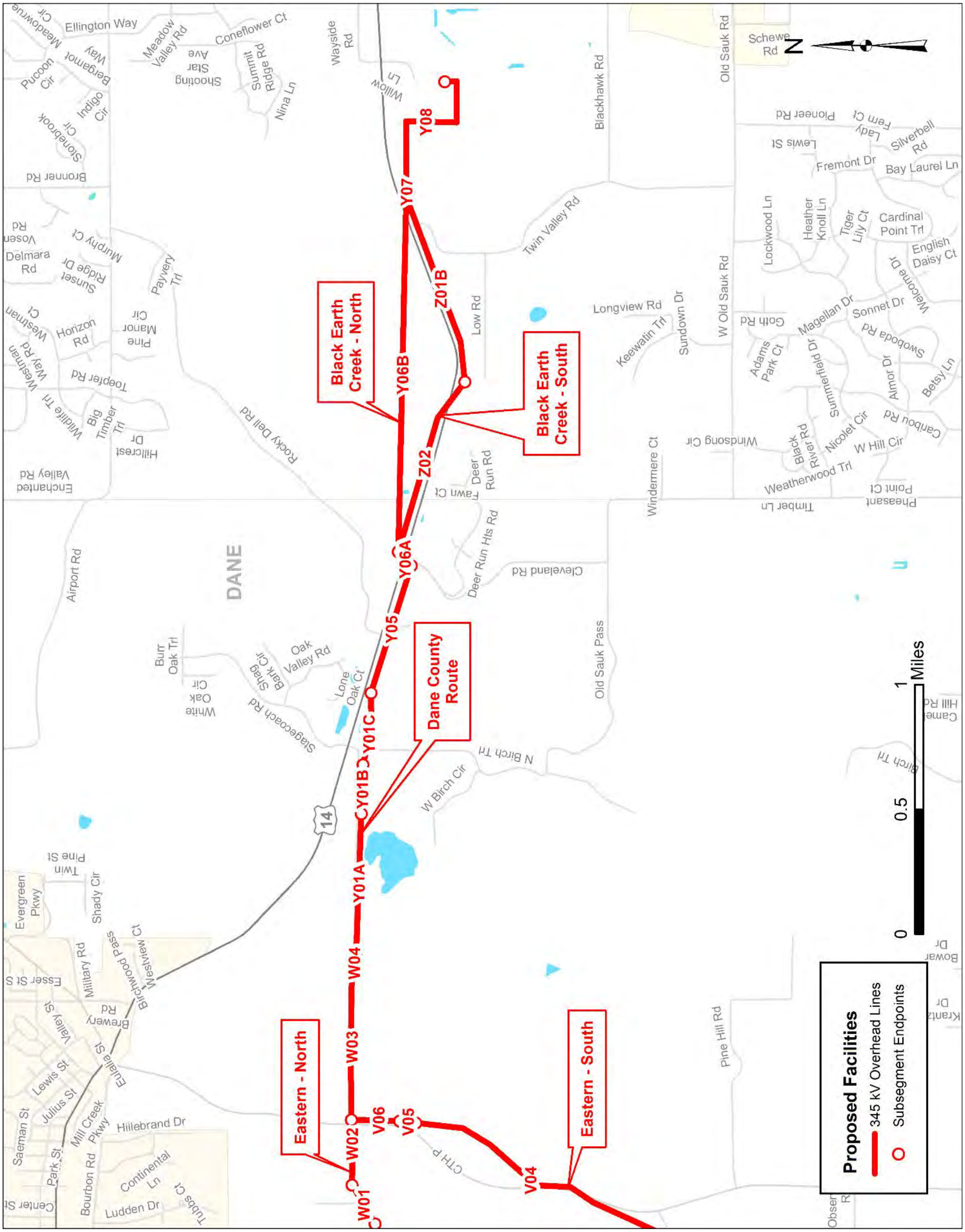
Route Alternative	Route Subsegments
Common Route Segments*	W03*, W04*, Y01A, Y01B, Y01C, Y05, Y06A*, Y07, Y08
Black Earth Creek-North*	Y06B*
Black Earth Creek-South*	Z02*, Z01B

*Additional routes under consideration by RUS (Appendix C)

9.1.1.1. Common Subsegments from the Eastern Routing Area

The proposed route would begin in the town of Cross Plains just east of the intersection of CTH P and Stagecoach Road at the end of W02 and V06. From there, **W03** would extend 0.6 miles east along the north side of Stagecoach Road in a double-circuit configuration with 6927, crossing a private driveway within 350 feet of two private residences, crossing another private driveway, passing within 100 feet of two adjacent private residences, passing within 200 feet of another private residence, and passing within 700 feet of two more private residences.

Figure 9-1 Dane County Routing Area



W04 would then extend 480 feet east-southeast, diagonally crossing from the north side to the south side of Stagecoach Road.

Y01A would then extend 0.6 miles along the south side of Stagecoach Road, crossing three private driveways within 200 feet of business, and passing within 250 feet of two private residences.

Y01B would then extend 0.2 miles east along the south side of Stagecoach Road, passing within 300 feet of three private residences.

Y01C would then extend 740 feet east-southeast, crossing N Birch Trail, and passing within 200 feet of a private residence and within 1000 feet of a few homes on the north side of USH 14, then extend 790 feet east.

Y05 would then extend 0.5 miles east-southeast along the south side of USH 14, passing within 300 feet of a private residence.

Y06A would then extend 400 feet northeast, crossing USH 14 at Cleveland Road.

9.1.1.2. Black Earth Creek-North

Y06B would begin at the east end of Y06A, and extend cross-country 1.4 miles east, passing within 350 feet of a private residence, passing within 550 feet of another private residence, passing within 500 feet of a commercial building, and passing within 200 feet of another private residence, to meet the beginning of the final common routes.

9.1.1.3. Black Earth Creek-South

Z02 would begin at the east end of Y06A, and extend 0.5 miles east-southeast along the north side of USH 14, crossing over a private residence. Z02 would then extend 0.2 miles southeast, diagonally crossing from the north side to the south side of USH 14.

Z01B would then extend 0.8 miles east-northeast along the south side of USH 14, passing within 500 feet of two private residences, passing within 50 feet of a commercial building, and passing within 100 feet of a private residence, to meet the beginning of the final common routes.

9.1.1.4. Common subsegments to Cardinal Substation

Y07 would extend 240 feet east in a double-circuit configuration with 6927.

Y08 would then extend 0.3 miles east to where 6927 continues underground to terminate at the existing West Middleton Substation. Y08 would then extend 0.2 miles south as a single-circuit line, extend 860 feet east, then extend 250 feet north to where it would terminate at the existing Cardinal Substation.

9.1.2. Proposed ROW in Dane County Routing Area

Due to the amount of common subsegments in this routing area, their metrics are listed separately in this table. To have a true quantification of the proposed ROW in this routing area, combine the Common Subsegments row to either Black Earth Creek-North or Black Earth Creek-South to have an accurate estimate of the proposed ROW in this routing area.

Table 9-2 Proposed route alternatives and common subsegments in the Dane County Routing Area

Route Alternatives	Length (miles)	Existing ROW Shared (acres)	New ROW (acres)	Total ROW (acres)	Percentage of Shared ROW
Common Subsegments	3.05	19.82	32.89	52.71	38%
Black Earth Creek-North	1.42	8.62	17.24	25.86	33%
Black Earth Creek-South	1.52	9.23	18.44	27.67	33%

9.1.3. Unique issues (e.g. WisDOT, construction, IBA, conservation easements, etc.)

9.1.3.1. Underground transmission facilities

Undergrounding of transmission lines is sometimes mentioned as a way of mitigating many of the impacts associated with the construction of overhead transmission lines, as this project is proposing. While it's true that placing transmission lines underground would avoid many impacts that would exist if it were above-ground, burying lines would come with its own set of impacts. Commission staff has previously prepared and has published an informational brochure on its website called "Underground Transmission" which has been incorporated into this DEIS in Appendix E.

As part of the scoping process for preparation of this DEIS, several commenters have suggested undergrounding the proposed project, in specific places, and in general, to avoid impacts. More specifically, the Ice Age Trail Alliance provided information during the scoping comment period regarding a portion of the proposed project, generally from County Road P in western Dane County to Twin Valley road near the Cardinal Substation where they are concerned about the visual impacts of a new high voltage transmission line. That stretch of the proposed project would encompass nearly the entire Dane County Routing Area where there are areas that the applicant has provided only one routing option (i.e. common subsegments). The Alliance is proposing to place the proposed project along this section underground so that it would not negatively impact the view and user experience of the Ice Age National Scenic Trail.

In response to Data Request 7.13,[317] the applicants provided documentation of correspondence between ATC and the National Park Service related to the proposed project in general and specifically related to potential visual impacts associated with the placement of an above-ground transmission line near the Ice Age Trail near Cross Plains.

In response to Data Request 7.14,[318] the applicants answered a series of questions from staff regarding constructing 345kV transmission facilities underground near the Ice Age Trail near Cross Plains. The applicants identified that in the worst case, approximately 11.4 miles[319] of transmission line would need to be placed underground to avoid any visual impact to the Ice Age Trail and the Cross Plains Complex. The applicants also stated that the cost in 2023 dollars to construct the proposed 345 kV facilities underground in the vicinity of the Ice Age NST and Cross Plains Complex for the identified 11.4 miles would be $513 million to $570 million,[320] which includes taxes, contingency, and escalation. This cost would compare to the overhead cost for the same 11.4-mile stretch, which was estimated to be $51.3 million to

---

317 Data Request 7.13 (PSC REF#: 359116)
318 Data Request 7.14 (PSC REF#: 359116)
319 In the comment provided by the NPS, they identified an area between two and four miles that they would prefer be constructed underground.
320 The applicants have stated that they do not have experience with operating underground 345 kV lines or repairing underground 345 kV lines, and as such they did not provide a cost estimate for repairing underground transmission facilities.

$57 million.[321] In addition, the applicants stated that they do not have experience constructing or operating underground 345 kV transmission facilities, and as such did not provide a list of operational limitations, maintenance issues, environmental concerns, or community impacts, as requested by Commission staff, that may occur if those facilities were constructed underground.

9.1.3.2. Avian risks in the Dane County Routing Area

This section discusses specific subsegments within the Dane County Routing Area that have been identified in the Avian Risk Review as having an elevated risk for avian impacts (Appendix F). Only one area was identified within this routing area as having an elevated risk for avian collisions. Near the intersection with Black Earth Creek, along USH 14, 1,349 feet of proposed Subsegments Y01A and Y01B, both common route subsegments, were identified (Figure 6, Appendix A). Factors contributing to avian collision risk in this area include the presence of a water filled sand and gravel quarry. Refer to Table 9-3 below for areas of increased avian risk. Commission staff are waiting on additional information about potential mitigation options from the applicants regarding the high risk areas identified in the Avian Risk Review.

Table 9-3 Areas of increased avian risk within the Dane County Routing Area adapted from the Avian Risk Review for the Cardinal-Hickory Creek Project (Figure 3, Appendix F)

Common Subsegment(s)	Potential Avian Collision Risk Areas	Approx. Length (feet)	Characteristics and Factors Contributing to Avian Collision Risk
Y01A, Y01B	Area along open waterbody	1,349	Sand and gravel quarry filled with water

9.1.4. Off-ROW access roads

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads or the ROW is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.2.5.1. Along the proposed routes, there are areas of steep topography that would make accessing via the ROW difficult or more impactful than the use of off-ROW roads.

The application states that the off-ROW access roads would typically be planned to 30 feet in width. There could be locations where the access road may need to be wider than 30 feet to accommodate certain topography and vehicles. If the project is approved, the applicants would refine off-ROW access routes during final construction planning. This planning stage would include landowner discussion and negotiations. The width of the off-ROW access routes is wider than that stated in other recent CPCN projects, and may cause more impacts to adjacent land and vegetation. Landowners may be able to negotiate which area is more impacted by the widening of existing routes to accommodate the proposed 30 feet width. After construction is completed, off-ROW access roads may be restored to pre-construction conditions or, depending on negotiations with the property owner, access roads constructed in upland areas may be left in place.

Generally, this area of the project is more level, and has roads that allow access to much of the proposed routes. Only one off-ROW access road is proposed to be used if the Subsegment Y06B is used in the Dane County Routing Area. The off-ROW access road would be approximately 0.20 miles in length and facilitate access to an area where there are forested slopes near the proposed ROW. The off-ROW access road appears to follow a gravel road that allows access to property owned by Dane County on the north

[321] The estimated overhead cost per mile is expected to range from $4.5 million to $5 million, which includes taxes, contingency, and escalation to 2023 dollars and the cost to double-circuit with the existing 69 kV line.

side of USH 14. The route would likely be widened, resulting in the removal of mature trees, to allow machinery access and delivery of materials.

Table 9-4 Off-ROW access road impacts by route alternative[322]

Route Alternative	Number of Roads	Length (miles)	Area (acres)	Wetlands (acres)	Upland Forest (acres)	Grassland (acres)	Agriculture (acres)
Common Subsegments	None identified						
Black Earth Creek-North	2	0.27	0.98	0	0.16	0.01	0.09
Black Earth Creek-South	None identified						

9.1.5. Laydown yards

During construction, laydown yards are utilized to minimize disturbance and provide suitable work surfaces for the temporary storage and staging of construction equipment and material. Laydown yards, also referred to as temporary staging areas, are used throughout construction to set up and store materials, job trailers, storage containers, portable toilets, dumpsters, construction mats, tools, equipment, etc. A typical laydown yard would be about 10 acres in size with a minimum of a 30-foot-wide driveway for ingress and egress; however, for the proposed project laydown yard size varies throughout the project area.

The typical construction activities that are involved in constructing laydown yards include the installation of erosion control measures, leveling of uneven surfaces, stripping and stockpiling of topsoil (if necessary), and installing (as needed) gravel, tracking pads, culvert(s), power, and fencing. This work is generally completed using equipment such as a bulldozer and dump trucks. The disturbance from any laydown yard would depend upon soil type and topography. Areas that are paved or have been previously graded and cleared of vegetation such as parking lots, old gravel pits, or fields are ideal locations for laydown yards.

Generally, the last step in the construction process would be to remove all items such as trailers, security fences, left over materials, storage containers, portable toilets, dumpsters, construction mats, tools, and equipment from the laydown yard. Depending on landowner preferences, laydown yards could be left in place or returned to prior conditions following construction activities.

The proposed laydown yards located within the Dane County Routing Area and the potential environmental impacts323 associated with each proposed laydown yard are included in Table 9-5. The proposed laydown yards are included in the same figures of the proposed route alternatives in Appendix A, as referenced in the table below.

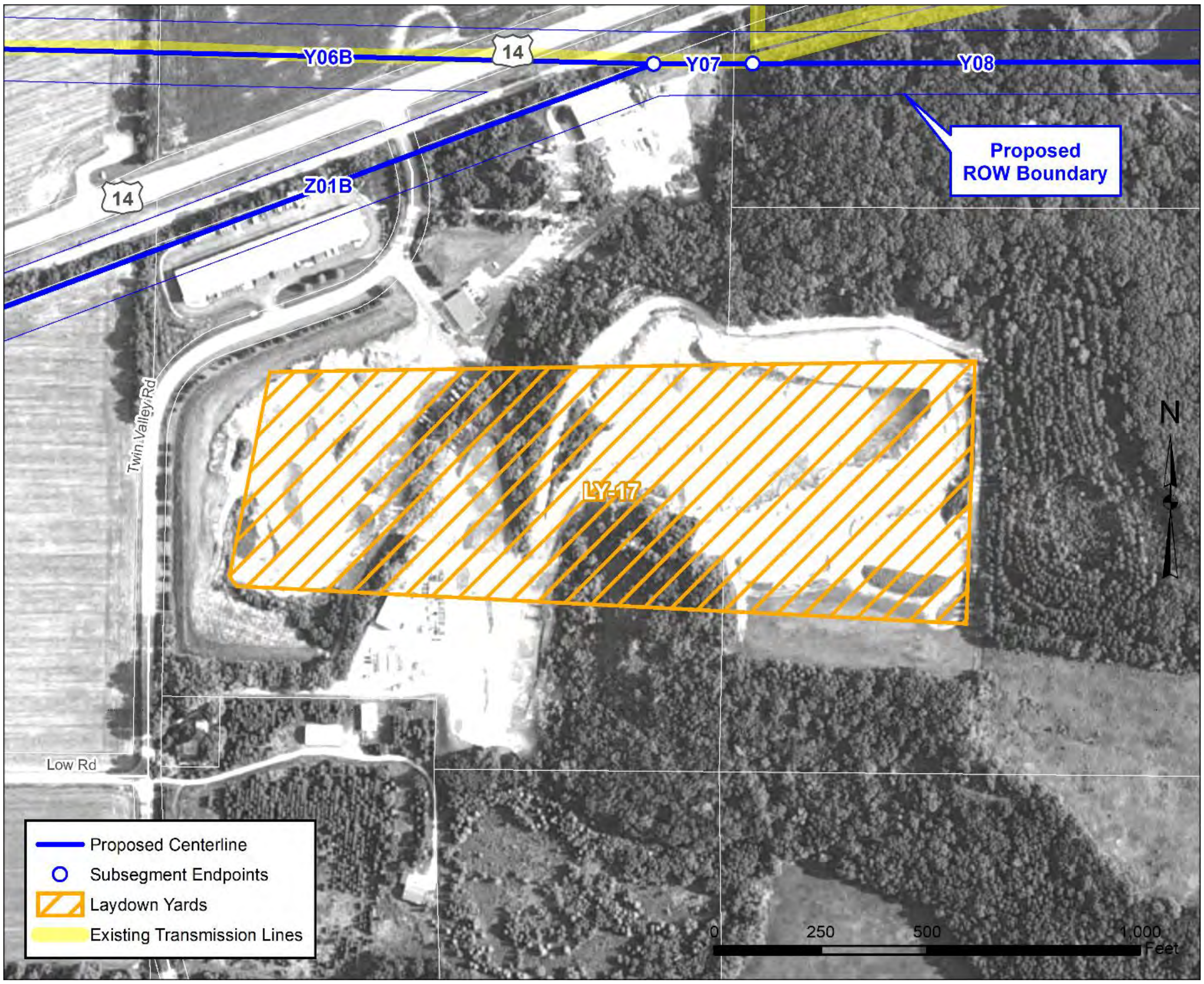
Refer to Section 2.1.5.3 for additional information on temporary workspaces that would also be utilized throughout the project area.

[322] Data compiled from Application, Appendix B, Table 8, updated in response to Data Request 4.72.
[323] PSC REF#: 345376

Table 9-5 Proposed laydown yard near Dane County Routing Area

Laydown Yard	Location	Size (acres)	Existing Land Use	Agricultural Land Cover (acres)	Grasslands Land Cover (acres)	Non-Forested Wetland Land Cover (acres)	Developed Land Cover (acres)	Appendix A Reference
LY-17	Twin Valley Road	21.81	Gravel Pit	0.00	0.77	4.43	16.61	Figure 1.27

Figure 9-2 Laydown Yard LY-17 near USH 14 in the town of Middleton



9.2. NATURAL RESOURCES AND POTENTIAL IMPACTS

9.2.1. Natural resource properties

This section discusses the properties in this part of the project area that are managed primarily for protecting natural resource habitat (Figure 9, Appendix A). These properties may include publicly-owned lands and also private lands covered by a conservation easement or agreement. There may be some overlap in this section with properties discussed in Section 9.3.5 because some properties serve multiple functions or have multiple designated uses. Note there may be additional conservation easements or agreements not included below that may exist within the project area. If any additional easement or agreements exist, they would be identified during the easement acquisition process if the project is approved.

In instances where impacts are anticipated to occur as a result of the project, the applicant should coordinate as early in the process as possible with the appropriate owner or manager of the property. Specifically, the applicant should attempt to identify landowner concerns, determine the probability and nature of impact, and, if possible work with the landowner to develop a mitigation strategy that would either lessen or eliminate potential impacts.

The Ice Age Trail Alliance provided information during the scoping comment period regarding a portion of the proposed project, generally from County Road P in western Dane County to Twin Valley road near the Cardinal Substation, where they are concerned about the visual impacts of a new high voltage transmission line. That stretch would cover nearly the entire routing area and is discussed in greater detail in Section 9.1.3.1.

9.2.1.1. Common subsegments

Subsegment Y01A would pass within 200 feet of the southern boundary of the Ice Age Trail Recreational Area, and then cross over an unnamed tributary to Black Earth Creek. Although no direct physical impacts are anticipated to occur to the Ice Age Trail Recreational Area, the applicant should coordinate construction activities in this area with Ice Age Trail Alliance management, and with the appropriate DNR staff to eliminate or minimize any indirect impacts to either public land.

9.2.1.2. Black Earth Creek-North

Subsegment Y06B proposes to cross a property encumbered with a Knowles-Nelson Stewardship Nonprofit Conservation Organization (NCO) Habitat Area subprogram grant. The property name is Sunnyside Seed Farm/Black Earth Creek and is owned by and grantee is Dane County Parks. If the project is approved and Black Earth Creek-North selected, detailed review would be required to determine the extent to which the proposed route impacts grant-encumbered property.

9.2.1.3. Black Earth Creek-South

Subsegments Z02 and Z01B proposes to cross a property encumbered with a Knowles-Nelson Stewardship Nonprofit Conservation Organization (NCO) Habitat Area subprogram grant. The property name is Sunnyside Seed Farm/Black Earth Creek and is owned by and grantee is Dane County Parks. If the project is approved and Black Earth Creek-South selected, detailed review would be required to determine the extent to which the proposed route impacts grant-encumbered property.

9.2.2. Forested lands

General impacts to forested communities from high-voltage transmission lines are discussed in greater detail in Section 4.6.2. The discussion below focuses on forest resources and forested communities in the Dane County Routing Area and although impacts to forested wetlands are mentioned, refer to Section 9.2.4 for more information. Many of the tree species mentioned in this section would be considered incompatible vegetation by transmission owners and therefore would be actively eliminated within the proposed ROW. This would significantly alter, and permanently affect, the existing and future ecological communities within the proposed ROW. If trees are removed from the proposed ROW and the remaining vegetation is not actively managed to encourage an ecological community that effectively outcompetes[324] tree seedlings, the ROW could become dominated with fast growing incompatible vegetation that could quickly colonize the ROW and require significant effort and disturbance to remove. Refer to Section 4.6.5 for more information about vegetative assets in utility ROWs.

Portions of subsegments within this routing area are sited along existing high-voltage transmission line corridors. If the applicants do not release the existing easements and continue to maintain the existing corridors as utility ROWs, even though transmission facilities would be double-circuited with the proposed Cardinal-Hickory Creek project, the quantification of impacts to forested areas provided by the applicants in its application would greatly underestimate the cumulative impacts forest resources and forest communities would experience if the Cardinal-Hickory Creek project was approved. The new Cardinal-Hickory Creek corridor would be, in some areas, much greater than the 150-foot-wide corridor identified in the application. Refer to Section 4.6.2.1 about the impacts associated with forest fragmentation.

The Dane County Routing Area is located within two ecological landscapes (Figure 3, Appendix A) including the:

- Western Coulees and Ridges[325] - Subsegments W03, W04, Y01A, Y01B, Y01C, and Y05, and
- Central Sand Hills[326] - Subsegments Y05, Y06A, Y06B, Y07, Y08, Z02, and Z01B.

The Western Coulees and Ridges used to contain the state's most extensive area of oak forest, oak openings, and oak woodland. The hardwood-dominated forests found in this landscape are more extensive than in other southern Wisconsin ecological landscapes; however, they have been dissected and interspersed with agricultural and residential areas. Forest cover in the Western Coulees and Ridges is currently dominated by oaks and hickories, with maples and basswoods also making up a significant portion of the mature forest canopy. Bottomland hardwoods dominated by silver maple, swamp white oak, river birch, ashes, elms, and cottonwood are also common in this area, especially within the floodplains of the larger rivers in the area. Due to the steep topography found throughout this landscape, limited access, development, and cultivation along steep slopes have allowed them to stay heavily forested. Dry-mesic and mesic hardwood forests are common throughout this ecological landscape, and these oak-dominated hardwoods are well known for their high ecological, economic, aesthetic, and recreational importance. Sustainable management of these oak-dominated forests is very difficult considering that mature oak stands and their associated ecological communities are very difficult to restore once lost. This should be taken into consideration when evaluating the impacts the proposed project would have on the forest resources and forested communities in this area.

The Central Sand Hills (Black Earth Creek-North, Black Earth Creek-South, and some common subsegments) was historically dominated by either oak forests or oak openings, scattered with marsh and sedge meadow wetlands. Historically, forests, woodlands, and savanna communities in the Central Sand Hills covered most of this ecological landscape; however, now these forested communities only represent about one-third of this landscape. Most of this loss is due to agricultural conversion, residential development, and ecological succession due to the absence of fire to maintain this landscape. Over time, the fire-adapted oaks have been replaced by eastern white pine or red maple, and red pine in sandier areas.

---

324 For example, implementation of an IVM program accredited by the ROWSC.

325 Wisconsin Department of Natural Resources. 2015. *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management.* Chapter 22, Western Coulees and Ridges Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS-1131X 2015, Madison.

326 Wisconsin Department of Natural Resources. 2015. *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management.* Chapter 9, Central Sand Hills Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS-1131K 2015, Madison.

Forest cover in the Central Sand Hills is highly variable and site specific, but when present it is generally dominated by oaks and pines, with lowland hardwoods also making up a portion of the remaining mature forest canopies. Nearly all the lowland hardwoods in this landscape are associated with the floodplains of the larger rivers. The lack of regeneration by some tree species and the continued disruption of hydrologic regimes, introduction of invasive species, and the loss of specific tree species (such as elms and ash) due to disease make the floodplain forests within this landscape especially vulnerable to disturbance. This should be taken into consideration when evaluating the impacts the proposed project would have on the remaining forested communities in this area.

In addition to the trees that are located in more natural settings, trees are also vitally important to cities, villages, and towns; and similar to electricity and water, an urban tree canopy is considered a part of the infrastructure of the community providing valuable environmental, economic, and social benefits[327]. This routing area is located adjacent to the Cross Plains and Middleton.

The applicants' characterized the forested areas[328] within the proposed ROW of this routing area as primarily deciduous stands. Most of these stands consisted of either pole-size or sawtimber logs, under private ownership used primarily for recreation. There is one property that has forested lands enrolled in MFL. The applicants' identified oaks, aspens, black cherry, black walnut, boxelder, northern red oak, and eastern cottonwood as common in the overstory with barberry, honeysuckle, buckthorn, hazelnut, and autumn olive found throughout the understory.

The applicants also identified several shrublands within this routing area. These shrublands were identified along Segments Y and contain several species including honeysuckle, autumn olive, sumac, buckthorn, nannyberry, and grey dogwood. Shrublands are unique habitats that are often considered transitional ecological communities that are heavily used by wildlife. These areas are also likely targeted by transmission owners as containing incompatible species. Clearing of shrublands for construction, as well as during vegetation management cycles, should be monitored closely as these areas can be assets to transmission owners for outcompeting incompatible tree species (Refer to Section 4.6.5); however, if they are continually disturbed they can become more problematic to transmission owners if they are not managed correctly.

9.2.2.1. Common subsegments

Along this route alternative, a total of approximately 15.5 acres of forested lands (15.2 acres of upland forest and 0.3 acres of forested wetland) would be impacted and permanently lost if this route alternative was constructed. No forested wetlands or MFL properties have been identified along this route alternative.

9.2.2.2. Black Earth Creek-North

Along this route alternative, a total of approximately 6.6 acres of upland forest would be impacted and permanently lost if this route alternative was constructed. No forested wetlands or MFL properties have been identified along this route alternative. Off-ROW access roads identified for this route alternative would not require additional clearing of forested areas.

The Dane County Black Earth Creek Wildlife Area – Sunnyside Unit is located along Subsegment Y06B which already has an existing transmission corridor through the property. There is potential for more permanent bird habitat loss as a result of additional forest fragmentation along these proposed subsegments.

---

327 Urban and community forests, DNR accessed at: https://dnr.wi.gov/topic/UrbanForests/.
328 Response to Data Request 4.50, Table 2 Environmental Inventory (PSC REF#: 353722)

9.2.2.3. Black Earth Creek-South

Along this route alternative, a total of approximately 6.6 acres of forested lands (5.6 acres of upland forest and 1.0 acres of forested wetland) would be impacted and permanently lost if this route alternative was constructed. There is one property along this route alternative that has forested lands enrolled in MFL that could be impacted by the proposed project.

The Dane County Black Earth Creek Wildlife Area – Sunnyside Unit is located along Subsegments Z02 and Z01B; however, the proposed subsegments along Black Earth Creek-South would be located in more open areas of this property.

9.2.2.4. Summary of potential impacts

Table 9-6 Summary of proposed impacts to forested lands by route alternative in the Dane County Routing Area. Off-ROW access roads identified in this routing area would not require additional upland forest clearing.

Route Alternative	Upland Forest (acres)	Forested Wetland (acres)	Total Forest Area (acres)	Off-ROW Upland Forest Area (acres)	MFL Properties (count)
Common Subsegments	15.2	0.3	15.5	0	0
Black Earth Creek-North	6.6	0	6.6	0.16	0
Black Earth Creek-South	5.6	1.0	6.6	0	1

9.2.3. Grasslands

Many grasslands in this routing area are in existing utility line or road ROW. These types of grasslands often consist of non-native, cool-season grasses and weedy plant species. They may be managed by regular mowing in the case of road ROWs, occasional mowing or brushcutting for utility ROWs, and some use of herbicides. There may be areas of remnant prairie habitats not identified in the application. On site visits to other projects in this region of the state, Commission and DNR staff have come across areas of more diverse prairie vegetation in road ROWs, railroad embankments, and utility corridors than in other parts of the state. If the project is authorized, a review of grassland habitat in the approved ROW should determine if there are areas of remnant prairies prior to starting construction. If any prairie remnants are found, the applicants should adopt mitigation actions accordingly to avoid impacts to these ecologically valuable areas.

Impacts to any wet-grassland habitats are not covered in this section of the EIS, see Section 9.2.4 for impacts to these habitat types.

Expected impacts from construction activities would include direct damage to plants, the potential spread of invasive species, and the rutting or compaction of soils. These impacts could be minimized through the use of matting, accessing the site during frozen conditions or during plant dormancy, and the use of BMPs to avoid spreading invasive species (Section 4.6.4.2.1). Identifying, marking and directly avoiding any areas of high plant diversity would likely be the most effective way of avoiding impacts. Any reseeding used during site restoration should use a mix of native species suitable to the area. Treatment of invasive species using non-specific herbicide application could impact native plant species. In areas where considerable work has gone into restoring or developing prairie habitats, any herbicide drift or non-specific application could have longer-term impacts on the success of any prairie conservation work.

9.2.3.1. Common Subsegments

A total of 11.43 acres of grassland would be impacted across the common segments of this route area. Approximately 7.88 acres are located in existing ROW, and approximately 3.55 acres of new grassland habitat would be impacted.

An area of restored prairie (approximately 0.85 acres) around the southern border of the Cardinal Substation was identified in the application table. If mitigation actions during construction are not followed, this restoration work may be undone. However, the applicants could use this as a unique opportunity to enhance the existing restored prairie if the project is approved.

9.2.3.2. Black Earth Creek-North

If the route option that proceeds through the Black Earth Creek Sunnyside Unit would be selected (Y06B), an additional 2.0 acres of grassland would be impacted, with 1.11 acres located in existing ROW and approximately 0.89 acres of new grassland habitat impacted.

9.2.3.3. Black Earth Creek-South

If the route that runs parallel to STH 14 would be selected (Z02 and Z01B), an additional 3.57 acres of grassland would be impacted, with 1.88 acres located in existing ROW and approximately 1.69 acres of new grassland habitat impacted. Part of this acreage would be on the Black Earth Creek Wildlife Area Sunnyside unit, and is categorized by the applicants in GIS data as a fallow field with agricultural weeds.

Table 9-7 Summary of grassland impacts within the Dane County Routing Area

Route Alternative	Shared ROW (acres)	New ROW (acres)	Off-ROW Access Roads (acres)	Total Impact (acres)
Common Subsegments	7.88	3.55	None identified	11.43
Black Earth Creek-North	1.11	0.89	0.01	2.0
Black Earth Creek-South	1.88	1.69	None identified	3.57

9.2.4. Wetlands

General information about wetland resources and the potential short- and long-term potential impacts of constructing transmission line through and across wetlands can be found in Section 4.6.7.

9.2.4.1. Black Earth Creek-North

Proposed Subsegment Y06B contains two wetlands within the proposed ROW, totaling 3.71 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow, farmed wetland, and seasonally flooded basin. Neither of these wetlands were identified as significant or high-quality when considering factors such as species composition, structural diversity, and hydrological functions. A total of two structures would be constructed in wetlands, resulting in 0.004 acres of permanent wetland impact. Temporary wetland impacts are anticipated to be 1.58 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

There are no wetland impacts associated with off-ROW areas for Black Earth Creek-North.

9.2.4.2. Black Earth Creek-South

Proposed Subsegment Z01B contains one wetland within the proposed ROW, a wet meadow, totaling 1.51 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.43 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment Z02 contains four wetlands within the proposed ROW, totaling 2.10 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as wet meadow and hardwood swamp. None of these wetlands were identified as significant or high-quality when considering factors such as species composition, structural diversity, and hydrological functions. One of the four wetlands is identified as ASNRI. One structure would be constructed in wetlands, resulting in 0.002 acres of permanent wetland impact. Temporary wetland impacts are anticipated to be 1.54 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.98 acres.

There are no wetland impacts associated with off-ROW areas for Black Earth Creek-South.

9.2.4.3. Common Subsegments

Proposed Subsegment W03 contains one wetland within the proposed ROW, a wet meadow, totaling 0.19 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. One structure would be constructed in this wetland, resulting in 0.002 acres of permanent wetland impact. Temporary wetland impacts are anticipated to be 0.19 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment Y01C contains one wetland within the proposed ROW, a mixture of open water and wet meadow, totaling 0.00003 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impact and forested wetland conversion is not anticipated.

Proposed Subsegment Y05 contains two wetlands within the proposed ROW, totaling 0.14 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. These wetlands are classified as sedge meadow, wet meadow, and wet prairie. Based on field investigations, one of the two wetlands were identified as significant or high-quality and designated as an ASNRI. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.12 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment Y06A contains one wetland within the proposed ROW, a mixture of wet meadow and shallow marsh, totaling 0.01 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. This wetland was not identified as high quality when considering factors such as species composition, structural diversity, and hydrological functions. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.008 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment Y07 contains one wetland within the proposed ROW, a mixture of wet meadow, shallow marsh, and hardwood swamp, totaling 0.11 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. Based on field investigations, this wetland was identified as significant or high-quality. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.04 acres due to the placement of construction matting. Forested wetland conversion is not anticipated.

Proposed Subsegment Y08 contains one wetland within the proposed ROW, a mixture of wet meadow, sedge meadow, shallow marsh, and deep marsh, totaling 5.50 acres of wetland. The applicants identified these wetlands through a combination of wetland delineations conducted in the 2017 growing season and review of available desktop mapping resources. Based on field investigations, this wetland was identified as significant or high-quality. Permanent wetland fill is not anticipated. Temporary wetland impacts are anticipated to be 0.26 acres due to the placement of construction matting. Forested wetland conversion is anticipated to be 0.27 acres.

There are no wetland impacts associated with off-ROW areas for the common subsegments within the Dane County Routing Area.

9.2.4.4. Summary of potential impacts

The wetlands present within each route alternative are summarized in Tables 9-8 and 9-9 below.

Table 9-8 Wetland habitat present within the proposed ROW of route alternatives within the Dane County Routing Area. Common subsegments have been included in each route alternative, as applicable.

Route Alternative	Forested Wetland			Non-Forested Wetland		Significant/High Quality Wetlands (count)
	Existing Shared ROW Not Cleared (acres)	Existing Shared ROW (acres)	New ROW (acres)	Existing Shared ROW (acres)	New ROW (acres)	
Black Earth Creek-North	0.00	0.00	0.27	1.63	3.59	3
Black Earth Creek-South	0.00	0.00	1.25	0.54	3.52	3

Table 9-9 Wetland impacts within the proposed ROW of route alternatives within the Dane County Routing Area. Common subsegments have been included in each route alternative, as applicable. Off-ROW Access roads identified by the applicants are not anticipated to have any associated wetland impacts.

Route Alternative	Total Wetland Present (acres)	Temporary wetland impact (acres)	Permanent wetland impact (acres)	Wetland conversion (acres)
Black Earth Creek-North	5.5	2.20	0.006	0.27
Black Earth Creek-South	5.31	2.59	0.004	1.25

9.2.5. Waterways

General information about waterways and the potential short- and long-term potential impacts of constructing transmission line through and across waterways can be found in Section 4.6.6.

9.2.5.1. Black Earth Creek-North

Proposed Subsegment Y06B contains one waterway within the proposed ROW, Black Earth Creek. Black Earth Creek is a tributary to Blue Mounds Creek and is a designated Class 1 trout stream, ORW waterway, and ASNRI waterway. This waterway meanders in and out of the proposed ROW, creating a total of two waterway crossings within the ROW. Both waterway crossings are proposed to be traversed via TCSB's for vehicle access.

There are no waterway impacts associated with off-ROW areas for Black Earth Creek-North.

9.2.5.2. Black Earth Creek-South

Proposed Subsegment Z02 contains one waterway within the proposed ROW, Black Earth Creek, which is a designated ASNRI waterway. This waterway meanders in and out of the proposed ROW, creating a total of five waterway crossings within the ROW. Of the five waterway crossings, three are proposed to be traversed via TCSB's for vehicle access and the remaining two crossings would not be traversed by vehicles.

There are no waterway impacts associated with off-ROW areas for Black Earth Creek-South.

9.2.5.3. Common Subsegments

Proposed Subsegment W03 contains one waterway within the proposed ROW, an unnamed tributary to Black Earth Creek. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment Y01A contains one waterway within the proposed ROW, an unnamed tributary to Black Earth Creek. This waterway is not designated as an ASNRI and is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment Y01B contains one waterway within the proposed ROW, Black Earth Creek, which is a designated ASNRI waterway. This waterway is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment Y05 contains one waterway within the proposed ROW, Black Earth Creek, which is a designated ASNRI waterway. This waterway is proposed to be traversed via a TCSB for vehicle access.

Proposed Subsegment Y06A contains one waterway within the proposed ROW, Black Earth Creek, which is a designated ASNRI waterway. This waterway is proposed to be traversed via a TCSB for vehicle access.

There are no waterway impacts associated with off-ROW areas for the common subsegments in the Dane County Routing Area.

9.2.5.4. Summary of potential impacts

The proposed waterways impact by route alternative are summarized in Table 9-10 below.

Table 9-10 Waterways present within the proposed ROW of route alternatives within the Dane County Routing Area. Common subsegments have been included in each route alternative, as applicable.

Route Alternative	Waterways Present	ASNRI Waterways Present	Waterway Crossings Proposed	**TCSB's** Required	**TCSB's** Required over ASNRI
Black Earth Creek-North	6	4	7	7	5
Black Earth Creek-South	6	4	10	8	6
Off-ROW Access Roads (all)	Not Provided	Not Provided	Not Provided	0	0

9.2.6. Endangered resources

This section discusses the potential impacts to endangered resources that may be affected by construction or operation of the proposed route alternatives in the Dane County Routing Area which includes common subsegments as well as Black Earth Creek-North and Black Earth Creek-South route alternatives. A general discussion of endangered resources is presented earlier in Section 4.6.1.

Endangered resources include rare or declining species, high quality or rare natural communities, and animal concentration sites. Endangered resources are tracked via the state's NHI database which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the proposed ROW and a buffer of 1.0 mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

This section identifies the endangered resources that could be present within the Dane County Routing Area, the project's potential impacts on these resources, and the avoidance measures that should be implemented. This section does not cover endangered resources that, while they may be present in the area, would not be impacted by this project. Rare species are discussed individually or as taxa groups if there is a high level of concern. The information discussed in this section includes information from existing sources within DNR including the NHI database, as well as external sources including landowners and surveys completed by the applicants.

For specific subsegments, an incidental take of state threatened or endangered animal species may occur as defined by Wis. Stat. § 29.604. Should this happen, an ITA would be required for construction to proceed on those subsegments. Instances where existing information indicates that additional assessment or consultation for would be needed to assess potential incidental take are also described in this EIS.

9.2.6.1. Birds

No known rare bird species with suitable habitat present were documented in the NHI database within the Dane County Routing Area.

9.2.6.2. Mammals

9.2.6.2.1 Common Subsegments (W03, W04, Y01A, Y01B, Y01C, Y05, and Y06A)

One state threatened bat species has been documented in the vicinity of these proposed common subsegments. This species can be found roosting in trees, bat houses, and buildings during the summer and hibernating in caves and mines from fall through spring. They forage primarily over open water and along edge habitats. This species is covered under the Cave Bat Broad ITA which recommends that where suitable habitat occurs, presence/absence surveys be conducted and limited/no tree clearing take place during the species' maternity period (June 1-August 15).

One state special concern small mammal has also been documented to occur within the vicinity of this proposed common route. This species is known to be found in dry open areas such as prairies and barrens which may be present within the proposed ROW. Therefore, it is recommended that impacts to this habitat be minimized, especially during the breeding season from March-November.

9.2.6.2.2 Black Earth Creek-North

No rare mammals with suitable habitat were present within the common subsegments that were documented from the NHI database.

9.2.6.2.3 Black Earth Creek-South and Common Subsegments (Y07 and Y08)

One state special concern small mammal has been documented to occur within the vicinity of this proposed route. This species is known to be found in dry open areas such as prairies and barrens which may be present within the proposed ROW. Therefore, it is recommended that impacts to this habitat be minimized, especially during the breeding season from March-November.

9.2.6.3. Herptiles

No known rare herptiles with suitable habitat present within the route were documented in the NHI database within the vicinity of the proposed ROW in the Dane County Routing Area.

9.2.6.4. Terrestrial invertebrates

9.2.6.4.1 Common Subsegments (W03, W04, Y01A, Y01B, Y01C, Y05, and Y06A)

The majority of this proposed route intersects the Rusty Patched Bumble Bee High Potential Zone and there are known occurrences of the bee nearby. Suitable habitat does appear to be present in some locations, and it would be highly recommended that where suitable habitat is present, to restore the area with a native prairie seed mix. This zone is a federally regulated zone and the applicants should consult with FWS regarding any further recommendations or requirements for this proposed subsegment.

Two endangered and three special concern moth and butterfly species have been observed in the vicinity of this proposed common route. Suitable habitat for all five species include woodlands, forest edges, and prairies which appear to be present along this proposed route. If this route is ordered, host plant surveys would be required in suitable habitat locations for the two endangered species. If host plants were located, surveys for the species itself would then be required if not already assumed present. An ITA would be likely if found or assumed present and the host plants could not be avoided.

9.2.6.4.2 Black Earth Creek-North and Black Earth Creek-South

Portions of these proposed route alternatives intersect the Rusty Patched Bumble Bee High Potential Zone and there are known occurrences of the bee nearby. Suitable habitat does appear to be present in some locations, and it would be highly recommended that where suitable habitat is present, to restore the area with a native prairie seed mix. This zone is a federally regulated zone and the applicants should consult with FWS regarding any further recommendations or requirements.

One endangered moth species has been observed in the vicinity of both proposed subsegments. Suitable habitat for this species includes mesic to wet prairies which appear to be present along both route alternatives, especially Black Earth Creek-South. If either route alternative is ordered, host plant surveys would be required in suitable habitat locations. If host plants were located, surveys for the species itself would then be required if not already assumed present. An ITA would be likely if found or assumed present and the host plants could not be avoided.

9.2.6.4.3 Common Subsegments (Y07 and Y08)

Portions of these proposed subsegments intersect the Rusty Patched Bumble Bee High Potential Zone and there are known occurrences of the bee nearby. Suitable habitat does appear to be present in some locations, and it would be highly recommended that where suitable habitat is present, to restore the area with a native prairie seed mix. This zone is a federally regulated zone and the applicants should consult with FWS regarding any further recommendations or requirements for this subsegment.

9.2.6.5. Fish and Aquatic invertebrates

Along the proposed common subsegments from either Eastern-North or Eastern-South, one special concern dragonfly species may be present within Black Earth Creek which crosses the proposed ROW and may be impacted by project activities occurring below the ordinary high water mark. Strong erosion and siltation control measures are encouraged to minimize impacts.

9.2.6.6. Plants

Impacts on natural communities can ultimately change habitat conditions and make it difficult for rare plants to persist. Wisconsin's Endangered Species Law protects state-listed endangered and threatened plant species only on public lands, but utility (including transmission line projects), agriculture, forestry, and bulk sampling projects are exempted from this protection. Additional surveys and avoidance/minimization measures for rare plant species are encouraged and recommended. Potential avoidance measures may include conducting plant surveys to determine presence/absence and avoiding areas where known plants occur. Other measures such as winter construction, use of mats to limit direct disturbance, or relocation, can minimize losses. DNR would also recommend that the applicants and landowners with rare species on their property develop a plan to protect these species.

9.2.6.6.1 Common Subsegments (W03, W04, Y01A, Y01B, Y01C, Y05, and Y06A)

One state threatened plant species may occur within the proposed ROW of this common route where suitable prairie, woodland, and occasionally, roadside habitat occurs. Further review would be recommended to determine where habitat and species surveys should be conducted.

9.2.6.6.2 Black Earth Creek-North and Black Earth Creek-South

One state threatened plant species may occur within the proposed ROW of this common route where suitable prairie, woodland, and occasionally, roadside habitat occurs. Further review would be recommended to determine where habitat and species surveys should be conducted.

9.2.6.6.3 Common Subsegments (Y07 and Y08)

No rare plant species have been documented from the NHI database within the vicinity of these proposed subsegments.

9.2.6.7. Natural communities

No natural communities are known to be present within or adjacent to this routing area.

9.2.6.8. Summary of potential impacts

Tables 9-11 through 9-14 identify the general types and numbers of rare species, natural communities, and other features that were identified as potentially impacted within the Dane County Routing Area primarily based on information from the NHI database.

Table 9-11 Summary of endangered resources impacted along Common Subsegments W03, W04, Y01A, Y01B, Y01C, Y05, and Y06A

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed, Candidate, or Species of Concern	Not Applicable
Birds					
Mammals	1	1			
Herptiles					
Terrestrial Invertebrates	2	4	1		
Fish/Aquatic Invertebrates		1			
Plants	1				
Natural Communities					
Summary	4	5	1	0	0

Table 9-12 Summary of endangered resources along Black Earth Creek-North

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds					
Mammals					
Herptiles					
Terrestrial Invertebrates	1	1	1		
Fish/Aquatic Invertebrates					
Plants	1				
Natural Communities					
Summary	2	1	1	0	0

Table 9-13 Summary of endangered resources along Black Earth Creek-South

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds					
Mammals		1			
Herptiles					
Terrestrial Invertebrates	1	1	1		
Fish/Aquatic Invertebrates					
Plants	1				
Natural Communities					
Summary	2	2	1	0	0

Table 9-14 Summary of endangered resources along Common Subsegments Y07 and Y08

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds					
Mammals		1			
Herptiles					
Terrestrial Invertebrates		1	1		
Fish/Aquatic Invertebrates					
Plants					
Natural Communities					
Summary	0	2	1	0	0

In summary, there would be little to no rare species impacts along the common subsegments in this routing area; although, if results of host plant and invertebrate surveys show presence, an ITA could be needed. Regardless, based on the number of rare invertebrate species that may be present, restoration with a native seed mix is highly encouraged.

Black Earth Creek-South appears to have more suitable habitat for the endangered moth which may result in an ITA. There is potential for more permanent bird habitat loss along Black Earth Creek-North as a result of forest fragmentation.

At the Cardinal Substation, there are fewer known potential impacts; however, there is plenty of forested upland habitat which could provide habitat for many species, both common and rare.

9.2.7. Invasive species

The applicants had access to some, but not all, areas of the proposed project during the planning stage. Where the applicants had access to proposed routes during the 2017 growing season, observations of invasive plant species were noted when practicable. The general location and species observed were added to an overall evaluation of the risk of spreading invasive species, pests, or diseases as a result of project construction activities. Wetland delineations and vegetation mapping tasks were the source of most of these observations; however, a targeted survey of proposed route alternatives to identify invasive species was not done. Other invasive species may be present in the project area and a more thorough assessment of invasive species presence should be done prior to the start of construction, if approved.

In addition to the applicants' observations of invasive species in this routing area, Commission staff reviewed the project using the DNR Lakes and Aquatic Invasive Species Viewer. This database has some records of aquatic invasive species, but the lack of any observations should not be interpreted as meaning there are no invasive species in a given area. This routing area has records of Curly-leaf pondweed and Eurasian water milfoil where the proposed routes would cross the Black Earth Creek. Commission staff are also aware of the presence of New Zealand Mudsnail in Black Earth Creek, although current records show the closest location of the highly invasive invertebrate is downstream in Cross Plains. The application states that work below the OHWM would be avoided to the extent practicable. Any machinery, equipment, or materials that are placed below the OHWM of a waterway should be decontaminated for invasive species before being used in another waterway in accordance with Wis. Admin. Code § NR 329.04(5).

The project area of southwestern Wisconsin has a range of plant pests that could affect trees and forestry operations such as oak wilt, emerald ash borer, and gypsy moths. See Section 4.6.2 for more discussion on these potential impacts to forests. The applicants state that standard BMPs to reduce the spread of these plant pests would be used during tree clearing operations. These BMPs include avoiding impacts to oak trees from April 1-July 15, and following guidelines to avoid spreading emerald ash borer and gypsy moths by leaving cut vegetation on site when possible.

A full list of invasive species that were recorded in the project area is provided in Section 4.6.4.3, and the invasive species recorded in this routing area are identified below. When invasive species are encountered, the applicants should implement the BMPs identified in Section 4.6.4.2 to minimize the spread of invasive species as a result of any activities conducted for the proposed project.

For the Dane County Routing Area, the application states that the following species were observed:

- Garlic mustard (*Alliaria petiolata*)
- Cattail (*Typha angustifolia, T. X glauca*)
- Canada thistle (*Cirsium arvense*)
- Bell's honeysuckle (*Lonicera bella,*)
- Amur honeysuckle (*Lonicera maackii,*)
- Tartarian honeysuckle (*Lonicera tatarica*)
- Leafy spurge (*Euphorbia esula*)
- Wild parsnip (*Pastinaca sativa*)
- White mulberry (*Morus alba*)
- Black locust (*Robinia pseudoacacia*)
- Multiflora rose (*Rosa multiflora*)
- Crown vetch (*Coronilla varia*)
- Autumn olive (*Elaeagnus umbellata*)
- Dame's rocket (*Hesperis matronalis*)
- Oriental bittersweet (***Celastrus orbiculatus)***

9.2.8. Archaeological and historic resources

The applicants completed several reviews in order to identify potential resources within the Dane County Routing Area.[329] The reviews identified two archaeological sites. Commission staff requested additional details from the applicants regarding potential impacts to resources as well as mitigation options[330]. Commission staff have also contacted the Ho-Chunk Tribal Historic Preservation Officer for comment regarding potential impacts to Native American burial mounds and have not received any additional information regarding potential impacts of the proposed project at this time.

9.2.8.1. Black Earth Creek-North (Subsegment Y06B)

- **DA-0667 (Subsegment Y06B, Off-ROW Access Road)** consists of a prehistoric lithic scatter/workshop intersected by an access road connecting to proposed Subsegment Y06B. The archaeological consultant recommended a complete survey of the site.

- **DA-0668 (Subsegment Y06B)** consists of a prehistoric lithic scatter/workshop adjacent to proposed Subsegment Y06B. The site has not been field surveyed or field verified. The archaeological consultant recommended complete survey of the site.

[329] PSC REF#: 341912, 341878, 341879, 341880, 345377, 345378, 345379, 345380, and 355953
[330] PSC REF#: 343192, 345369, 346685, 350239, and 355945

9.2.8.2. Summary of potential impacts

Table 9-15 Summary of potential archaeological and historic resource impacts in the Dane County Routing Area

Route Alternative	Archaeological Sites	Human Burial Sites	Historic Buildings	Historic Districts
Common Subsegments	0	0	0	0
Black Earth Creek-North	2	0	0	0
Black Earth Creek-South	0	0	0	0
Off-ROW Access Roads	1	0	0	0

In accordance with Wis. Stat. § 44.40 and the PSC-SHPO Interagency Programmatic Agreement, Commission staff is consulting with SHPO regarding resources identified within this section of the proposed project. Any work conducted within human burial sites would need a Permit to Disturb a Human Burial as per Wis. Stat. § 157.70. To further minimize or avoid impacts to archaeological and historic resources in the project area, the applicants should implement the recommended actions identified for each site.

9.3. COMMUNITY RESOURCES AND POTENTIAL IMPACTS

9.3.1. Agriculture

The presence of a high-voltage transmission line can adversely affect farm operations and field productivity. Refer to Section 4.5.2 for a discussion of potential impacts associated with transmission line construction and operation in agricultural fields. Transmission lines can affect field operations, irrigation, aerial spraying, windbreaks, and future land uses. DATCP will present its analyses of the potential impacts of the proposed project to farmed fields in its AIS. See Section 1.3.3. for a discussion of the role of DATCP in this project.

According to the application, no clear evidence of drain tile lines along the segments was apparent from either aerial photography interpretation or field investigation. However, there are areas of farmland along each route alternative that contain hydric soils in close proximity to ditches, which suggests that drain tiles may exist in these locations. If drainage tiles do exist along an approved route, construction vehicle traffic could break them. During the final design process, the applicants should work with landowners to place structures so that impacts to drain tiles are minimized, to the extent practicable. Other agricultural practices that may be affected by this project include windbreaks, organic farms, and automated tractor use.

Windbreaks consist of rows of trees that can help reduce wind erosion by providing a barrier on the windward side of a field. Depending on soil conditions and supporting practices, a single row of trees protects for a distance downwind of approximately 10 to 12 times (or more) the height of the windbreak. The removal of windbreaks because of transmission line construction, especially in agricultural soils highly susceptible to wind erosion, could result in reduced crop productivity due in part to a permanent loss of top soil and the potential for additional non-point pollution of downwind streams.

In recent years there has been discussion about the potential for construction projects to spread farm pests and diseases or to otherwise affect the health of farming operations. Concerns have been raised about Johne's disease, soybean cyst nematode, the spreading of ginseng diseases to plots reserved for future ginseng production, and pesticide contamination of soils on organic farms. Issues of biosecurity can be a concern to many farm operators.

Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly affect future crop yields. Soils may be mixed during the excavation of pole foundations or during the undergrounding of electrical lines. The excavation depth for transmission structure foundations can vary greatly, but in some projects may be more than 50 feet deep. Excavated parent material or subsoils should not be mixed with topsoils and spread on the surface of the ROW. Significant rutting can occur when soils become saturated or in areas of sensitive soils. Rutting might impact agricultural lands by increasing the mixing of soils, allowing topsoils to erode during rain events, and compacting soils. Compacted soils inhibit percolation of rainwater and, in turn, inhibit seed germination and crop root growth. The degree to which soils are compacted by heavy construction equipment again depends on the type of soil and its saturation level. Ineffective erosion controls may wash valuable topsoils downhill and impact wetlands and waterways. Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed.

Farms that practice organic farming would require specific protection measures during construction to avoid the spread of farm pests and diseases or to protect organic certifications. Additional issues for organic farms might be caused by the removal of tree buffers for new ROWs or the enlargement of existing ROWs. The removal of buffers might threaten a crop's organic status by increasing the potential for herbicide drift from adjacent fields. Biosecurity and organic farm impacts can be minimized by the applicants working with agricultural landowners well in advance of construction, giving advance notice of construction activities, and following through with agreed to protective measures.

The full width of the ROW would likely be cleared for construction of the proposed line, including properties currently planted with trees as part of plantations or tree farms. Under state statute (Section 4.4), landowners must be compensated for any crop damage caused by construction or maintenance of a high voltage transmission line. The applicants should work with tree farm and plantation landowners to minimize construction impacts and determine allowable post-construction use of the land within the easement.

Wisconsin Stat. § 182.017(7)(c) through (h) contains a list of landowner rights, many of which address issues important to farm fields, and these rights include required construction impact mitigation measures such as proper segregation of topsoils, post-construction restoration of the field, repair of damaged fences or drainage tile, payment for crop damage and others. A detailed discussion of landowners' statutory rights is included in Section 4.4.

In general, in advance of any construction for the project, the applicants would and should coordinate with each agricultural landowner regarding their farm operation including field facilities like drainage tiles, locations of farm animals and crops, current farm biological security practices, landowner concerns, and use of access routes. Potential impacts to each farm property along an ordered route would need to be identified and, where practicable, construction impact minimization measures would need to be agreed upon and implemented. Site-specific practices would need to vary according to the activities of the landowner/farm operator, the type of agricultural operation, the susceptibility of site-specific soils to compaction, the degree of construction occurring on the parcel, and the ability to avoid areas of potential concern.

Prime farmland is land that contains soils with certain characteristics that allow for high yields of a variety of commonly grown agricultural crops. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding. Prime farmland, as described here, is a categorization based on environmental factors. It is not a program, certification, or an easement category. The geologic history of the area played a large role in the formation of these farmlands.

Much of the land that is actively being farmed in the proposed ROW's of the project is comprised of NRCS-classified prime farmland. PSC staff reviewed GIS information to analyze and confirm the locations of prime farmland along the project routes.

Soil properties are only one of several criteria that are necessary for an area to be designated Prime farmland. Other considerations include:

- Land use – Prime farmland is designated independently of current land use, but it cannot include areas of water or urban or built-up land. Map units that are complexes or associations containing components of urban land or miscellaneous areas as part of the map unit name cannot be designated as prime farmland.
- Frequency of flooding – Some map units may include both prime farmland and land that is not prime farmland because of variations in flooding frequency.
- Water table – Some map units include both drained and undrained areas. Only the drained areas meet the prime farmland criteria.

9.3.1.1. Black Earth Creek-North

Approximately 47.8 percent of proposed Black Earth Creek-North is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 12.35 acres of crop land would be impacted by Black Earth Creek-North. There are no specialty crops located along Black Earth Creek-North that Commission staff or the applicants are aware of.

There are no agricultural buildings within 300 feet or dairy operations within 0.5 miles of the centerline of this route alternative.

No organic farming operations have been identified along this route alternative.

9.3.1.2. Black Earth Creek-South

Approximately 30.4% of proposed Black Earth Creek-South is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 8.38 acres of crop land would be impacted by Black Earth Creek-South. There are no specialty crops located along Black Earth Creek-South that Commission staff or the applicants are aware of.

There are no agricultural buildings within 300 feet or dairy operations within 0.5 miles of the centerline of this route alternative.

No organic farming operations have been identified along this route alternative.

9.3.1.3. Common Route Subsegments

Approximately 28.3% of the proposed common route subsegments is currently in agricultural land use, which is primarily comprised of actively cropped land. Approximately 14.92 acres of crop land would be impacted by common route subsegments in this routing area. There are no specialty crops located along this proposed route that Commission staff or the applicants are aware of.

There are five agricultural buildings within 300 feet and no dairy operations within 0.5 miles of the centerline of the common route subsegments.

No organic farming operations have been identified along this route alternative.

9.3.1.4. Summary of potential impacts

Refer to the Draft Agricultural Impact Statement that is being prepared by DATCP for additional information regarding impacts from the proposed project on agricultural land and landowners. Refer to Appendix G for DATCP's Summary of Analysis and Recommendations from the Draft Agricultural Impact Statement that was prepared for the Cardinal-Hickory Creek Project.

Table 9-16 Agricultural impacts in the Dane County Routing Area

Route Alternative	Actively Cropped Land				Specialty Crops		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Total impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total impact (acres)
Black Earth Creek-North	7,511	4.1	8.25	12.35	0.0	0.0	0.0
Black Earth Creek-South	8,034	0.42	7.96	8.38	0.0	0.0	0.0
Common Route Subsegments	16,103	3.42	11.5	14.92	0.0	0.0	0.0

9.3.2. Land use plans

In general, residential uses are considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily because of potential adverse aesthetic effects. Greater potential for conflict with land use plans exists in areas of urban development, where existing and planned residential and commercial uses are more common. The potential for conflict is also present in areas undergoing land use change, such as where rural land is being converted to residential use.

Corridor sharing with different types of infrastructure (for example, transmission lines and multi-lane highways) can mitigate impacts by causing incremental impacts instead of entirely new impacts associated with a new ROW corridor. Not all corridors that can be shared with a transmission line serve to lessen potential impacts though. Places with narrow, canopy-covered local roads, winding rural roads, and residential areas supporting smaller lots may experience greater impacts from a new high-voltage transmission line.

This proposed route follows Stagecoach Road east from CTH P to USH 14, and is primarily located in an agricultural preservation district in the town of Cross Plains. A block of environmental and resource protection district lands lie on the north side of Stagecoach Road, near USH 14. An existing rural residential district lies on the opposite side of the USH 14 expressway from the proposed route at Birch Trail Road. Another residential subdivision is found further east, on the south side of the highway, at the Cross Plains/Middleton town line. Residential use is planned for most undeveloped land in the town of Middleton. County parkland is found on both sides of the highway as the proposed route continues eastward before entering a commercial district that contains a quarry and the Cardinal Substation.

9.3.3. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to homes, schools, daycares, hospitals, and other places where people frequently gather in this routing area. Information for this section came from the tables submitted in the project application that categorize the number of residences and dwellings within specified distances of the proposed centerline of the new 345 kV line and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public and conducted numerous site visits along the proposed routes.

The proximity of properties to a high-voltage transmission line is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, magnetic fields, and other electrical phenomenon, and personal and public safety.

Commission staff recognizes that individuals and families have substantial financial, physical, and

emotional investments in their homes and properties and that the discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes.

A generalized discussion of some of these issues is contained in Chapter 4 including:

- aesthetics (Section 4.5.1);
- electric and magnetic fields (Section 4.5.6);
- property values (Section 4.5.7);
- safety (Section 4.5.10);
- stray voltage (Section 4.5.11); and
- noise and light impacts (Section 4.5.13).

Appendix E contains a brief review of the health issues associated with electric and magnetic fields generated by transmission lines. Additionally, potential aesthetics and visual impacts in this routing area are discussed in Section 9.3.4 for several specific areas or properties along the proposed route and others that are recognized regionally or state-wide for their natural beauty.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of this high-voltage transmission line cannot be adequately addressed in this document, but a discussion of some special concerns that have been raised follows in Section 9.3.3.2.

9.3.3.1. Residential impacts

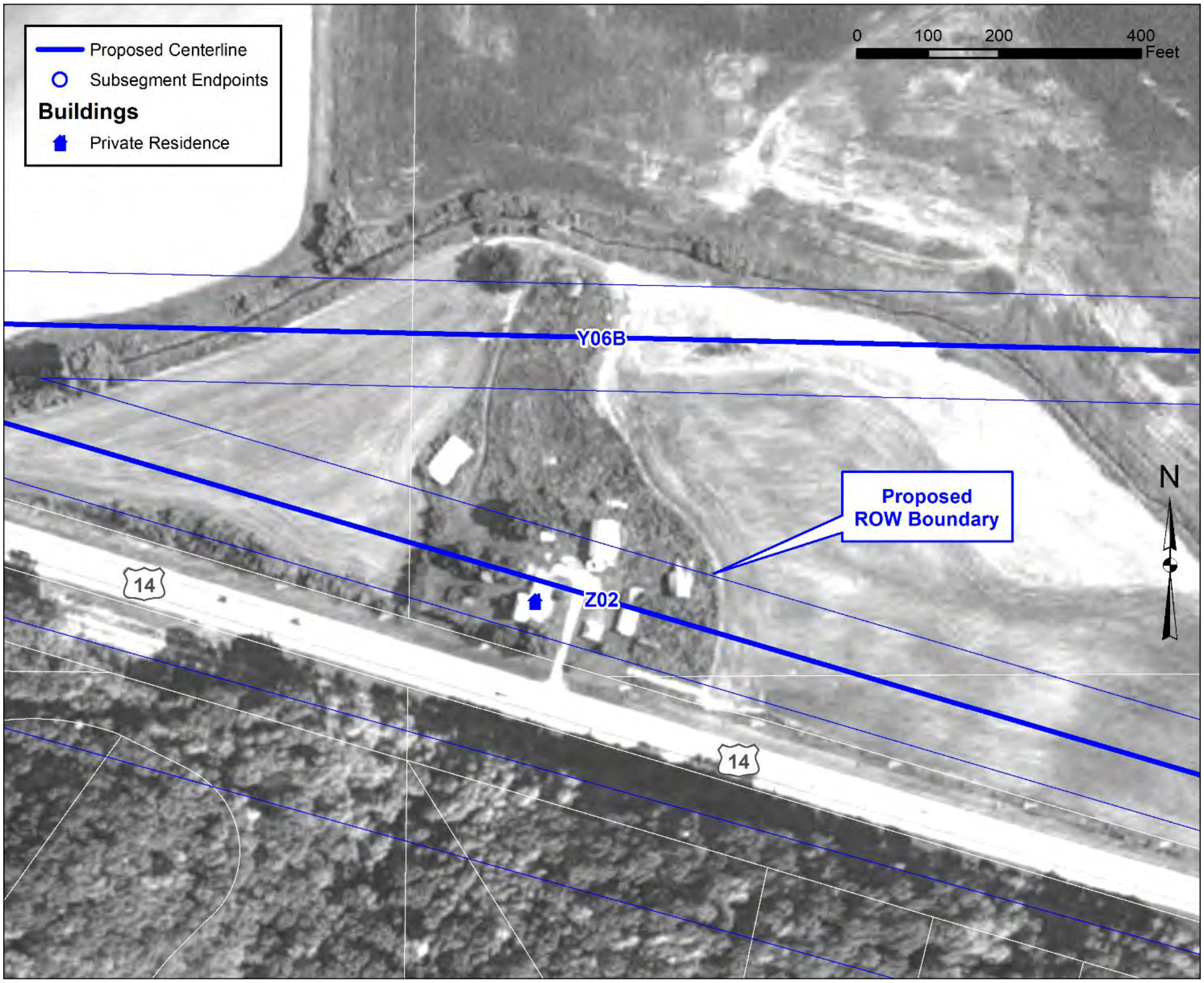
9.3.3.1.1 Common Subsegments

There are 10 residences located within 300 feet of the proposed centerline of common route subsegments within the Dane Country Routing Area. One residence is located within 51 to 100 feet. Three residences are located within 101 to 150 feet, and six residences within 151 to 300 feet. There are no apartment units or apartment buildings within 300 feet of the proposed centerline of common route subsegments.

9.3.3.1.2 Black Earth Creek route alternatives

There is one residence located near both Black Earth Creek-North and Black Earth Creek-South route alternatives. The residence is located on the north side of USH 14 immediately east of the Cross Plains-Middleton border. Subsegment Y06B (Black Earth Creek-North) would run approximately 300 feet to the north of the residence. Subsegment Z02 (Black Earth Creek-South) would run within 25 feet of the residence (Figure 9-3). Placement of the proposed facilities along Subsegment Z02 would result in significant impacts, including the loss of the house and all landscaping around the property in preparation of construction and continued maintenance of the facilities. The applicants have been in contact with the property owners regarding possible removal of the house as well as other impacts to their property associated with Subsegments Y06B and Z02. The applicants have stated that the property owners would prefer approval of Subsegment Z02 which would result in the loss of the house. There are no apartment units or apartment buildings within 300 feet of the proposed centerline of either Black Earth Creek-North or Black Earth Creek-South.

Figure 9-3 Proposed ROW along Subsegments Y06B (Black Earth Creek-North) and Z02 (Black Earth Creek-South) on a private residence near Middleton



9.3.3.1.1 Summary of potential impacts

Table 9-17 Number of residential structures within 300 feet of the proposed centerline along route alternatives in the Dane County Routing Area

Route Alternative	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
Common Subsegments	0	1	3	6	10
Black Earth Creek-North	0	0	0	1	1
Black Earth Creek-South	1	0	0	0	1

9.3.3.2. Potentially sensitive populations and properties

According to data provided by the applicants, there are no sensitive receptors such as schools, daycares, or hospitals within 300 feet of the proposed centerlines of the route subsegments within this routing area.

9.3.3.3. Electric and magnetic fields

Some background information and a general discussion of EMF is found in Section 4.5.6 and in Appendix E of this EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic field lines at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after a new line is placed in operation. The magnetic field profiles included in the application appear to be reasonably representative of the potential circuit configurations. Below are brief summaries of the estimated magnetic field levels for the proposed 345 kV transmission line along the various proposed segments along this portion of the proposed route.

9.3.3.3.1 Common Subsegments

Subsegments W03 and W04

The proposed 345 kV line would turn east and be double-circuited with existing 69 kV line 6927, following Stagecoach Road for a distance, before moving south across the road. The expected magnetic fields are tabulated below.

Table 9-18 Estimated magnetic fields for Subsegments W03 and W04

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	336 A	435 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	18	23	32	40	34	43
100	2.6	3.4	5.4	5.9	6.7	7.0
200	0.66	0.86	1.7	1.8	2.2	2.2
300	0.29	0.38	0.80	0.82	1.1	1.0

Subsegments Y01A, Y01B, and Y01C

The proposed 345 kV line continues east and remains double-circuited with the existing 69 kV line 6927, as described in the previous section. The expected magnetic fields are tabulated below.

Table 9-19 Estimated magnetic fields for Subsegments Y01A, Y01B, and Y01C

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	336 A	435 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	3.5	4.5	40	40	34	43
100	21	28	8.9	8.9	8.8	9.9
200	2.4	3.1	1.7	1.7	2.2	2.1
300	0.63	0.81	0.80	0.80	1.1	1.0

Subsegment Y05

The proposed 345 kV line continues to parallel the track of the existing 69 kV line 6927, with the 6927 line connecting to a standalone switching structure that would be near the currently existing 6927 switch. The expected magnetic fields are tabulated below.

Table 9-20 Estimated magnetic fields for Subsegment Y05

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	336 A	435 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	34	44	32	40	34	43
100	3.9	5.1	5.7	6.3	7.0	7.4
200	9.6	12	9.3	12	9.3	12
300	0.59	0.74	1.2	1.3	1.4	1.5

Subsegment Y06A

The proposed 345 kV line would remain in a double-circuited configuration and would turn northeast, crossing over USH 14 and paralleling the existing 69 kV 6927 line alignment. The expected magnetic fields are tabulated below.

Table 9-21 Estimated magnetic fields for Subsegment Y06A

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	370 A	480 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	28	36	35	45	38	49
100	4.0	5.2	5.7	6.4	6.9	7.5
200	1.1	1.4	1.7	1.8	2.2	2.2
300	0.48	0.63	0.82	0.85	1.1	1.0

Subsegments Y07 and Y08

The proposed 345 kV line would continue in a double-circuited configuration and continue east until the 69 kV line transitions to an existing riser structure with Subsegment Y08 turning south. Line 6927 would continue underground until terminating at the West Middleton Substation, while the proposed 345 kV line would be constructed as a single-circuit line with design for a future 138 kV underbuild. The proposed 345 kV single-circuit line would continue north and east into the Cardinal Substation. The expected magnetic fields are tabulated below.

Table 9-22 Estimated magnetic fields for Subsegments Y07 and Y08

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	370 A	480 A	306 A	295 A	406 A	385 A

Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	2.3	3.0	36	45	39	49
100	19	25	5.2	5.7	6.4	6.8
200	7.7	10	11	15	11	14
300	0.40	0.51	0.99	1.1	1.2	1.2

9.3.3.3.2 Black Earth Creek-North

Subsegment Y06B

The proposed 345 kV line would remain in a double-circuited configuration and would continue approximately east, crossing back over USH 14 and paralleling the existing 69 kV 6927 line alignment, then connecting to Subsegment Y07. The expected magnetic fields are tabulated below.

Table 9-23 Estimated magnetic fields for Subsegment Y06B

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	370 A	480 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	28	36	35	45	38	49
100	4.0	5.2	5.7	6.4	6.9	7.5
200	1.1	1.4	1.7	1.8	2.2	2.2
300	0.48	0.63	0.82	0.85	1.1	1.0

9.3.3.3.3 Black Earth Creek-South

Subsegment Z02

Upon crossing USH 14 on Subsegment Y06A, the proposed 345 kV line would remain in its double-circuited configuration and proceed approximately southeast, paralleling the ROW of USH 14 on the north side, until transitioning back to the south side of the road. The expected magnetic fields are tabulated below.

Table 9-24 Estimated magnetic fields for Subsegment Z02

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	104 A	130 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	1.0	1.3	36	45	39	49
100	10	13	11	12	12	14
200	0.59	0.74	2.0	2.2	2.6	2.6
300	0.16	0.20	0.91	0.95	1.2	1.2

Subsegment Z01B

The proposed 345 kV line would continue in its double-circuit arrangement, paralleling the railroad tracks on the south side of USH 14, until meeting up with the existing 6927 alignment. The expected magnetic fields are tabulated below.

Table 9-25 Estimated magnetic fields for Subsegment Z01B

	Existing Operation (2018)		First Year of Operation (2024)		Tenth Year of Operation (2033)	
	80% of peak load	100% of peak load	80% of peak load	100% of peak load	80% of peak load	100% of peak load
Current	104 A	130 A	306 A	295 A	406 A	385 A
Distance from centerline (ft)	Magnetic field (mG)	Magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)	Estimated magnetic field (mG)
25	0.20	0.25	36	48	39	49
100	0.70	0.87	6.1	18	7.4	8.0
200	6.5	8.2	6.3	62	6.4	8.0
300	0.36	0.45	1.1	15	1.3	1.4

9.3.4. Aesthetics and visual impacts

The following discussion summarizes the potential aesthetic impacts within the Dane County Routing Area. This section includes the area from the village of Cross Plains to the Cardinal Substation near the city of Madison. Most of this proposed route consists of common subsegments.

Approximately one-mile south of Cross Plains, the proposed route would continue eastward to the Cardinal Substation from either Eastern-North or Eastern-South (Subsegments W03, W04, Y01B, Y01C, and Y05). New transmission line would utilize, or run parallel to, existing ROW for these segments. The route would follow local roads and USH 14, passing over agricultural land, forest, and grassland. Several rural residences and residential subdivisions are located along the proposed route, which would experience visual impacts and a change from the existing scenic aesthetics.

The Ice Age Complex at Cross Plains (also known as Cross Plains State Park) is located approximately half of a mile south of the proposed route (Subsegment Y05). The complex is part of the National Ice Age Scientific Reserve and is a compilation of federal, state, and county land that is used for year-round recreational activities. The applicants provided photo simulations from the park[331]. These simulations show that new visual impacts would result from the proposed project, affecting the scenic aesthetics of the area.

Black Earth Creek-North would leave USH 14 after Subsegment Y05, creating new transmission ROW over agricultural land, a small waterway, and forest (Subsegments Y06A and Y06B). This new line would pass several rural residences and require the clearing of some forest.

Black Earth Creek-South would continue from Subsegment Y05 along the south side USH 14 (Subsegments Z02 and Z01B). No existing transmission infrastructure is present along this route; however, a railroad and the highway have already altered some of the aesthetics of the area. Some forest would be cleared for the construction and maintenance of a new line, which would increase the disturbance of the scenic aesthetics. Some residences are located in a subdivision south of the proposed route, but these would continue to be screened from a new line with existing forest.

9.3.5. Public lands and recreation

As discussed in Section 9.2.1, the Black Earth Creek corridor, along with the associated county park, wildlife area, and fishery area, as well as the Ice Age Trail are major natural resource properties within the Dane County Routing Area.

---

[331] PSC REF#: 341399, 341400, and 341401

The Ice Age Trail Alliance provided information during the scoping comment period regarding a portion of the proposed project, generally from County Road P in western Dane County to Twin Valley road near the Cardinal Substation, where they are concerned about the visual impacts of a new high voltage transmission line. That stretch would cover nearly the entire routing area and is discussed in greater detail in Section 9.1.3.1. More specifically, Subsegment Y01A would pass within 200 feet of the southern boundary of the Ice Age Trail Recreational Area, and then cross over an unnamed tributary to Black Earth Creek. Although no direct physical impacts are anticipated to occur to the Ice Age Trail Recreational Area, the applicant should coordinate construction activities in this area with Ice Age Trail Alliance management, and with the appropriate DNR staff to eliminate or minimize any indirect impacts to either public land.

9.3.6. Airports and airstrips

The applicants identified public and private airports and heliports located within four miles of the proposed route centerlines and provided information on these airports and airstrips as part of the application. The FAA reviewed information provided by the applicants regarding potential structure heights, locations, and ground elevations for the proposed project and used this information to conduct an aeronautical study under the federal regulations to determine if the structures, as described, exceeds obstruction standards and/or would have an adverse interference effect on navigable airspace or air navigation facilities. The applicants provided the correspondence from the FAA on these determinations as Appendix H, Exhibit 3[332] of the application

In the Dane County Routing Area, the only airport within four miles of any route subsegment is the Middleton Municipal airport, the Morey Field. Morey Field is located west of the city of Middleton. The airport has one asphalt runway and one turf runway, and is located west of USH 12 and north of Airport Road. The asphalt runway is just under 4,000 feet and has a northwest/southeast alignment, and the turf runway is approximately 2,000 feet and has a roughly north/south alignment. It is owned and managed by the city of Middleton. The northwest corner of the nearest runway is located approximately 2.1 miles northeast of subsegment Y08 (common route subsegment).

The FAA determined that none of the structures the applicants provided information on for this routing area would be presumed hazards to the Morey Field airport. If built as described, the proposed project is not expected to impact airports or air navigation in this routing area.

9.3.7. Communication facilities

An initial assessment[333] of the potential impact to communication facilities was conducted by

Electrical Consultants, Inc. to determine whether a viable risk to communication operations was present. As discussed in Section 4.5.14, the primary types of potential interference with communication facilities include:

- AM broadcast antenna re-radiation,
- transferred voltages to communication facility grounding systems, and
- microwave line-of-sight signal degradation.

---

332 The relevant set of correspondence is found in part 1 of 3 in Appendix H, Exhibit 3 (PSC REF#: 341407).
333 Appendix K, Exhibit 1 (PSC REF#: 341394).

The initial assessment found a significant number of communication facilities within a 10-kilometer radius of the proposed route alternatives. If the project is approved, additional analyses (phase 2) would be expected to determine the operational status of these facilities, the likelihood of interference, and the appropriate range of mitigation measures.

A review of FCC database showed that no microwave radio antenna line-of-sight paths would be obstructed by the proposed transmission line structures in this routing area. If the project is approved, a field review prior to construction would confirm that there are no microwave line-of-sight path issues. If any issues would be found, the applicants would work with the licensee to mitigate the issue.

No AM stations were listed within 10 km of this routing area.

Communication facilities were found within 500 feet of the proposed route alternatives. A ground system inspection would need to be completed for each of these communication facilities to assure they meet OSHA grounding standards to avoid induced voltages causing problems with communications equipment and safety risks. Any facilities identified that do not meet OSHA requirements would need further investigation and mitigation.

9.3.8. Electric distribution facilities

One area of distribution line owned by MGE on a shared area of the Dane County Routing Area would need to be removed and relocated if the proposed project is approved. Existing distribution lines that are proposed for relocation are located in areas that may pose physical conflicts with the proposed route or where their proximity to one of the transmission lines might result in stray voltage concerns through NEV.

Due to concern over the impacts associated with stray voltage and its potential effect on confined animals (such as dairy cows), all routes were analyzed for areas where distribution lines might be located too close to the proposed transmission lines. There is a general consensus that distribution lines located less than 150 feet from a transmission line and running parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts to farms with confined animals. Further information on the cause, impact, and mitigation options of stray voltage or NEV is provided in Section 4.5.11.

All distribution modifications required as a result of the ordering of this project would be made by the distribution owners, including distribution line design, relocation, burial, and any associated permitting.

The affected distribution line is located on the north side of Stagecoach Road, east of CTH P where the Eastern-North and Eastern-South route alternatives meet near Cross Plains. The existing distribution line runs parallel to Stagecoach Road and the proposed 345 kV route. Approximately 0.7 miles would need to be removed and relocated in this routing area.

CHAPTER

10

10. Summaries and Comparisons of Route Alternatives

This chapter provides a summary and comparison of the various route alternatives for the proposed project under consideration by the Commission. It includes details regarding the composition of each route alternative plus summaries and comparisons of the potential natural resource and communities impacted by each alternative. The proposed project includes the construction of a new substation (Hill Valley Substation) as well as modifications at several other substations. Refer to Section 2.3 and Chapter 5 for additional details on these proposed activities.

10.1. SUMMARY OF ROUTE ALTERNATIVES

Under WEPA, an EIS must consider alternatives to the proposed action (Wis. Stat. § 1.11(2)(c)3.), and an EIS must clearly describe the alternatives being considered (Wis. Admin. Code § PSC 4.30(2)(c)). System alternatives for the proposed project are discussed in Chapter 3. Proposed route alternatives that could be constructed if the need of the proposed project is verified and the potential impacts of these proposed route alternatives are discussed in Chapters 6 through 9 of this EIS. Under Wis. Stat. § 196.025(2m)(c), the PSC and DNR have the following obligation regarding transmission project alternatives:

> "…for a project identified in an application for a certificate under s. 196.491(3), the Commission and the department are required to consider only the location, site, or route for the project identified in the application and one alternative location, site, or route."

The applicants made an effort to ensure that it had two viable alternative routes in the CPCN application; basically, a northern route and a southern route from Cassville, WI to Montfort, WI, that would end near Middleton, WI (Figure 1, Appendix A).

In this EIS, the applicants' proposed route subsegments have been combined into route alternatives that have then been grouped into routing areas to facilitate the Commission's review of the proposed project. These routing areas provide an organizational tool for presenting and analyzing information about the ecological and socioeconomic impacts of the proposed project for each proposed route alternative. The four distinct routing areas and their associated chapters within this EIS are the following:

- Mississippi River Routing Area (Chapter 6),
- Western Routing Area (Chapter 7),
- Eastern Routing Area (Chapter 8), and
- Dane County Routing Area (Chapter 9).

The proposed project must cross the Mississippi River to get from the Hickory Creek Substation (Dubuque County, IA) to the Cardinal Substation (Dane County, WI). The applicants have provided two different areas where it could cross the Mississippi River in Cassville, WI:

- Stoneman Substation – which contains an existing high-voltage transmission line crossing of the Mississippi River
- Nelson Dewey Substation – which would be a new crossing of the Mississippi River

The Mississippi River Routing Area is the only routing area that has more than two route alternatives. The proposed route alternatives for either river crossing (Nelson Dewey or Stoneman) would connect to either Western-North or Western-South. For example, Nelson Dewey-North only connects to Western-North and Nelson Dewey-South only connects to Western-South. The same goes for the Stoneman crossing.

Both of the route alternatives in the Western Routing Area would connect to the proposed Hill Valley Substation in Montfort, WI. From the proposed Hill Valley Substation, Eastern-North and Eastern South travel east, northeast towards the same end point just south of Cross Plains, Wisconsin. In the Dane County Routing Area, a common route (no route alternative) would travel from either Eastern-North or Eastern-South east towards Black Earth Creek where there are two route alternatives north or south of Black Earth Creek. From here, the proposed transmission line would follow a common route (no route alternative) into the Cardinal Substation near Middleton, Wisconsin.

The route alternatives within each routing area that are being evaluated in this EIS include the following:

- Mississippi River Routing Area:
    - Nelson Dewey-North
    - Nelson Dewey-South
    - Stoneman-North
    - Stoneman-South
- Western Routing Area:
    - Western-North
    - Western-South
- Eastern Routing Area:
    - Eastern-North
    - Eastern-South
- Dane County Routing Area
    - Black Earth Creek-North
    - Black Earth Creek-South

Each route alternative contains subsegments that would be shared with either route alternative. These common subsegments have been included in the quantification of impacts for each route alternative throughout the tables in this EIS. The Dane County Routing Area is the only routing area that contains several common subsegments for a significant length where there is no route alternative. For the purposes of this summary chapter, all of the impacts for the common subsegments in the Dane County Routing Area have been included in the quantification of impacts for Black Earth Creek-North and Black Earth Creek-South, as appropriate.

The proposed route alternatives have been analyzed, discussed, and considered equally in this EIS in preparation for the independent decisions that must be made by the Commission. The applicants proposed route alternatives are identified by routing area and their associated subsegments in Table 10-1.

The communities that could be impacted by the proposed project are identified in Table 10-2. Refer to Appendix C for additional project options under consideration by RUS.

Table 10-1 Proposed route alternatives for the Cardinal-Hickory Creek project. Refer to Section 2.1 for additional **information on the applicants' routing and siting of the proposed project.**

Routing Area	Route Alternative	Route Subsegments
Mississippi River	Nelson Dewey-North	A01A, A01B, A02, A03
	Nelson Dewey-South	A01A, C02A, C02B, C04
	Stoneman-North	B01, B02, C01, C03
	Stoneman-South	B01, B02, B03, B04
Western	Western-North	D01, D03, D04, D05, D08, D09A
	Western-South	E01, E03, E04, E06, E07, E09, E10, E12, E13, E14, E16, E18, E19, G01, F01, F02, F03, G06A, G06B, G08, G09, H01, H02, H03, H06, H07, H09, I01, I02, I05, I06, 107, I08, I09, K01, L01, L02, L03, L04, D10C
	Common Subsegments	D10A, D10B, L05
Eastern	Eastern-North	P01, P02, P03, P04, P05, P06, P07, P08, P09, W01, W02
	Eastern-South	Q01, Q02, Q03, Q04, Q05, Q06, S01, S04, S05, S08, S09, S10A, S10B, S10C, S10D, S12, S13, T01, T02, T03, T04, T05, V01, V02, V03, V04, V05, V06
	Common Subsegments	N07 (138kV only), N01, N03, N04, N05, N06
Dane County	Black Earth Creek-North	Y06B
	Black Earth Creek-South	Z02, Z01B
	Common Subsegments	W03, W04, Y01A, Y01B, Y01C, Y05, Y06A, Y07, Y08

Table 10-2 Local communities impacted by the proposed project. Refer to Section 1.4 for more information.

Routing Area	Community	County	Route Alternative	Route Subsegments	Additional project infrastructure
Mississippi River; Western	Cassville	Grant	ND-N, ND-S, S-N, S-S, W-N, W-S	A01A, A01B, A01C, A02, B01, B02, C01, C02A, C02B, D01, D03, D04, E01, E03, E04	2 Laydown Yards
Western	Beetown	Grant	W-N	D04	
	Clifton	Grant	W-S	D08, J01, J02, J03, J04, K01	
	Ellensboro	Grant	W-N	D08	
	Harrison	Grant	W-S	E16, E18, E19	
	Liberty	Grant	W-N	D08	
	Livingston	Grant	W-S	J02, J03	
	Platteville	Grant	W-S	E19, F01, F02, F03, F04, F06, G01, G04, G06A, G06B, G08	4 Laydown Yards
	Potosi	Grant	W-S	E10, E12, E13, E14, E16	
	South Lancaster	Grant	W-N	D04, D05, D08	
	Waterloo	Grant	W-N, W-S	D04, E04, E06, E07, E09, E10	1 Laydown Yard
	Wingville	Grant	W-N, W-S	D08, D09A, D09B, D10A, D10B, D10C, L02, L03, L04, L05, M03, N01, R01	Hill Valley Substation, 1 Laydown Yard
	Mifflin	Iowa	W-S	H06, H07, H09, I01, I02, I05, I06, I07, I08, I09, J01, J04, K01, L01, M01	
	Rewey	Iowa	W-S	H06, H07	
	Belmont	Lafayette	W-S	G09, H01, H02, H03, H06	1 Laydown Yard
	Elk Grove	Lafayette	W-S	G08, G09	

Routing Area	Community	County	Route Alternative	Route Subsegments	Additional project infrastructure
Eastern	Blue Mounds	Dane	E-S	S13	1 Laydown Yard
	Mount Horeb	Dane	E-S	S13	
	Springdale	Dane	E-S	S13, T01, T02, T03, U01	
	Vermont	Dane	E-N	P09	
	Montfort	Grant	E-N, E-S	N01	1 Laydown Yard
	Arena	Iowa	E-N	P09	
	Barneveld	Iowa	E-S	S10D, S11D, S12, S13	
	Brigham	Iowa	E-S	S09, S10A, S10B, S10C, S11A, S11B, S11C, S11D, S13	
	Cobb	Iowa	E-S	Q02	
	Dodgeville	Iowa	E-N, E-S	P03, P04, P05, P06, P07, P08, P09, Q02, Q03, Q04, Q05, Q06, R09, R10, R11, R13, R14, R15, S01, S02, S03, S04,	2 Laydown Yards
	Eden	Iowa	E-N, E-S	L01, L02, M01, M02, M03, M04, M05, N03, N04, N06, N07, O02, O03, P01, P02, Q01, Q02, R01, R02, R03, R04	1 Laydown Yard
	Highland	Iowa	E-N	P02, P03	
	Linden	Iowa	E-S	Q02, R04, R05, R06, R07, R08, R09	1 Laydown Yard
	Ridgeway	Iowa	E-S	S04, S05, S08, S09	
	Wyoming	Iowa	E-N	P09	
Eastern; Dane County	Cross Plains	Dane	E-N, E-S, Black Earth Creek-North, Black Earth Creek-South	P09, T03, T04, T05, U02, V02, V01, V02, V03, V04, V05, V06, W01, W02, W03, W04, X01, X02, Y01A, Y01B, Y01C, Y05, Y06A, Y06B, Z01A, Z02	
Dane County	Middleton	Dane	Black Earth Creek-North, Black Earth Creek-South	Y06B, Y07, Y08, Z01A, Z01B, Z02	1 Laydown Yard

10.1.1. ROW length and corridor sharing

In considering, comparing, and contrasting potential impacts of the proposed route alternatives, one consideration could be the amount and percentage of new ROW that would be constructed for the proposed project. Wisconsin Stat. § 1.12(6) directs the Commission to consider corridor sharing opportunities when reviewing transmission facility projects. The statute states that, when siting new electric transmission facilities, it is the policy of the state to attempt to share existing corridors to the greatest extent feasible. It is also important to take into consideration that once a corridor is constructed, the likelihood of additional infrastructure following that corridor is also increased.

As stated in previous sections of this EIS, the applicants have stated that they may not release existing easements for transmission facilities that the proposed Cardinal-Hickory Creek project would share a corridor with. If this is the case, the metrics in the impact tables throughout this EIS may significantly underestimate the ROW and the associated impacts of the proposed project in all areas where the proposed project would share a ROW with an existing electric transmission corridor.

Each route alternative includes various structure combinations and configurations. The structure combinations and configurations are illustrated in the figures in Appendix D. The route lengths and amounts of new ROW required are included in the tables below.

Table 10-3 Proposed route alternatives in the Mississippi River Routing Area. Refer to Section 6.1 for more information.

Route Alternative	Length (miles)	Existing ROW Shared (acres)	New ROW (acres)	Total ROW Required (acres)	Percentage of New ROW
Nelson Dewey-North	1.54	7.11	20.84	27.95	75%
Nelson Dewey-South	1.82	3.43	29.71	33.14	90%
Stoneman-North	1.83	11.73	21.55	33.28	65%
Stoneman-South	1.08	7.56	12.14	19.7	62%

Table 10-4 Proposed route alternatives in the Western Routing Area. Refer to Section 7.1 for more information.

Route Alternative	Length (miles)	Existing ROW Shared (acres)	New ROW (acres)	Total ROW Required (acres)	Percentage of New ROW
Western-North	32.54	204.22	387.15	591.37	65%
Western-South	50.42	317.1	598.17	915.27	65%

Table 10-5 Proposed route alternatives in the Western Routing Area. Refer to Section 8.1 for more information.

Route Alternative	Length (miles)	Existing ROW Shared (acres)	New ROW (acres)	Total ROW Required (acres)	Percentage of New ROW
Eastern-North	46	136.94	698.02	834.96	84%
Eastern-South	48.72	422.67	454.47	877.14	52%

Table 10-6 Proposed route alternatives and common subsegments in the Dane County Routing Area. Refer to Section 9.1 for more information.

Route Alternatives	Length (miles)	Existing ROW Shared (acres)	New ROW (acres)	Total ROW Required (acres)	Percentage of New ROW
Black Earth Creek-North	4.47	28.44	50.13	78.57	64%
Black Earth Creek-South	4.57	29.05	51.33	80.38	64%

10.1.2.1. Off-ROW access roads

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads or the ROW is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.2.5.1. As stated throughout this EIS, this is a unique area of the state where there are many areas of steep topography that would make accessing work areas more difficult and more impactful. When considering the amount of impacts the proposed ROW would have, the off-ROW areas required to construct the project should also be taken into consideration. The off-ROW access roads and their potential impacts are included in the tables below.

Table 10-7 Off-ROW access road impacts within the Mississippi River Routing Area. Refer to Section 6.1.4 for more information.

Route Alternative	Roads (count)	Length (miles)	Area (acres)	Wetlands (acres)	Upland Forest (acres)	Grassland (acres)	Agriculture (acres)
Nelson Dewey-North	2	1.52	5.44	0	0.21	1.29	0.72

Nelson Dewey-South	1	0.26	0.92	0	0	0	0.92
Stoneman-North	1	0.26	0.96	0	0.07	0	0.32
Stoneman-South	None identified						

Table 10-8 Off-ROW access road impacts within the Western Routing Area. Refer to Section 7.1.4 for more information.

Route Alternative	Roads (count)	Length (miles)	Area (acres)	Wetlands (acres)	Upland Forest (acres)	Grassland (acres)	Agriculture (acres)
Western-North	90	35.93	130.65	0.07	3.58	24.28	76.88
Western-South	64	24	87.27	0.05	4.86	12.50	49.45

Table 10-9 Off-ROW access road impacts within the Eastern Routing Area. Refer to Section 8.1.4 for more information.

Route Alternative	Roads (count)	Length (miles)	Area (acres)	Wetlands (acres)	Upland Forest (acres)	Grassland (acres)	Agriculture (acres)
Eastern-North	41	16.31	59.3	1.54	6.09	12.59	23.79
Eastern-South	35	4.15	15.09	0.04	0.84	2.79	15.18

Table 10-10 Off-ROW access road impacts by route alternative. Refer to Section 9.1.4 for more information.

Route Alternative	Number of Roads	Length (miles)	Area (acres)	Wetlands (acres)	Upland Forest (acres)	Grassland (acres)	Agriculture (acres)
Black Earth Creek-North	2	0.27	0.98	0	0.16	0.01	0.09
Black Earth Creek-South	None identified						

10.1.2.2. Laydown yards

During construction, off-ROW areas referred to as laydown yards (or staging areas) are also utilized to minimize disturbance and provide suitable work surfaces for the temporary storage and staging of construction equipment and material. Laydown yards are used throughout construction to set up and store materials, job trailers, storage containers, portable toilets, dumpsters, construction mats, tools, equipment, etc. A brief discussion of the roles of off-ROW laydown yards and temporary workspaces are included in Sections 2.2.5.2 and 2.2.5.3. For the proposed project laydown yard size varies throughout the project area, as identified in the tables below.

Table 10-11 Proposed laydown yards near the Mississippi River Routing Area. Refer to Section 6.1.5 for more information.

Laydown Yard	Location	Size (acres)	Existing Land Use	Agricultural Land Cover (acres)	Grasslands Land Cover (acres)	Non-Forested Wetland Land Cover (acres)	Developed Land Cover (acres)
LY-01	Nelson Dewey Generating Station	17.52	Stockyard	0.00	0.00	0.00	17.52
LY-03	Stoneman Generating Station	16.77	Stockyard/Agricultural	2.68	6.91	0.00	7.18
LY-04	STH 133	7.22	Agricultural	0.00	7.22	0.00	0.00

Table 10-12 Proposed Laydown Yards near Western Routing Area. Refer to Section 7.1.5 for more information.

Laydown yard	Location	Size (acres)	Existing Land Use	Agricultural Land Cover (acres)	Grasslands Land Cover (acres)	Non-forested Wetland Land Cover (acres)	Developed Land Cover (acres)
LY-02	USH 18/Stockyard Road	12.79	Agricultural	12.20	0.59	0.0	0.0
LY-10	STH 80/ATC Property	20.59	Agricultural/proposed substation site	20.59	0.0	0.0	0.0
LY-11	STH 80	8.70	Gravel pit	7.77	0.93	0.0	0.0
LY-12	Whitson Road/USH 18	5.36	Gravel pit	0.0	0.0	0.0	5.36
LY-13	Survey Road/USH 18	10.23	Gravel pit	0.0	0.0	0.0	10.23

Table 10-13 Proposed Laydown Yards near Eastern Routing Area. Refer to Section 8.1.5 for more information.

Laydown yard	Location	Size (acres)	Existing Land Use	Agricultural Land Cover (acres)	Grasslands Land Cover (acres)	Non-forested Wetland Land Cover (acres)	Developed Land Cover (acres)
LY-02	USH 18/Stockyard Road	12.79	Agricultural	12.20	0.59	0.0	0.0
LY-05	STH 133/W Haas Lane	17.30	Pasture	0.0	17.30	0.0	0.0
LY-06	Southwest Road	7.94	Gravel pit	0.0	0.0	0.0	7.94
LY-07	Bluff Lane	8.14	Gravel pit	0.32	7.82	0.0	0.0
LY-08	STH 80/Enterprise Drive	11.53	Developed/pasture	0.0	0.0	0.0	11.53
LY-09	USH 151/Bonner Road	18.86	Agricultural	18.86	0.0	0.0	0.0

Laydown yard	Location	Size (acres)	Existing Land Use	Agricultural Land Cover (acres)	Grasslands Land Cover (acres)	Non-forested Wetland Land Cover (acres)	Developed Land Cover (acres)
LY-10	STH 80/ATC Property	20.59	Agricultural/proposed substation site	20.59	0.0	0.0	0.0
LY-14	Industrial Drive/Ernie Drive	14.14	Gravel pit	0.0	3.22	0.0	10.21
LY-16	STH 78/USH 18	9.96	Gravel pit	0.0	0.86	0.0	9.10

Table 10-14 Proposed Laydown Yard near Dane County Routing Area. Refer to Section 9.1.5 for more information.

Laydown Yard	Location	Size (acres)	Existing Land Use	Agricultural Land Cover (acres)	Grasslands Land Cover (acres)	Non-Forested Wetland Land Cover (acres)	Developed Land Cover (acres)
LY-17	Twin Valley Road	21.81	Gravel Pit	0.00	0.77	4.43	16.61

10.2. COMPARISON OF IMPACTS

In Chapters 6-9 of this EIS, the route alternatives within each routing area were examined for potential ecological and socioeconomic impacts on local and regional resources. For the purposes of this summary chapter, all of the impacts for the common subsegments in the Dane Country Routing Area have been included in the quantification of impacts for Black Earth Creek-North and Black Earth Creek-South, as appropriate. The analyses in this EIS generally assume that the entire proposed ROW width could be affected; although actual impacts may differ.

In general, the degree of impact of a proposed electric transmission line is determined by the quality or uniqueness of the existing environment along the selected route. The quality of the existing environment is influenced by several factors including the degree of disturbance that already exists, the uniqueness of the resource, and the threat of future disturbance. Environmental features such as soil type, topography, land cover, and weather may affect the degree of impact expected from the construction and operation of the proposed project. Physical features such as the design and placement of structures and the amount of ROW required for the proposed project could also affect the degree of impact. For example, a horizontal configuration of conductors may allow the conductors to be located at canopy-level of nearby forests decreasing aesthetic impacts and minimizing potential avian collisions, but it may also require a wider ROW than a vertical configuration of conductors.

When assessing impacts, it is important to consider the duration of these impacts. In Wisconsin, transmission facilities are designed to operate between 35 and 40 years, but often last upwards of 60 years. Long-term impacts may occur as long as the line exists, and in some cases longer; short-term impacts may occur only during certain phases of a project or during infrequent intervals. Both short- and long-term impacts are considered in this EIS. It is important to consider that short-term impacts can become long-term impacts if not properly managed or mitigated.

Prevention and mitigation of long-term and short-term impacts from the proposed project can be achieved, if ordered to do so by the Commission and other permitting agencies. Refer to Sections 4.2 and 10.5 regarding general mitigation strategies that could be implemented to avoid or minimize impacts of the proposed project. In addition, refer to Chapters 6 through 9 for additional mitigation strategies that would avoid or minimize the specific impacts of the proposed project.

The following sections include summary tables for potential impacts to each selected resource by routing area. The data tabulated in these tables are based on the impact tables provided by the applicants in their CPCN application. Staff has reorganized these data to facilitate the equal comparison of route alternatives in preparation for the independent decisions that must be made by the Commission. These data are included Appendix B.

10.2.1. Agricultural Lands

As identified in Section 4.5.2, transmission line construction can affect farm operations in several different ways including interruption or damage to irrigation and drainage systems, temporary modifications to grazing areas, row crops, existing fencing, field flooding, and non-compliance with organic practices; just to name a few. After construction would be completed, the project may continue to affect agricultural productivity for several years afterwards. Yield reductions can be caused by inadequate protection of topsoil, changes to surface and subsurface drainage, construction debris left in fields, and opportunistic weed growth. Agricultural properties may also have issues working under and near operating electric lines such as induced voltage and problems with grounding. These and other problems can increase costs for the farm operators.

Refer to Sections 6.3.1, 7.3.1, 8.3.1, and 9.3.1, as well as the Agricultural Impact Statement that is being prepared by DATCP, for additional information regarding the potential impacts on agricultural lands and landowners as a result of the proposed project. DATCP's Summary of Analysis and Recommendations from the Draft Agricultural Impact Statement that was prepared for the Cardinal-Hickory Creek Project has been incorporated into Appendix G of this EIS. Refer to Section 4.5.2.2 for general mitigation strategies for minimizing and avoiding impacts to agricultural lands and landowners. Agricultural lands that could be impacted by the proposed project are included in the tables below.

Table 10-15 Agricultural impacts in the Mississippi River Routing Area

Route Alternative	Actively Cropped Land				Specialty Crops		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)
Nelson-Dewey North	8,118	0.96	2.03	2.99	0.0	0.0	0.0
Nelson-Dewey South	9,624	0.64	4.84	5.48	0.0	0.0	0.0
Stoneman-North	9,664	1.98	2.54	4.52	0.0	0.0	0.0
Stoneman-South	5,720	1.37	1.15	2.52	0.0	0.0	0.0

Table 10-16 Agricultural impacts in the Western Routing Area

Route Alternative	Actively Cropped Land				Specialty Crops		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)
Western-North	171,801	88.8	165.97	254.77	0.06	0.73	0.79
Western-South	266,212	128.36	376.59	504.95	10.41	0.48	10.89

Table 10-17 Agricultural impacts in the Eastern Routing Area

Route Alternative	Actively Cropped Land				Specialty Crops		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)
Eastern-North	242,875	44.82	214.30	259.12	0.18	3.88	4.06
Eastern-South	257,250	79.76	282.58	362.34	0.0	0.0	0.0

Table 10-18 Agricultural impacts in the Dane County Routing Area

Route Alternative	Actively Cropped Land				Specialty Crops		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Total Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total impact (acres)
Black Earth Creek- North	23,614	7.52	19.75	27.27	0.0	0.0	0.0
Black Earth Creek- South	24,137	3.84	19.46	23.3	0.0	0.0	0.0

10.2.2. Forested lands

As stated in Section 4.6.2, forested lands in Wisconsin provide unique recreational opportunities, habitat for wildlife, diverse plant communities, and merchantable timber for commercial and private uses. Many of the tree species mentioned in this EIS would be considered incompatible vegetation by transmission owners; and therefore, would be actively eliminated within the proposed ROW during initial construction as well as throughout the life of the facilities. This would significantly alter, and permanently affect, the existing and future ecological communities within and adjacent to the proposed ROW. This would result in a significant alteration (conversion) of the existing forested community into a more open, disturbed grassland community subject to quick colonization by pioneer species (including invasive species and tree seedlings) and continued impacts through cyclic vegetation management practices.

One mile of 150-foot ROW (the average ROW width of the proposed project, not including the existing corridors) through a forested area results in the loss of approximately 18 acres of forested land. The potential impacts of a new transmission ROW on forested land includes, but are not limited to forest fragmentation, the loss and degradation of forested habitat, loss of merchantable timber, decreased carbon sequestration, a reduction of aesthetic enjoyment of the resource, loss of income, creation of a movement barrier or corridor, and opportunities for invasive species and disease organisms to spread.

Refer to Sections 4.6.2, 6.2.2, 7.2.2, 8.2.2, and 9.2.2 for additional information regarding potential impacts to forested lands, as well as recommended practices to avoid and minimize impacts as a result of the Cardinal-Hickory Creek project. Forested lands that could be impacted by the proposed project are included in the tables below.

Table 10-19 Summary of proposed impacts to forested areas by route alternative in the Mississippi River Routing Area

Route Alternative	Upland Forest (acres)	Forested Wetland (acres)	Total Forest Impact (acres)	MFL Properties (count)
Nelson Dewey-North	7.1	0	7.1	0
Nelson Dewey-South	16.8	0	16.8	0
Stoneman-North	11.4	0	11.4	0
Stoneman-South	5.6	0	5.6	0

Table 10-20 Summary of proposed impacts to forested lands by route alternative in the Western Routing Area

Route Alternative	Upland Forest (acres)	Forested Wetland (acres)	Total Forest Impact (acres)	MFL Properties (count)
Western-North	111.5	1.7	113.2	11
Western-South	95.6	0.4	96	6

Table 10-21 Summary of proposed impacts to forested lands by route alternative in the Eastern Routing Area

Route Alternative	Upland Forest (acres)	Forested Wetland (acres)	Total Forest Impact (acres)	MFL Properties (count)
Eastern-North	355.1	11.3	366.4	97
Eastern-South	76.8	2.3	79.1	3

Table 10-22 Summary of proposed impacts to forested lands by route alternative in the Dane County Routing Area

Route Alternative	Upland Forest (acres)	Forested Wetland (acres)	Total Forest Impact (acres)	MFL Properties (count)
Black Earth Creek-North	21.8	0.3	22.10	0
Black Earth Creek-South	20.8	1.3	22.10	1

10.2.3. Grasslands

As stated in Section 4.6.3, grassland resources are defined in the PSC application filing requirements as any undeveloped landscape dominated by herbaceous (non-woody) vegetation. Construction has the potential to affect grasslands in numerous ways. Permanent impacts may result from the placement of transmission structures. Permanent changes could also occur to soil characteristics and plant communities resulting from construction activities. Temporary impacts may result from disturbance around the structure or guy-wires during construction, maintenance, and vegetation management activities within the ROW.

As stated throughout this EIS, the proposed project occurs in a very unique part of the state where some of the last tallgrass prairie remnant communities remain. In addition, even though Wis. Stat. § 29.604 makes it illegal to take, transport, possess, process, or sell any wild animal that is included on the Wisconsin Endangered and Threatened Species List, utility practices are exempted from the taking prohibitions of listed plant species.

Refer to Sections 4.6.3, 6.2.3, 7.2.3, 8.2.3, and 9.2.3 for additional information regarding potential impacts to grassland, as well as recommended practices to avoid and minimize impacts as a result of the Cardinal-Hickory Creek project. Grasslands that could be impacted by the proposed project are included in the tables below.

Table 10-23 Summary of grassland impacts within the Mississippi River Routing Area

Route Alternative	Shared ROW (acres)	New ROW (acres)	Total Impact (acres)
Nelson Dewey-North	5.04	4.76	9.80
Nelson Dewey-South	2.6	2.6	5.2
Stoneman-North	6.28	2.39	8.67
Stoneman-South	2.75	0.85	3.6

Table 10-24 Summary of grassland impacts within the Western Routing Area

Route Alternative	Shared ROW (acres)	New ROW (acres)	Total Impact (acres)
Western-North	97.4	95.42	192.82
Western-South	116.14	111.12	227.26

Table 10-25 Summary of grassland impacts within the Eastern Routing Area

Route Alternative	Shared ROW (acres)	New ROW (acres)	Total Impact (acres)
Eastern-North	48.77	93.06	141.83
Eastern-South	191.34	74.83	266.17

Table 10-26 Summary of grassland impacts within the Dane County Routing Area

Route Alternative	Shared ROW (acres)	New ROW (acres)	Total Impact (acres)
Black Earth Creek-North	8.99	4.44	13.43
Black Earth Creek-South	9.76	5.24	15.0

10.2.4. Wetlands

As stated in Section 4.6.7, wetlands provide numerous vital functions that benefit society such as minimizing stormwater runoff, enabling the slow recharge of groundwater resources, and lowering downstream peak flood levels. Wetlands also filter sediments and pollutants from the air, precipitation, and upstream sources which results in higher water quality downstream. Wetlands provide food, cover, and nesting habitat for many species of fish and wildlife. It is estimated that between one-quarter and one-third of all rare species in Wisconsin are found in wetlands.

Construction and maintenance of transmission lines can impact wetland functional values and/or cause the existing wetland community to be converted into another wetland type. The degree and nature of impacts to wetlands depend on factors such as the type of wetland, quality of the wetland, ground conditions at the time of construction, and the type and duration of construction activities. Short-term wetland impacts can become long-term impacts if the construction phase is not well managed, or if restoration techniques are not implemented or properly applied. Examples of long-term impacts include the loss of wetland acres due to the placement of transmission structures in wetlands, the unintended spread of invasive species due to inadequate cleaning of construction equipment, the conversion of forested wetland complexes to herbaceous dominated wetland complexes, and the fragmentation of wetland types.

Certain wetland types are more susceptible to long-term impacts due to transmission line construction. They can have a more fragile habitat (such as a calcareous fen) that is difficult to re-create, or the requirements of the ROW could prevent full mitigation efforts. Forested wetlands are an example of a type of wetland that may never fully recover from the construction process

Refer to Sections 4.6.7, 6.2.4, 7.2.4, 8.2.4, and 9.2.4 for additional information regarding potential impacts to wetlands, as well as recommended practices to avoid and minimize impacts as a result of the Cardinal-Hickory Creek project. Wetlands that could be impacted by the proposed project are included in the tables below.

Table 10-27 Wetland impacts within the proposed ROW of route alternatives within the Mississippi River Routing Area

Route Alternative	Total Wetland Present (acres)	Temporary wetland impact (acres)	Permanent wetland impact (acres)	Wetland conversion (acres)	Significant/High Quality Wetlands (count)
Nelson Dewey-North	0	0	0	0	0
Nelson Dewey-South	0	0	0	0	0
Stoneman-North	0	0	0	0	0
Stoneman-South	0	0	0	0	0

Table 10-28 Wetland impacts within the proposed ROW of route alternatives within the Western Routing Area

Route Alternative	Total Wetland Present (acres)	Temporary wetland impact (acres)	Permanent wetland impact (acres)	Wetland conversion (acres)	Significant/High Quality Wetlands (count)
Western-North	16.70	5.20	0.009	1.69	18
Western-South	7.87	3.67	0.004	0.36	19

Table 10-29 Wetland impacts within the proposed ROW of route alternatives within the Eastern Routing Area

Route Alternative	Total Wetland Present (acres)	Temporary wetland impact (acres)	Permanent wetland impact (acres)	Wetland conversion (acres)	Significant/High Quality Wetlands (count)
Eastern-North	45.38	14.85	0.03	11.30	15
Eastern-South	7.25	3.75	0.004	2.16	10

Table 10-30 Wetland impacts within the proposed ROW of route alternatives within the Dane County Routing Area

Route Alternative	Total Wetland Present (acres)	Temporary wetland impact (acres)	Permanent wetland impact (acres)	Wetland conversion (acres)	Significant/High Quality Wetlands (count)
Black Earth Creek-North	5.5	2.20	0.006	0.27	3
Black Earth Creek-South	5.31	2.59	0.004	1.25	3

10.2.5. Waterways

As stated in Section 4.6.6, creeks, streams, rivers, and lakes (collectively referred to as waterways throughout this EIS) are abundant throughout Wisconsin. Many of the rivers have been designated as special resources that have state, regional, or national significance. Certain waters of the state possess significant scientific value and are identified by DNR as Areas of Special Natural Resource Interest (ASNRI) for their protection (Wis. Admin. Code § NR 1.05). Construction and operation of transmission lines across waterways may have both short-term and long-term impacts. The type and significance of the impact is dependent on the characteristics of the waterway and the overall design of the transmission facilities. Physical features of the waterway should be considered when assessing potential impacts to water quality, water quantity, habitat, recreational use, and the scenic quality of the waterway.

Refer to Sections 4.6.6, 6.2.5, 7.2.5, 8.2.5, and 9.2.5 for additional information regarding potential impacts to waterways, as well as recommended practices to avoid and minimize impacts as a result of the Cardinal-Hickory Creek project. Waterways that could be impacted by the proposed project are included in the tables below.

Table 10-31 Waterways present within the proposed ROW of route alternatives within the Mississippi River Routing Area

Route Alternative	Waterways Present	ASNRI Waterways Present	Waterway Crossings Proposed	**TCSB's Required** over ASNRI	**Total TCSB's** Required
Nelson Dewey-North	2	0	0	0	0
Nelson Dewey-South	3	0	1	0	1
Stoneman-North	3	0	2	0	2
Stoneman-South	3	0	1	0	1

Table 10-32 Waterways present within the proposed ROW of route alternatives within the Western Routing Area

Route Alternative	Waterways Present	ASNRI Waterways Present	Waterway Crossings Proposed	TCSBs Required over ASNRI	TCSBs Required	TCSBs Required (Off-ROW)	Total TCSBs Required
Western-North	53	3	74	1	23	15	38
Western-South	75	2	88	1	49	5	54

Table 10-33 Waterways present within the proposed ROW of route alternatives within the Eastern Routing Area

Route Alternative	Waterways Present	ASNRI Waterways Present	Waterway Crossings Proposed	TCSBs Required over ASNRI	TCSBs Required	TCSBs Required (Off-ROW)	Total TCSBs Required
Eastern-North	54	8	56	9	55	7	62
Eastern-South	62	12	63	11	57	4	61

Table 10-34 Waterways present within the proposed ROW of route alternatives within the Dane County Routing Area

Route Alternative	Waterways Present	ASNRI Waterways Present	Waterway Crossings Proposed	TCSBs Required over ASNRI	Total TCSBs Required
Black Earth Creek-North	6	4	7	5	7
Black Earth Creek-South	6	4	10	6	8

10.2.6. Endangered resources

As identified in Section 4.6.1, endangered resources include rare or declining species, high quality or rare natural communities, and unique or significant natural features. The state's Endangered Species Law, Wis. Stat. § 29.604, makes it illegal to take, transport, possess, process, or sell any wild animal that is included on the Wisconsin Endangered and Threatened Species List. In addition, it is illegal to remove, transport, carry away, cut, root up, sever, injure or destroy a wild plant on the Wisconsin Endangered and Threatened Species List on public lands. However, utility practices are exempted from the taking prohibitions of listed plant species.

The DNR manages the NHI database, which lists known occurrences of rare plants, animals, and natural communities. This database was used by the applicants to identify potential impacts to endangered resources as a result of the proposed project. It should be taken into consideration that most areas of the state (especially the Driftless Area) have not been surveyed extensively or recently, especially on privately-owned lands; therefore, the NHI database should not be relied upon as a sole information source for rare species.

Endangered resources that could be impacted by the proposed project are included in the tables below. It should be taken into consideration that these tables only represent the number of endangered resources within each proposed route alternative that have been recorded in the NHI database. The total number of protected species that could be impacted by each proposed route alternative may not be representative of the actual impacts these species experience. Refer to Sections 4.6.4, 6.2.6, 7.2.6, 8.2.6, and 9.2.6 for additional information regarding potential impacts to endangered resources, as well as recommended practices to avoid and minimize impacts as a result of the Cardinal-Hickory Creek project.

Table 10-35 Summary of endangered resources impacted within the Mississippi River Routing Area.

Route Alternative	Protected Status					Total Protected Species (count)
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed, Candidate, or Species of Concern	Natural Community or Animal Concentration Site	
Nelson Dewey-North	26	28	1	3	4	62
Nelson Dewey-South	25	26	1	3	3	58
Stoneman-North	19	14	1	1	3	38
Stoneman-South	19	11	1	1	3	35

Table 10-36 Summary of endangered resources impacted within the Western Routing Area

Route Alternative	Protected Status					Total Protected Species (count)
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed, Candidate, or Species of Concern	Natural Community or Animal Concentration Site	
Western-North	8	11	1	1	6	27
Western-South	7	19	1	1	9	37

Table 10-37 Summary of endangered resources impacted within the Eastern Routing Area

Route Alternative	Protected Status					Total Protected Species (count)
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed, Candidate, or Species of Concern	Natural Community or Animal Concentration Site	
Eastern-North	15	13	2	4	6	40
Eastern-South	19	18	2	5	6	50

Table 10-38 Summary of endangered resources impacted within the Dane County Routing Area

Route Alternative	Protected Status					Total Protected Species (count)
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed, Candidate, or Species of Concern	Natural Community or Animal Concentration Site	
Black Earth Creek-North	6	8	3	0	0	17
Black Earth Creek-South	6	9	3	0	0	18

10.2.7. Avian risk areas

As stated in Section 4.6.7.1, the proposed ROW for the Cardinal-Hickory Creek Project occurs in areas of known high bird use. Birds are known to collide with electric lines which can cause cascading ecological impacts, particularly to rare species. Besides the state and federal protection afforded to rare bird species (Section 4.6.1.1), all migratory birds in North America are federally protected under the Migratory Bird Treaty Act of 1918 because of their important role in global-scale ecology (Section 4.6.1.2). In a recent study, it is estimated that between eight million and 57 million birds are killed annually in the U.S. by collisions with power lines[334].

The applicants had an Avian Risk Review prepared for the proposed Cardinal-Hickory Creek project. This review has been incorporated into Sections 6.1.3.2, 7.1.3.2, 8.1.3.2, and 9.1.3.2, and attached in Appendix F. Refer to these sections for additional information regarding potential avian risks as a result of the Cardinal-Hickory Creek project. Avian collision risk areas identified by the applicants have been included in the tables below.

Table 10-39 Areas of increased avian risk within the Mississippi River Routing Area adapted from the Avian Risk Review (Appendix F)

Route Alternative	Route Subsegment(s)	Approx. Length (feet)	Approx. Length (mile)
Nelson Dewey-North	A01A, A01B, A02 (Refuge Subsegments B-1A2, B-1A)	14,318	2.71
Nelson Dewey-South	A01A, C02A, C02B (Refuge Subsegment B-1A)	8,402	1.59
Stoneman-North	None identified		
Stoneman-South	None identified		

[334] Loss, S.R., Will, T., Marra, P.P. 2014. Refining estimates of bird collision and electrocution mortality at power lines in the United States. PLoS ONE. 9(7): 1-10.

Table 10-40 Areas of increased avian risk within the Western Routing Area adapted from the Avian Risk Review (Appendix F)

Route Alternative	Route Subsegment(s)	Approx. Length (feet)	Approx. Length (mile)
Western-North	D04, D08	13,479	2.55
Western-South	E16	1,771	0.34

Table 10-41 Areas of increased avian risk within the Eastern Routing Area adapted from the Avian Risk Review Avian Risk Review (Appendix F)

Route Alternative	Route Subsegment(s)	Approx. Length (feet)	Approx. Length (mile)
Eastern-North	P09	6,883	1.30
Easter-South	None identified		

Table 10-42 Areas of increased avian risk within the Dane County Routing Area adapted from the Avian Risk Review (Appendix F)

Route Alternative	Common Route Subsegment(s)	Approx. Length (feet)	Approx. Length (mile)
Black Earth Creek-North	Y01A, Y01B	1,349	0.26
Black Earth Creek-South	Y01A, Y01B	1,349	0.26

10.2.8. Archaeological and Historic Resources

Refer to Sections 4.5.4, 6.2.8, 7.2.8, 8.2.8, and 9.2.8 for additional information regarding the potential impacts to archaeological and historic resources as a result of the proposed project as well as recommended practices to avoid and minimize these impacts. Archaeological and historic resources that could be impacted by the proposed project are tabulated in the tables below.

Table 10-43 Summary of potential archaeological and historic resource impacts in the Mississippi River Routing Area

Route Alternative	Archaeological Sites	Human Burial Sites	Historic Buildings	Historic Districts	Total
Nelson Dewey-North	0	0	0	0	0
Nelson Dewey-South	1	1	0	0	2
Stoneman-North	0	0	7	1	8
Stoneman-South	0	0	7	1	8
Laydown Yards	1	2	0	0	3

Table 10-44 Summary of potential archaeological and historic resource impacts in the Western Routing Area

Route Alternative	Archaeological Sites	Human Burial Sites	Historic Buildings	Historic Districts	Total
Western-North	1	2	0	0	3
Western-South	6	3	0	0	9
Off-ROW Access Roads	1	2	0	0	3

Table 10-45 Summary of potential archaeological and historic resource impacts in the Western Routing Area

Route Alternative	Archaeological Sites	Human Burial Sites	Historic Buildings	Historic Districts	Total
Eastern-North	2	0	1	0	3
Eastern-South	5	0	3*	0	8

*Two of the sites are NRHP listed

Table 10-46 Summary of potential archaeological and historic resource impacts in the Dane County Routing Area

Route Alternative	Archaeological Sites	Human Burial Sites	Historic Buildings	Historic Districts	Total
Black Earth Creek-North	2	0	0	0	2
Black Earth Creek-South	0	0	0	0	0
Off-ROW Access Roads	1	0	0	0	1

10.2.9. Proximity to residences

Refer to Section 4.4 for additional information on landowner rights, as well as Sections 6.3.3, 7.3.3, 8.3.3, and 9.3.3 for additional information regarding the potential impacts on nearby residences and sensitive populations. Residences within 300 feet of the proposed facilities that could be impacted by the proposed project are included in the tables below.

Table 10-47 Number of residential structures within 300 feet of the proposed centerline along route alternatives in the Mississippi River Routing Area

Route Alternative	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
Nelson Dewey-North	0	0	0	0	0
Nelson Dewey-South	0	0	0	1	1
Stoneman-North	0	5	4	11	20
Stoneman-South	0	5	3	10	18

Table 10-48 Number of residential structures within 300 feet of the proposed centerline along route alternatives in the Western Routing Area

Route Alternative	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
Western-North	0	0	1	13	14
Western-South	0	0	10	27	37

Table 10-49 Number of residential structures within 300 feet of the proposed centerline along route alternatives in the Eastern Routing Area

Route Alternative	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
Eastern-North	0	1	6	11	18
Eastern-South	3 houses and 4 apt. units	11 houses and 32 apt. units	16	59 houses and 38 apt. units	89 houses and 74 apt. units

Table 10-50 Number of residential structures within 300 feet of the proposed centerline along route alternatives in the Dane County Routing Area

Route Alternative	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
Common Subsegments	0	1	3	6	10
Black Earth Creek-North	0	0	0	1	1
Black Earth Creek-South	1	0	0	0	1

10.3. SITING CONSIDERATIONS

10.3.1. Mississippi River Crossing

As identified in Section 1.8, the only exception to the Commission having the primary siting authority for the proposed project in Wisconsin would be where it crosses property that is owned by a federal agency or encumbered with federal easement. The applicants would need a federal easement in the Upper Mississippi River National Wildlife and Fish Refuge (IA) prior to crossing the Mississippi River to get from the Hickory Creek Substation (IA) to the Cardinal Substation (WI).

As it is currently proposed, the project would either cross the Mississippi River at the existing high-voltage transmission line crossing to the Stoneman Substation or at a new high-voltage transmission crossing to the Nelson Dewey Substation. If USFWS and USACE approve a ROW location within the refuge that differs from the Commission's decision in the Mississippi River Routing Area, the location of the federal easement approved by the federal agencies would be the one that is constructed. Additional information regarding the Mississippi River route alternatives are discussed in Chapter 6.

10.3.2. Additional project options under consideration by RUS

In the CPCN application submitted to the Commission, the applicants provided information on additional project options under consideration by RUS[335]. These additional options came up during the federal EIS scoping process and are being evaluated through the NEPA process led by RUS. All of these route options were eliminated by the applicants during the initial siting of the proposed project and are not being proposed to the Commission in docket 5-CE-146. Refer to Appendix C for additional information.

10.3.3. Badger Hollow Solar Farm

The Commission's decisions regarding the Badger Hollow Solar Farm (docket 9697-CE-100 and 9697-CE-101) are expected to occur prior to its decisions on the Cardinal-Hickory Creek project. The potential for these projects to impact each other are dependent upon the decisions the Commission makes regarding these projects. The applicants state that since the Badger Hollow solar array panels must be designed and placed to accommodate the existing transmission lines, little to no impact would be expected on the proposed Cardinal-Hickory Creek transmission line from the solar array panels. Due to the proposed construction schedules for each project, if both are approved, it is unknown at this time if the applicants' assumptions about the impact of the solar arrays on the Cardinal-Hickory Creek line are accurate. Refer to Section 5.9.4.1.1 for additional information.

10.3.4. Driftless Area

The proposed Cardinal-Hickory Creek project traverses southwestern Wisconsin from the Mississippi River to Middleton, Wisconsin; well-known and often referred to as the Driftless Area. Wisconsin's Driftless Area has not been glaciated for at least the last 2.4 million years and consists of significant topographic variation and unique ecological communities found nowhere else in the state. Southwestern Wisconsin contains areas of steep forested ridges, deeply dissected river valleys, and karst geology with plenty of spring-fed and cold-water trout streams. Refer to Section 2.5 for additional information.

Many have recognized the Driftless Area as a unique resource worthy of ecological, cultural, and economic importance; and thus, this area is the focus of several government, non-profit, and private partnerships

[335] Appendix M of the CPCN Application (PSC REF#: 350875)

and organizations that are solely focused on the conserving, restoring, and enjoying this unique area in the state. Concerns for the impacts the proposed Cardinal-Hickory Creek project could and would have on the Driftless Area are a common theme found throughout the hundreds of comments received on the project as well as the parties intervening in the proceeding of the proposed project.

10.4. GENERAL MITIGATION STRATEGIES

Some of the ecological and socioeconomic impacts that could occur as part of the proposed project may be mitigated or avoided entirely by specific construction methods, route siting, as well as other pre-and post-construction best management practices that are mentioned throughout this EIS. The Commission can require the applicants to incorporate specific mitigation methods into the project design, construction process, and/or maintenance procedures to minimize and avoid ecological and socioeconomic impacts from the proposed project. Some examples of mitigation strategies are identified below in Table 10-51 as well as throughout this EIS (Chapters 4-9).

In addition, the Commission must make a number of determinations regarding the proposed construction project in a short timeframe, without knowing whether other state and federal regulatory permits would be granted for the Cardinal-Hickory Creek project. The Commission typically includes language in an order authorizing a project that states an applicant is required to obtain all necessary federal, state, and local permits prior to starting construction on either the entire project, or project construction spread, as a practical way of mitigating that uncertainty. The reason for this requirement is to ensure that the Commission does not approve, and the applicants begin constructing, a section of a project that would not be able to obtain the required permits from other state and federal regulatory agencies.

Table 10-51 Examples of mitigation strategies

Project Phase	Feature	Examples of Mitigation Strategies
Design Phase	Route Siting	Use corridor-sharing to minimize new ROW requirements; however, this also increases the cumulative impacts on existing corridors.
	Transmission Structure	Choose a different transmission structure with different construction requirements and aesthetic appeal: • H-frame structures, while requiring wider ROWs, have longer span lengths which may make it easier to cross rivers, wetlands, or other resources with fewer impacts. • The darker color of oxidized steel structures may blend in better with forested backgrounds. • Low profile structures, while necessarily closer together with possibly wider ROWs, can be used near airports to avoid interference with flight approaches.
	Structure Placement	Make minor adjustments to structure locations to avoid archaeological sites or minimize effects on agricultural operations.
	Add-ons	The applicants conducted an Avian Risk Review for the proposed project. In the areas where the applicants identified increased risk for avian collisions, they could add flight diverters to conductors to minimize bird collisions with the wires.
Construction Phase	Timing	Alter the timing of the construction periods: • Construct when the ground is frozen and vegetation is dormant to minimize impacts to wetlands or other sensitive habitats. • Delay construction in agricultural areas until after harvest to minimize crop damage and reduce soil compaction (if done while ground is frozen).
	Specific Construction Equipment	Use wide-track vehicles and matting to reduce soil compaction and rutting in sensitive soils and natural areas.
	Erosion Control	Install and maintain proper erosion controls during construction to minimize run-off of topsoil and disturbances to natural areas.

Project Phase	Feature	Examples of Mitigation Strategies
Post-Construction Phase	Invasive Species Management	Clean equipment as work finishes in one area to avoid spreading invasive plants to new areas. Annually survey for and eliminate new populations of invasive species caused by construction disturbances.
	Restoration	Decompact soils in agricultural areas to allow soil structure to redevelop and reduce impacts to crop yields. Revegetate ROW with appropriate seed mixes, include native species to the greatest extent practicable, and select plant species with season-long sources of pollen and/or nectar to ROWs for declining pollinator species.
	ROW Vegetation Management	Implement integrated vegetation management (IVM) practices, accredited or supported by the ROW Stewardship Council, to create a long-term compatible vegetative community within the ROW. Develop maintenance schedules and techniques to enhance habitat for rare or compatible species and communities; delay brush-cutting and mowing until nesting birds have fledged.

10.4.1. Independent Construction Monitors

While construction conditions specified in the Commission's order and DNR's permit can avoid, minimize, and mitigate the potential adverse impacts of an approved project, it is sometimes useful to employ an independent environmental monitor (IEM) and/or an independent agricultural monitor (IAM). These independent construction monitors can assist the regulatory agencies in ensuring compliance with regulatory requirements. Additionally, a monitor's presence during construction of the project may proactively prevent and minimize impacts from occurring through close work with construction personnel. In Section 4.2.5.2, there is a brief discussion of how an IEM or an IAM may function for projects that have a potential to impact high-quality natural resources or special or fragile farmlands.

10.4.1.1. Independent Environmental Monitor

IEMs have been required by the Commission in six transmission construction projects. The projects include the Arrowhead-Weston (docket 05-CE-113), Gardner Park-Central Wisconsin and Morgan-Werner West also known as GCMW (dockets 137-CE-122 and 137-CE-123), Rockdale-West Middleton (docket 137-CE-147), CapX2020 Alma-La Crosse (docket 5-CE-136), Badger Coulee (docket 5-CE-142), and North Appleton-Morgan (docket 137-CE-166). The Commission determined in each of these dockets that one or more IEMs should be hired due to the scope of the projects, the diversity of landscapes through which the transmission would pass, and the presence of sensitive natural resources. As third-party independent monitors, the IEMs reported directly to PSC staff, rather than the applicants or construction subcontractors. IEMs were charged with reporting incidents and stopping work, if appropriate, when construction practices violated any applicable permit, approval, order, and/or agreements issued by regulatory agencies or were likely to cause non-approved impacts to the environment or private properties.

Construction activities that were subject to monitoring and reporting by the IEMs included activities that might impact wetlands and bodies of water, habitats and occurrences of protected species, archeological sites, agricultural fields or facilities, state and federal properties, and private property with detailed construction agreements or specific issues such as organic farming practices or trees valued by the landowner. In these dockets, the Commission, DNR, and DATCP submitted testimony that an independent environmental monitoring was critical in obtaining a clear and current record of construction activities and environmental protection measures being implemented. The utilities were required to pay the salaries and expenses of the IEMs, as reviewed and approved by PSC staff. The Commission-approved IEM scopes of work for these transmission projects varied from complete coverage of all utility construction activities to specific areas or specific construction activities.

As a method to identify sensitive resources along the approved route and appropriate environmental mitigation measures, a PSC-approved plan was required prior to the start of construction of project segments. Consultation with other regulatory agencies ensured that sensitive sites were identified and would be properly protected. The PSC-approved plans became a useful communication and training tool for the contractors, construction crews, IEM(s), and PSC staff and other regulatory agencies. The PSC-approved plans included current contact information, general construction and mitigation practices, specific construction and mitigation measures needed at sensitive resource locations, and maps identifying all pertinent structures and resources.

10.4.1.2. Independent Agricultural Monitor

An agricultural monitor has been found useful for the most recent high-voltage transmission projects, Rockdale to West Middleton and CapX2020 Alma-La Crosse, for construction activities that will impact agricultural lands. For Badger-Coulee and North Appleton to Morgan, the Commission combined the roles of the IEM and the IAM into one position under the IEM title; however, when the IEM was working in the capacity as the IAM they did not have stop work authority. Prior to these projects, utilities have hired agricultural monitors on an as-needed basis or to step in only after problems in the field occurred. Similar to IEMs, the leading benefits of an independent agricultural monitor are for the regulatory agencies to obtain a current record of construction activities and agricultural protection measures and to proactively prevent or minimize potential impacts. The agricultural monitors are only involved with the protection of agricultural properties and their operation.

If this project is approved, the qualifications and responsibilities of an IAM could be included in an agricultural impact mitigation plan or determined in a Commission order point. The IAM would typically be funded by the applicant but could report directly to the DATCP and could act as a liaison between landowners and DATCP, if necessary.

10.5. PROPOSED PROJECT COSTS

The total estimated project costs for the proposed route alternatives based on the Mississippi River crossing selected are included in Table 10-52. The total estimated costs include the costs for the new Hill Valley Substation as well as the modifications at all the other substations identified in this EIS.

Table 10-52 Estimated project costs by route alternative and Mississippi River crossing. Refer to Section 2.4 for additional information. The total costs include substation modifications and construction and it assumes that Black Earth Creek-North and the Black Earth Creek-South route alternatives would have the same cost.

Route Alternatives	Western-North	Western-South	Western-North	Western-South
	Eastern-South	Eastern-North	Eastern-North	Eastern-South
Total Project Cost - Nelson Dewey Crossing	$492,216,000	$542,996,000	$474,180,484	$560,136,483
Total Project Cost - Stoneman Crossing	$493,573,000	$539,534,000	$475,537,484	$556,674,483

Acronyms

Abbreviation or Acronym	Definition
%	Percent
§	Section
AAT	Accelerated Alternative Technologies
ABB	ASEA Brown Boveri Corporation
AC	Alternating current
AFUDC	Allowance for funds used during construction
AIS	Agricultural Impact Statement
ALTE	Alliant Energy
APC	Adjusted Production Cost
APLIC	Avian Power Line Interaction Committee
APE	Area of Potential Effect
ASNRI	Areas of Special Natural Resource Interest
ATC	American Transmission Company LLC
Badger Hollow	Badger Hollow Solar Farm
BFD	Bird Flight Diverters
BMP	Best Management Practices
Cardinal Hickory Creek	Cardinal Hickory Creek transmission line project
CBM	Customer Benefit Metric
CEII	Critical Energy Infrastructure Information
ch.	Chapter
ComEd	Commonwealth Edison Company
Commission or PSCW	Public Service Commission of Wisconsin
CPCN	Certificate of Public Convenience and Necessity
CRANES	Capital Region Advocacy Network for Environmental Sustainability
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CTH	County Highway
CWA	Clean Water Act
DATCP	Department of Agriculture, Trade and Consumer Protection
DBH	Diameter at Breast Height
DC	Direct Current
DEIS	Draft Environmental Impact Statement
DNR	Department of Natural Resources
DOA	Department of Administration
DPC	Dairyland Power Cooperative
EA	Environmental Assessment
EAB	Emerald Ash Borer
e.g.	*exempli gratia*, for example
EF	Existing Fleet
EHV	Extra High-Voltage
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Fields
EMI	Electromagnetic Interference
EPRI	Electric Power Research Institute
ERF	Electronic Records Filing
ERW	Exceptional Resource Waters
FAA	Federal Aviation Administration

Abbreviation or Acronym	Definition
FCC	Federal Communications Commission
FCITC	First Contingency Incremental Transfer Capability
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FPISC	Federal Permitting Improvement Steering Committee
FPP	Farmland Preservation Program
FSA	Farm Service Agency
FTR	Financial Transmission Rights
G	Gauss
GIS	Geographic Information System
GW	Gigawatts
NTA	Non-Transmission Alternative
HHI	Herfindahl-Hirschman Index
HVDC	High Voltage Direct Current
IAM	Independent Agricultural Monitor
IBAs	Important Bird Areas
ICD	Implantable Cardioverter Defibrillators
IDNR	Iowa Department of Natural Resources
IDOT	Iowa Department of Transportation
IEM	Independent Third-Party Environmental Monitors
ISO	Independent System Operators
ITC	ITC Midwest LLC
IUB	Iowa Utilities Board
i.e.	*id est,* that is
ITA	Incidental Take Authorization
IVM	Integrated Vegetation Management
kHz	Kilohertz
Km	Kilometers
kV	Kilovolt – 1,000 volts
LAWCON	Land and Water Conservation
LBA	Load Balancing Authorities
LMP	Locational Marginal Pricing
LRZ	Local Resource Zones
LSE	Load Serving Entities
LUG	Local Units of Government
LVA	Low Voltage Alternative
LWCF	Land and Water Conservation Fund
MBTA	Migratory Bird Treaty Act
MCC	Marginal Congestion Components
MFL	Managed Forest Law
mG	Milligauss
MGE	Madison Gas and Electric
MISO	Midwest Independent Transmission System Operator, Inc.
MMWG	Multiregional Modeling Working Group
MRPHA	Military Ridge Prairie Heritage Area
MTEP	MISO Transmission Expansion Plan
MVA	Megavolt-Ampere
MVAR	Megavolt-Amperes Reactive
MVC	Mississippi Valley Conservancy
MVP	Multi Value Project
MW	Megawatt
MWh	Megawatt hour
NA	No-Action
N/A	Not Available or Not Applicable

Abbreviation or Acronym	Definition
NCO	Nonprofit Conservation Organization
NEC	National Electrical Code
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NEV	Neutral-to-Earth Voltage
NHI	Natural Heritage Inventory
NHPA	National Historic Preservation Act
NLL	No Load Loss Allowed contingencies
NPV	Net Present Value
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NSPW	Northern States Power Company-Wisconsin
NTA	Non-Transmission Alternative
NYMEX	New York Mercantile Exchange
OHWM	Ordinary High Water Mark
OMS	Organization of MISO States
OPGW	Optical Ground Wire
ORW	Outstanding Resource Waters
PAC	Planning Advisory Committee
Paraquat	“Paraquat”
PJM	Pennsylvania – New Jersey – Maryland Interconnection LLC
PR	Policy Regulation
PRFoxconn	Policy Regulations with Foxconn
PRLE	Policy Regulation with MISO Low Energy Demand
PSCW or Commission	Public Service Commission of Wisconsin
PSS®E	Power System Simulator for Engineering
PV	Photovoltaic
PVRR	Present Value Revenue Requirement
Refuge	Upper Mississippi River National Wildlife and Fish Refuge
REPS	Wisconsin Rural Electric Power Services
Reradiation	AM Antenna Radiation Pattern
RFI	Radio Frequency Interference
RGOS	Regional Generation Outlet Study
Roundup	Glyphosate
ROW	Right-of-Way
RUS	Rural Utilities Service
RPC	Regional Planning Commissions
RPS	Renewable Portfolio Standards
RTO	Regional Transmission Organizations
SHPO	State Historic Preservation Office
SMARTransmission	Strategic Midwest Area Renewable Transmission
sp.	Species (singular)
spp.	Species (plural)
SSR	System Support Resource
STH	State Highway
SWGSCA	Southwest Wisconsin Grassland and Stream Conservation Area
SWWAP	South West Wisconsin Area Progressives
TCSB	Temporary Clear-Span Bridges
TYA	Ten Year Assessment
U.S.	United States
USH	U.S. Highway
UMTDI	Upper Midwest Transmission Development Initiative
UPPC	Upper Peninsula Power Company

Abbreviation or Acronym	Definition
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USEAP	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USH	U.S. Highway
WEC	Wisconsin Electric Power Company
WEPA	Wisconsin Environmental Policy Act
WEPCO	Wisconsin Electric Power Comany
WHS	Wisconsin Historical Society
WHPD	Wisconsin Historic Preservation Database
Wis. Admin. Code	Wisconsin Administrative Code
WisDOT	Wisconsin Department of Transportation
Wis. Stat.	Wisconsin Statutes
WMC	Wisconsin Manufacturers and Commerce
WPDES	Wisconsin Pollutant Discharge Elimination System
WPL	Wisconsin Power and Light
WPSC	Wisconsin Public Service Corporation
WRP	Wetlands Reserve Program