Environmental Assessment

Parkers Prairie 115 kV Transmission Line Project

In the Matter of the Route Permit Application by Great River Energy
for the Parkers Prairie 115 kV Transmission Line Project in Otter Tail County

PUC Docket No. ET2/TL-11-867

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Abstract

On October 24, 2011, Great River Energy (GRE) filed a route permit application with the Minnesota Public Utilities Commission (Commission) for the Parkers Prairie 115 kV transmission line project. GRE indicates in its application that the proposed project will address low voltage issues in the rural areas immediately west of Parkers Prairie, Minn.

GRE proposes to replace approximately 2.1 miles of an existing 41.6 kV transmission line in Otter Tail County, Minnesota, with a new line at a voltage of 115 kV. The existing transmission line runs parallel to and on the south side of Otter Tail County Road 6. In addition, GRE, in collaboration with Lake Region Electric Cooperative (LREC), proposes to modify and update the existing Parkers Prairie distribution substation, and to connect the substation and new line to an existing GRE 115 kV line through a switch structure.

Under the Power Plant Siting Act (Minn. Stat. 216E), a route permit from the Commission is required to construct a high voltage transmission line (HVTL). Department of Commerce, Energy Facility Permitting (EFP) staff is responsible for conducting the environmental review for route permit applications submitted to the Commission (Minn. Rules 7850). Accordingly, EFP staff has prepared this environmental assessment (EA) for the Parkers Prairie project. This EA addresses the issues required in Minnesota Rule 7850.3700, subpart 4, and those identified in the Department's scoping decision of January 13, 2012.

Persons interested in this project can place their names on the Departments' project mailing list by registering online at: www.energyfacilities.puc.state.mn.us/Docket.html?Id=32307 or by contacting Ray Kirsch, Energy Facilities Permitting, 85 7th Place East, Suite 500, St. Paul, Minnesota 55101, phone: (651) 296-7588, e-mail: raymond.kirsch@state.mn.us. Documents of interest can be found at the above website and on the eDockets system: https://www.edockets.state.mn.us/EFiling/search.jsp (enter the year "11" and the number "867").

Following release of this environmental assessment, a public hearing will be held in the project area. The hearing will be presided over by an administrative law judge from the Office of Administrative Hearings. Upon completion of the environmental review and hearing process, the record compiled on the route permit application will be presented to the Commission for a final decision. A decision on a route permit for the Parkers Prairie project is anticipated in May/June 2012.

Acronyms, Abbreviations, and Definitions

ACSR	Aluminum Conductor Steel Reinforced
AC	Alternate Current
ALJ	Administrative Law Judge
BMP	Best management practice
BPA	Bonneville Power Association
Commission	Minnesota Public Utilities Commission
CN	Certificate of Need
CSAH	County State Aid Highway
dB	decibels
dBA	A-weighted sound level recorded in units of decibels
DC	Direct Current
DNR	Minnesota Department of Natural Resources
DOC	Department of Commerce
EA	Environmental Assessment
EFP	Department of Commerce Energy Facilities Permitting
EMF	electromagnetic field
EPA	United States Environmental Protection Agency
ER	Environmental Report
FEMA	Federal Emergency Management Agency
G	Gauss
GRE	Great River Energy
HVTL	high voltage transmission line
Hz	Hertz
kV	kilovolt
kV/M	Kilovolt per meter
kWh	Kilowatt hour
LREC	Lake Region Electric Cooperative (LREC)
mA	milliAmperes
MCBS	Minnesota County Biological Survey
MDH	Minnesota Department of Health
mG	milligauss
MHz	Mega Hertz
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MSIWG	Minnesota State Interagency Working Group
MW	Megawatt
NAC	noise area classification
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NEV	Neutral-to-Earth Voltage
NIEHS	National Institute of Environmental Health Sciences
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory

PM	Particulate Matter
ppm	parts per million
PWI	Public Waters Inventory
RAPID	U.S. EMF Research and Public Information Dissemination
ROW	Right-of-Way
RUS	Rural Utilities Service
SFD	Swan Flight Diverter
SHPO	State Historic Preservation Office
SNA	Scientific and Natural Area
SWPPP	Stormwater Pollution Prevention Plan
USCOE	United States Corp of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WCA	Minnesota Wetland Conservation Act
WHO	World Health Organization
WPA	Waterfowl Production Area
WMA	Wildlife Management Area

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1.0 Introduction

Under the Power Plant Siting Act (Minn. Stat. 216E), a route permit from the Minnesota Public Utilities Commission is required to construct and operate a high voltage transmission line (HVTL) in Minnesota. On October 24, 2011, Great River Energy (GRE) filed an HVTL route permit application with the Commission for the Parkers Prairie 115 kV transmission line project.

Department of Commerce, Energy Facility Permitting (EFP) staff is responsible for conducting the environmental review for route permit applications submitted to the Commission (Minn. Rules 7850). EFP staff has prepared this environmental assessment (EA) for the Parkers Prairie project. The intent of the environmental review process is to inform the public, the applicant, and decision-makers about potential impacts and possible mitigations of the proposed project and alternatives.

1.1 Organization of the Environmental Assessment

This environmental assessment (EA) addresses the issues noted in Minnesota Rule 7850.3700, subpart 4, and those identified in the Department's scoping decision for this project (**Appendix A**), and is organized as follows:

Section 1.0	**Introduction**	The introduction provides an overview of this document and of the proposed project. It also provides a summary of the potential impacts of the project and route alignment alternatives.
Section 2.0	**Regulatory Framework**	Section 2.0 describes the regulatory framework associated with the project, including certificate of need criteria, route permit requirements, and the alternative permitting process.
Section 3.0	**Proposed Project**	Section 3.0 describes the Parkers Prairie project as proposed by GRE, including rights-of-way, structures, and conductors.
Section 4.0	**Project Construction**	Section 4.0 describes the construction methods for the project including easement acquisition.
Section 5.0	**Potential Impacts and Mitigation Measures**	Section 5.0 details the potential impacts of the proposed project to human and natural environments and identifies measures that could be implemented to avoid, minimize, or mitigate any potential adverse impacts.
Section 6.0	**Alignment Comparisons**	Section 6.0 provides a comparison of route alignments that may mitigate potential impacts of the project.

Sources of Information

The primary source of information for this environmental assessment is the route permit application submitted by GRE. Additional sources of information are indicated in footnotes. Information from earlier EFP environmental review documents and other state agencies, such as the Minnesota Department of Natural Resources, is also included. First hand information was gathered by site visits and by conversations with landowners and citizens.

1.2 Project Overview

Great River Energy (GRE) proposes to replace approximately 2.1 miles of an existing 41.6 kV transmission line in Otter Tail County, Minn., with a new line at a voltage of 115 kV. In addition, GRE, in collaboration with Lake Region Electric Cooperative (LREC), proposes to modify and update the existing Parkers Prairie distribution substation, and to connect the substation and new line to GRE's existing Inman – Alexandria 115 kV line (LR-IA) through a switch structure (**Figure 1**).

GRE proposes to construct the new 115 kV transmission line on the same alignment as the existing 41.6 kV line, currently located along the south side of County Road 6 (CSAH 6). GRE has requested a route width of 300 feet centered on CSAH 6, which would allow for the new transmission line to be constructed on the north or south side of CSAH 6, or some combination thereof. GRE has indicated the 115 kV line will require a right-of-way (easement) of 100 feet (50 feet on each side of the transmission line). Wood poles, ranging in height from 60 – 85 feet, will be used for the new line. Specialty poles (e.g., taller poles) or guy wires may be required at specific locations. The footprint of the Parkers Prairie distribution substation will be expanded 40 feet to the south to accommodate a new 115 kV transformer.

Upon construction of the new 115 kV line and connection to the existing LR-IA line, GRE will remove approximately 1650 ft. of 41.6 kV line which will no longer be need for electrical service in the area. The estimated cost for Parkers Prairie project is $1.5 million dollars.

Project Location

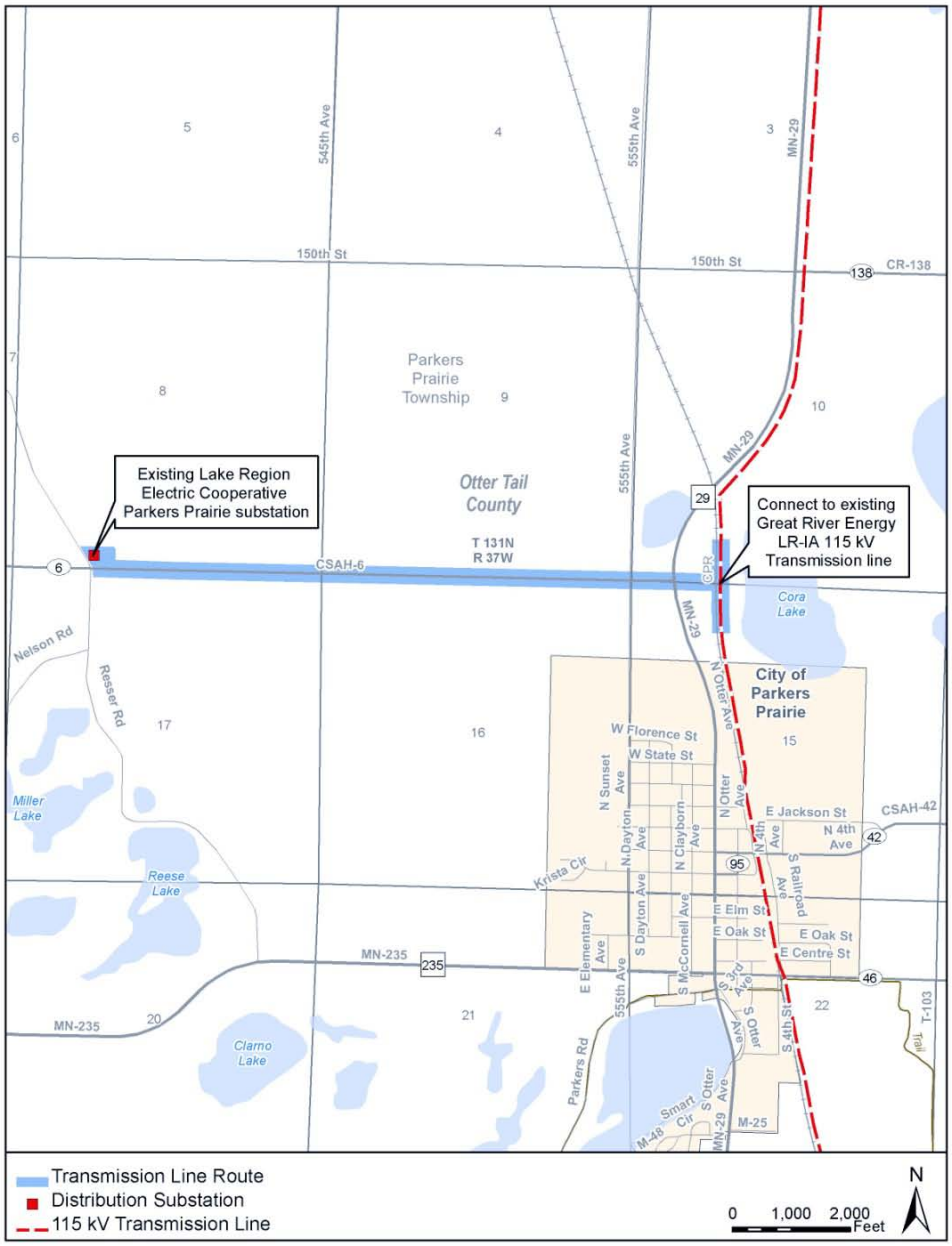
The Parkers Prairie project will be located in Parkers Prairie Township in Otter Tail County, Minn. The project is proposed to parallel County Road 6 and to cross Minnesota State Highway 29, just north of the city of Parkers Prairie.

Project Purpose

GRE indicates in its route permit application that the proposed project will address potential low voltage issues in the rural areas immediately west of Parkers Prairie, Minn. These areas are currently served out of the Parkers Prairie substation. The substation serves a relatively large load in the area and is fed from the Milton substation during normal operations and the Brandon substation during non-normal operations. The Parkers Prairie substation is at the radial end of older, high impedance 41.6 kV transmission line. This line introduces a substantial voltage drop in the regional electrical system. The voltage drop is such that during non-normal operations electrical appliances and lighting may not perform as expected and could be damaged. GRE identified this low voltage issue in its 2008 long range transmission plan.[1]

[1] Great River Energy, Long-Range Transmission Plan, October, 2008, pages F17 – F19, http://www.greatriverenergy.com/deliveringelectricity/planningforthefuture/doc083180.pdf.

Figure 1. Project Overview Map



1.3 Summary of Potential Impacts and Alignment Alternatives

In issuing a route permit for the Parker Prairie project, the Minnesota Public Utilities Commission is charged with selecting a route and alignment that minimize adverse human and environmental impacts of the project.[2] For many categories of impacts, the potential impacts of the Parkers Prairie project are anticipated to be minimal. These include impacts to public health and safety, public services, electronic communications, water resources, soils, and fauna. There are categories where impacts are expected to be non-minimal and could be significant – specifically, impacts to land-based economies (agriculture, forestry), to shelterbelts and treed areas, and to aesthetics (particularly residential aesthetics).

[2] Minnesota Statute 216E.02, Subd 1, https://www.revisor.mn.gov/statutes/?id=216E.02.

In general, the proposed route for the project along CSAH 6 is straightforward and consistent with the Commission's charge of utilizing existing infrastructure corridors for new transmission lines.[3] However, there are a number of agricultural operations, a tree farm, field shelterbelts, and residential shelterbelts which abut CSAH 6. These enterprises and natural resource coexist successfully with the current electrical lines along CSAH 6 – a distribution line on the north side and a 41.6 kV line on the south side. Alignments significantly outside of the existing CSAH 6 right-of-way have the potential to significantly impact land-based economies, shelterbelts, and aesthetics in the project area.

Impacts to enterprises and natural resources along CSAH 6 result primarily from GRE's intention to manage vegetation within the new 115 kV line right-of-way (ROW) in a manner that is different from current vegetation management for the existing distribution line and 41.6 kV line. GRE intends to remove tall growing species within the 115 kV ROW; whereas, to date, such species have been allowed to grow (some with regular trimming) in the rights-of-way for the distribution line and 41.6 kV line.

Where impacts are expected to be non-minimal and potentially significant, these impacts can be mitigated through individual easement agreements with landowners along the route, e.g., monetary compensation, replanting of shelterbelt with low-growing species. Impacts can also be mitigated by the selection of an alignment for the new 115 kV line that avoids impacts. In general, impacts to agricultural operations can be mitigated by placing the alignment on the south side of CSAH 6. Impacts to forestry operations (a tree farm) can be mitigated by placing the alignment on the north side of CSAH 6 in the area near Minnesota State Highway 29. In general, impacts to shelterbelts and trees can be mitigated by placing the alignment on the north side of CSAH 6. Aesthetic impacts and impacts to residences are primarily related to the potential loss of trees in residential shelterbelts.

Alignments which utilize both sides of CSAH 6 have the potential to mitigate and balance impacts. Alignments which cross CSAH 6 and alignments on the north side of CSAH 6 – requiring the underbuilding or undergrounding of the existing distribution line – make the project relatively more expensive.

[3] Minnesota Statute 216E.03, Subd. 7, https://www.revisor.mn.gov/statutes/?id=216E.03.

2.0 Regulatory Framework

Persons seeking to construct and operate a high voltage transmission line in Minnesota must seek permission(s) to do so from the Minnesota Public Utilities Commission (Commission).

2.1 Certificate of Need

No person may construct a large energy facility in Minnesota without a certificate of need from the Commission (Minn. Stat. 216B.243). A transmission line is a large energy facility if it (1) has a capacity of 200 kV or more and is greater than 1,500 feet in length, or (2) has a capacity of 100 kV or more with more than 10 miles of its length in Minnesota, or (3) has a capacity of 100 kV or more and crosses a state line (Minn. Stat. 216B.2421).

The project as proposed, a 115 kV transmission line with a length of approximately 2.1 miles, does not qualify as a large energy facility; thus, a certificate of need is not required.

2.2 Route Permit

In Minnesota, no person may construct a high voltage transmission line without a route permit from the Commission (Minn. Stat. 216E.03). A high voltage transmission line is defined as a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kV or more and greater than 1,500 feet in length (Minn. Stat. 216E.01). Associated facilities of a transmission line may include buildings, equipment, and other physical structures that are necessary to the operation of a high voltage transmission line.

The Parkers Prairie project will consist of approximately 2.1 miles of new 115 kV transmission line and therefore requires a route permit from the Commission. GRE has submitted the route permit application for the Parkers Prairie project under the Commission's alternative permitting process (Minn. Rules 7850). The application was submitted on October 24, 2011, and accepted as complete on December 7, 2011. The alternative permitting process includes environmental review and a public hearing, and typically takes six months to complete.

A copy of GRE's route permit application, along with other documents relevant to this project, can be viewed on the Commission's energy facility permitting webpage: www.energyfacilities.puc.state.mn.us/Docket.html?Id=32307, and on the Commission's eDockets webpage: https://www.edockets.state.mn.us/EFiling/search.jsp (enter the year "11" and the number "867").

Environmental Review

Applications for transmission line route permits are subject to environmental review conducted by EFP staff (Minn. Rule 7850.3700). Projects proceeding under the alternative permitting process require the preparation of an environmental assessment (EA). An EA is a document which describes the potential human and environmental impacts of the proposed project and potential mitigative measures. The Department of Commerce determines the scope of the EA. The Department may include alternative routes suggested by the public in the scope of the EA if such alternatives will assist in the Commission's decision on the route permit. The EA must be completed and made available prior to the public hearing for the project.

On Tuesday, December 13, 2011, EFP staff held a public information and scoping meeting at the Prairie Event Center in Parkers Prairie, Minn. The purpose of the meeting was to provide information to the

public about the proposed project, to answer questions, and to allow the public an opportunity to suggest impacts and alternatives that should be considered in the environmental assessment for the project.

Approximately 15 persons attended the public meeting; two persons made comments or asked questions. A court reporter was present at the meeting and transcribed questions and comments made by the public, as well as responses from EFP staff and GRE representatives.

A comment period followed the public meeting and was open through Friday, December 30, 2011. EFP staff received five comment letters by the end of the comment period. Two comment letters expressed concern for the potential loss of trees due to the proposed project. The Otter Tail County Highway Department commented that it would like to reserve a 120 ft. road right-of-way for CSAH 6 to accommodate future road reconstruction. The Minnesota Pollution Control Agency (MPCA) commented that the project will very likely require a National Pollution Discharge Elimination System (NPDES) stormwater permit. The Minnesota Department of Transportation (MnDOT) commented that a road crossing permit, consistent with MnDOT's utility accommodation policy, would be required for crossing Minnesota State Highway 29.

After consideration of the route permit application and public comments received, the Department of Commerce Deputy Commissioner issued his scoping decision on January 13, 2012. The EA scoping decision is included in **Appendix A**.

Public Hearing

Upon completion of the EA, a public hearing will be held in the project area (Minn. Rule 7805.3800). It is anticipated that this hearing will be held in April 2012. The hearing will be presided over by an administrative law judge (ALJ) from the Office of Administrative Hearings. Members of the public will have an opportunity to speak at the hearing, present evidence, ask questions, and submit comments. The ALJ will ensure that the record created at the hearing is preserved and will provide EFP staff with a summary of testimony from the hearing.

Comments received during the hearing on the environmental assessment become part of the record in the proceeding, but EFP staff is not required to revise or supplement the EA document. Upon completion of the environmental review and hearing process, the record compiled for the route permit application will be presented to the Commission for a final decision. A decision by the Commission on a route permit for the Parkers Prairie project is anticipated in June 2012.

The Commission's obligation is to choose routes that minimize adverse human and environmental impacts while insuring continuing electric power system reliability and integrity, and also while insuring that electric energy needs are met and fulfilled in an orderly and timely fashion. The route permit will contain conditions specifying construction and system operation standards. A sample route permit is included in **Appendix C**.

If issued a route permit by the Commission, GRE may exercise the power of eminent domain to acquire land for the Parkers Prairie project (Minn. Stat. 216E.12).

2.3 Other Permits

A route permit from the Commission is the only state permit required for the routing of the Parkers Prairie project. A route permit supersedes local planning and zoning regulations (Minn. Stat. 216E.10). However, various local, state, and federal permits may be required for activities related to the

construction and operation of the project. **Table 1** includes a list of permits that may be required for the Parkers Prairie project.

Table 1. Potential Permits and Approvals[4]

Permit	Jurisdiction
Federal Approvals	
Spill Prevention , Control, and Countermeasure (SPCC) Plan	EPA
State of Minnesota Approvals	
Utility Permit (road crossing)	MnDOT
NPDES Permit (substation, transmission line)	MPCA
Section 401, Clearn Water Act	MPCA
Local Approvals	
Utility Permit	County
Road Crossing Permits	County, Township
Lands Permits	County, Township
Overwidth Loads Permits	County, Township
Driveway/Access Permits	County, Township

2.4 Applicable Codes

The Parkers Prairie project must meet the requirements of the National Electrical Safety Code (NESC).[5] The code is designed to protect human health and the environment. It also ensures that the transmission line and all associated structures are built from high quality materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment, provided that routine maintenance is performed.

Utilities must comply with the most recent edition of the NESC, as published by the Institute of Electrical and Electronics Engineers, Inc., and approved by the American National Standards Institute, when constructing new facilities or reinvesting capital in existing facilities (Minn. Statute 326B.35, Minn. Rule 7826.0300).

[4] Application to the Minnesota Public Utilities Commission for a Route Permit, Parkers Prairie 115 kV Project, Great River Energy, 24 October 2011, Section 9.3, Route Permit Application [hereafter Route Permit Application).
[5] National Electrical Safety Code, http://standards.ieee.org/about/nesc/#q1.

2.5 Issues Outside the Scope of the Environmental Assessment

In accordance with the scoping decision for this EA (**Appendix A**), the following topics are not addressed in this document:

- No-build alternative.
- Issues related to the project need, size, type, or timing.
- Any route or substation alternative not specifically identified in the scoping decision.
- Policy issues surrounding whether utilities or local governments should be liable for the cost to relocate utility poles when roadways are widened.
- The manner in which landowners are paid for transmission rights-of-way easements.

3.0 Proposed Project

Great River Energy (GRE) proposes to replace approximately 2.1 miles of an existing 41.6 kV transmission line in Otter Tail County, Minn., with a new line at a voltage of 115 kV. In addition, GRE, in collaboration with Lake Region Electric Cooperative (LREC), proposes to modify and update the existing Parkers Prairie distribution substation, and to connect the substation and new line to GRE's existing Inman – Alexandria 115 kV line (LR-IA) through a switch structure. Upon construction of the new 115 kV line and connection to the existing LR-IA line, GRE will remove the existing 41.6 kV line serving the Parkers Prairie substation and an additional 1650 ft. of 41.6 kV line which will no longer be need for electrical service in the area.[6]

3.1 Route and Right-of-Way

When it issues a route permit, the Minnesota Public Utilities Commission (Commission) approves a route, a route width, and an anticipated alignment within that route width. The route width is typically larger than the actual right-of-way needed for the transmission line (**Figure 2**). This additional width provides flexibility in constructing the line, yet is not of such an extent that the placement of the line is undetermined. The route width is intended to provide flexibility and predictability.

GRE has requested a route width of 300 feet centered on Otter Tail County Road 6 (CSAH 6), which would allow for the new transmission line to be constructed on the north or south side of CSAH 6, or some combination thereof (see maps in **Appendix B**). GRE has indicated the 115 kV line will require a right-of-way (ROW) of 100 feet (50 feet on each side of the transmission line). Additional right-of-way may be required to accommodate guy wires. The ROW required for the project is typically acquired by easement agreements with landowners (see Section 4.1)

GRE is proposing to place the new 115 kV line approximately five (5) feet outside of the CSAH 6 road right-of-way.[7] This placement serves a number of purposes, including (1) reducing the size and potential impacts of the ROW required from landowners by sharing ROW with CSAH 6, and (2) minimizing GRE's relocation costs should relocation be required for a future road project.[8] The current right-of-way for CSAH 6 is 100 feet (50 ft. on each side of the centerline). The Otter Tail County Highway Department has indicated that it anticipates reconstructing CSAH 6 in the future, and it requests a ROW of 120 feet be reserved for this reconstruction.[9]

Thus, the placement of the poles (the alignment) for the Parkers Prairie project could be:

(1) Within the existing CSAH 6 ROW (or directly on the edge of the ROW) on the north or south side of CSAH 6. Two electrical lines – the existing 41.6 kV line and a local distribution line – currently occupy these alignments and parallel CSAH 6 (see Section 3.3)

(2) Just outside the current CSAH 6 ROW (approximately 55 ft. from centerline) on the north or south side of CSAH 6,

[6] Route Permit Application, Section 4.
[7] Route Permit Application, Section 6.2.
[8] In general, if the new poles are placed within the CSAH 6 ROW, GRE must pay for their future relocation. If the poles are placed outside of the CSAH 6 ROW, Otter Tail County must pay for their future relocation.
[9] Otter Tail County Highway Department, Comment Letter on Scope of Environmental Assessment, December 12, 2011, https://www.edockets.state.mn.us/EFiling/ShowFile.do?DocNumber=20121-69970-02.

(3) Just outside a potential future CSAH 6 ROW (approximately 65 ft. from centerline) on the north or south side of CSAH 6, or

(4) Some combination of #1, #2, and #3 – within or just outside the current and/or future CSAH 6 ROW on the north and/or south side of CSAH 6.

In its route permit application, GRE proposes to construct the new 115 kV transmission line adjacent to the alignment for the existing 41.6 kV line – i.e., on the south side of CSAH 6, approximately 55 ft. from the road centerline.[10] Because the placement of the alignment within the route could affect the potential impacts of the project, this EA examines alignments on both sides of CSAH 6, within and outside the current CSAH 6 ROW, and at the current and potential future ROW width for CSAH 6 (see **Map B-1** and **Section 5**).

Figure 2. Route Width and Right-of-Way Illustration[11]

3.2 Route Alternatives

GRE has proposed a route, centered on CSAH 6, from the Parkers Prairie substation to a connection with GRE's existing LR-IA 115 kV line, just east of Minnesota State Highway 29 and north of Parkers Prairie, Minn. GRE indicates that this route (1) parallels existing infrastructure, (2) reduces potential impacts to system reliability during construction, and (3) appropriately upgrades the local transmission and distribution system for continued, reliable electrical service.[12]

GRE determined that there were no feasible route alternatives for the Parkers Prairie project.[13] The relatively short length of the line and the use of an existing transmission line / road corridor weighed against other possible routes. An alternative to the project's configuration was raised during the EA scoping process. This alternative proposed moving the Parkers Prairie substation to a new location east of Minnesota State Highway 29. For the reasons outlined in the scoping decision for this project, this alternative was not included in the scope of this EA (see **Appendix A**). Accordingly, the only route examined in this EA is the route proposed by GRE in its route permit application.

[10] Route Permit Application, Section 1.2.2
[11] Illustration not to scale. The right-of-way could be on either side of CSAH 6; it could move back and forth across CSAH 6.
[12] Route Permit Application, Section 4.
[13] Id.

3.3 Structures and Conductors

GRE proposes to use single pole wooden structures, ranging in height from 60 to 85 ft., for the project. Three variations on this structure type are shown in **Figure 3**. Poles with horizontal post insulators will be the primary structure used on the project. Braced post insulators will be used if longer spans are required. Guy wires may be used as needed to minimize structure deflections. If guying is used, a box-shaped easement will be obtained from the landowner for the guy wire and anchor. If guying is not practicable, direct embedded laminate wood poles or steel poles on concrete foundations may be used.

The transmission line structures will have three single conductor phase wires and one shield wire. The conductor wires will be 477 aluminum conductor steel reinforced (ACSR), a common transmission conductor. The average span between poles will be 300 to 400 feet. The structure type, height, and spans will vary depending on topography, existing infrastructure, and potential human and environmental impacts.

A 115 kV, 2000 amp, three-way switch will be located at the intersection of the new 115 kV line and GRE's existing LR-IA 115 kV line. The switch will be located on a transmission line structure. This structure will likely be a specialty structure, i.e., due to its location and function it will likely be a direct embedded laminate wood pole or a steel pole on a concrete foundation. Two to four structures on GRE's existing LR-IA line may need to be replaced in order to facilitate the connection with the new 115 kV line. Depending on design requirements, these may also be specialty structures. GRE has requested a 300 foot route width, centered on the existing LR-IA line and extending north and south of the proposed connection point to facilitate the placement of the switch (see maps in **Appendix B**).

Existing Structures and Conductors

Upon construction of the new 115 kV line and connection to the existing LR-IA line, GRE will remove the existing 41.6 kV line serving the Parkers Prairie substation and an additional 1650 ft. of 41.6 kV line which will no longer be need for electrical service in the area.[14] This section of additional 41.6 kV line runs south of CSAH 6 and roughly parallel to Minnesota State Highway 29.

Lake Region Electric Cooperative (LREC) operates an electrical distribution line on the north side of CSAH 6 (**Figure 4**). The line is strung on single pole wooden structures approximately 40 ft. in height. If the Commission permits a route with an anticipated alignment on the north side of CSAH 6, the distribution line would be placed on the poles for the new 115 kV line (a process known as "underbuilding") or placed underground (see **Figure 3**).[15]

The 41.6 kV transmission line which currently serves the Parkers Prairie substation is located on the south side of CSAH 6 (**Figure 4**). The line is strung on single pole wooden structures approximately 40 ft. in height. The structures are generally 45 ft. from the centerline of CSAH 6; five feet inside the current road right-of-way. The line was constructed and placed into service in about 1970. GRE's review of easements for this line indicates that the right-of-way was not well defined, and there are several instances along the line where trees (windbreaks) are growing in what would be the typical ROW for such a line (see Section 5.12).[16]

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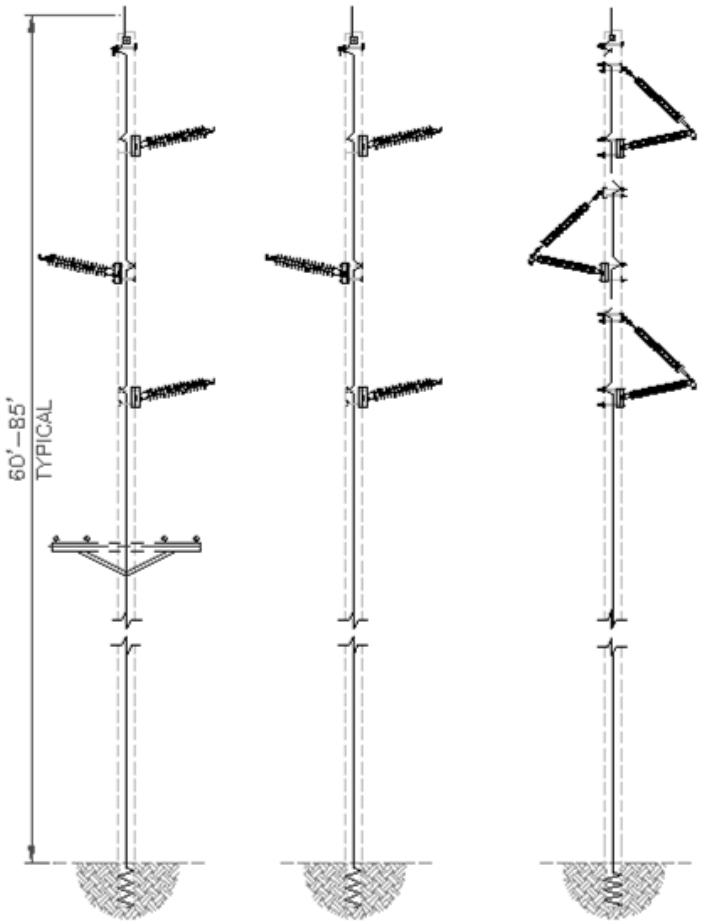
[14] Route Permit Application, page 5-2. The additional line (1650 ft.) will be removed by GRE or Otter Tail Power Company (OTP). OTP currently owns the 41.6 kV line. GRE indicates that they will coordinate with OTP on which utility will remove the line.

[15] Route Permit Application, Section 1.2.2, Section 6.1.

[16] Route Permit Application, Section 6.1.

Figure 3. Transmission Line Structure Types[17]



115 kV Horizontal Post with Distribution Underbuild | 115 kV Horizontal Post without Distribution Underbuild | 115 kV Braced Post without Distribution Underbuild

3.4 Parkers Prairie Substation

As part of the Parkers Prairie project, the Parkers Prairie substation will be upgraded with a new 115/12.5 kV transformer. The substation site (fence line) will be expanded approximately 40 ft. to the south to accommodate the new transformer and associated equipment, e.g., buses, switches (**Figure 5**). The site expansion will occur on existing LREC property.

3.5 Project Costs

The estimated total cost for Parkers Prairie project is approximately $1.5 million dollars (**Table 2**).[18] Estimated costs are divided into three categories: (1) pre- and post-construction, (2) construction, and (3) operations and maintenance. Pre- and post- construction costs include expenses for permitting, surveying, easement acquisition, engineering, and restoration.

[17] Route Permit Application, Section 5.1.
[18] Route Permit Application, Section 3.4.

Construction costs vary depending on the type of the structure, the height and spans of the poles, and associated hardware (e.g., conductors, insulators). Single pole construction costs are approximately $340,000 dollars per mile. Single pole with underbuild construction is approximately $430,000 dollars per mile. The underbuild construction is more expensive because of costs related to moving an existing distribution line to the new 115 kV line. Annual operations and maintenance costs for a 115 kV line are in the range of $1,100 – $1,350 dollars per mile.

Table 2. Estimated Project Costs

Owner	Route	Estimated Pre- and Post- Construction Costs (dollars)	Estimated Construction Costs 115 kV Line (dollars)	Estimated Substation Costs (dollars)	Total Project Costs (dollars)
GRE	2.1 miles	$465,000	$681,000	$75,000	$1,221,000
LREC	NA	NA	NA	$250,000	$250,000
Total	2.1 miles	$465,000	$681,000	$325,000	$1,471,000

Figure 4. Existing Electrical Lines along CSAH 6[19]

[19] View looking east. The LREC distribution line is on the left-hand side of the photograph. The GRE 41.6 kV line is on the right-hand side of the photograph.

Figure 5. Parkers Prairie Substation[20]

[20] View looking northeast.

4.0 Project Construction

Construction of the Parkers Prairie project would begin after appropriate federal, state, and local permits and approvals have been issued. Construction is anticipated to begin in late 2012; however, the construction timeline is dependent upon a number of factors including permits, weather, road restrictions, and the availability of labor and materials.

4.1 Easement Acquisition

Upon issuance of a route permit by the Commission for the Parkers Prairie project, GRE will conduct a design survey to establish the transmission line centerline and right-of-way (ROW). GRE indicates that landowners will be notified of the survey work and associated soil investigation.[21] This work will be followed by easement acquisition for the required ROW.

During the easement acquisition process, landowners will be provided a number of easement documents, including a copy of the route permit, complaint procedures, structure designs or photos, a plan showing the transmission line relative to the landowner's property, and an offer of compensation. Landowners and utilities typically negotiate easement terms that reduce negative impacts to a landowner's property and provide just compensation for the utility's use of the easement (see **Appendix D**). In addition to permanent easements for the operation of the transmission line, agreements for the use of temporary work space (marshalling yards) may be obtained from some landowners. Marshalling yards are typically used for temporary storage and staging of construction materials.

If a negotiated settlement for an easement cannot be reached, GRE may use the eminent domain process to reach a settlement (Minn. Stat. 308A, Minn. Stat. 117). In the eminent domain process, three court-appointed commissioners determine the value of the easement, and both the landowner and utility are bound by this determination. If the eminent domain process is used, GRE must obtain at least one appraisal for the property proposed to be acquired (Minn. Stat. 117.036).

Tree Clearing and Staking

After easements have been secured, GRE will begin initial construction. GRE indicates that landowners will be notified of construction schedules, ingress and egress for the project, tree and vegetation removal, and other related construction activities. [22] The initial phase of construction includes staking the centerline of the new transmission line, followed by removal of trees and other vegetation from the ROW. As a general practice, all vegetation is removed from the ROW, unless otherwise negotiated with the landowner, e.g., in the easement agreement. The primary concern regarding vegetation is the potential for vegetation to interfere with the safe operation of the transmission line. Low-growing bush or tree species may be acceptable. Tall-growing tree species will likely not be acceptable (see Section 5.12).

4.2 Construction

The proposed 115 kV transmission line would be constructed at the existing grade. Thus, it is not anticipated that any grading, filing, or other movement of soil will be necessary for construction. The typical wooden structures proposed for the Parkers Prairie project will require a hole 10 – 15 ft. deep and about 3 – 4 ft. in diameter for placement of the each pole.[23] Poles will be backfilled with native

[21] Route Permit Application, Section 6.3.
[22] Id.
[23] Route Permit Application, Section 7.1.

soils, crushed rock, or concrete depending on design requirements. Poles may be delivered directly to staked locations or may be stored temporarily in a marshalling yard. Hardware and insulators are typically attached to the poles prior to being place in a hole with a bucket truck or crane. Special construction techniques may be required to minimize impacts to environmentally sensitive areas, e.g., lowland areas, wetland areas (see Section 5.10).

Once structures have been erected for the line, conductors are strung. During this process, temporary guard or clearance poles will be used at crossings to provide adequate clearance over roads and other potential obstructions. Stringing activities will commence only after notifications have been provided and permissions obtained such that potential impacts to traffic flow and other activities in the project area are mitigated.

Parkers Prairie Substation

Modification of the Parkers Prairie substation will begin once all necessary permits are obtained and a final design is complete. The substation site will require grading to accommodate the 40 ft. expansion of the station's fenced are to the south. New footings for structures and a new concrete slab for the 115 kV transformer will be added. GRE indicates that all modifications will be conducted in accordance with NESC standards.[24] GRE and/or LREC will likely need to obtain a National Pollutant Discharge Elimination System (NPDES) construction stormwater permit from the Minnesota Pollution Control Agency and to prepare a Stormwater Pollution Prevention Plan (SWPPP) to mitigate the project's cumulative construction impacts (see Section 5.10).

4.3 Restoration

Upon completion of construction, GRE and LREC will restore the impacted project area including removing debris, dismantling temporary facilities, employing erosion control measures, and reseeding disturbed soils.[25] Landowners will be contacted to determine whether they believe there is any construction damage to their property (damage beyond or remaining after restoration measures). GRE indicates that areas that have been damaged will be restored to their pre-construction condition to the extent possible.[26] Once construction cleanup is complete and construction damages remedied, landowners will be notified of the project's completion, and given an opportunity to note any outstanding issues related to the project.

4.4 Maintenance

GRE will use its transmission line right-of-way to perform inspections, maintenance and repairs. Regular inspections of the new 115 kV line are required to ensure reliable electrical performance. Inspections will be done by foot, snowmobile, truck, and aerially. An aerial inspection of the transmission line will be conducted monthly.

GRE will conduct periodic vegetation surveys and will remove, in accordance with applicable easement agreements, vegetation that would interfere with the operation of the transmission line.[27] Vegetation management is typically on a three to seven year cycle. Right-of-way clearing practices include mechanical and hand clearing, along with the use of herbicides (where allowed and in accord with applicable easement agreements).

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[24] Id.
[25] Id.
[26] Route Permit Application, Section 6.5.
[27] Route Permit Application, Section 7.2.

5.0 Potential Impacts and Mitigation Measures

The construction of a transmission line involves both short and long-term impacts. Short-term impacts are generally associated with the construction phase of the project and can include noise, dust, and soil compaction. Long-term impacts can exist for the life of the project and may include aesthetic impacts, economic impacts, and land use restrictions or modifications. Mitigation measures are measures that could be implemented to reduce, minimize, or eliminate potential impacts.

Potential impacts and mitigation measures for the Parker Prairie project are discussed in this section. Potential impacts due to the Parkers Prairie project could range from minimal to significant, depending upon the location and alignment of the proposed 115 kV line. In general, impacts are minimized by alignments on, within, or just outside the current CSAH 6 ROW. Impacts to agricultural operations could be significant if the line were located outside of a future CSAH 6 ROW (65 ft. from the centerline of CSAH 6. Impacts to flora (treed areas) are generally minimized by alignments on the north side of CSAH 6. Impacts to forestry operations are minimized by an alignment on the north side of CSAH 6 near Minnesota State Highway 29. Impacts to human settlements, public health, public services, electronic communications, and natural resources are expected to be minimal and relatively independent of the alignment of the new 115 kV line.

The Commission, when it issues a route permit for the Parkers Prairie project, can require Great River Energy to adopt a specific alignment for the project and to use specific mitigation measures or require that certain mitigation thresholds or standards be met through permit conditions.

5.1 Environmental Setting

The Parkers Prairie project area lies within the Hardwoods Hills ecological subsection of the Eastern Broadleaf Forest province in west central Minnesota.[28] The soils, flora, and fauna of this subsection have been shaped extensively by glaciation. Moraines, outwash plains, and kettle lakes are common; soils are generally well drained and calcareous.[29] Presettlement vegetation was a mix of tallgrass prairie, aspen-oak land, and savanna. Agriculture is currently the most important land use in the project area, and there are few remnants of presettlement vegetation left.[30] Forested areas, wetlands, and grasslands are interspersed with agricultural fields. There are two hydrologic features of note in the project area – a wetland in Section 10 of Parkers Prairie Township, and Cora Lake, which spans sections 10 and 15 of Parkers Prairie Township.[31]

Land use along the proposed route for the Parkers Prairie project is primarily agricultural. Agricultural lands are prevalent on the western end on the route. A mix of agricultural fields, forests, and grasslands is prevalent on the eastern end and near the proposed switch connection with GRE's existing LR-IA 115 kV line.[32]

[28] http://www.dnr.state.mn.us/ecs/222/index.html
[29] Id. See also Route Permit Application, Figure B-9.
[30] Id. See also Route Permit Application, Figure B-8.
[31] Route Permit Application, Figure B-9.
[32] Route Permit Application, Figure B-8.

5.2 Socioeconomics

According to 2010 census data, the minority population in the project area, as a percentage of residents, is less than that of the State of Minnesota (**Table 3).** Parkers Prairie township has a median household income which is slightly greater than the median for the State of Minnesota (**Table 3**).

Table 3. Socioeconomic Characteristics of Project Area[33]

Characteristic	Minnesota	Otter Tail County	Parkers Prairie Township[34]
Population 2010	5,303,925	57,303	348
Percent White	88.6	96.1	99.4
Percent Black/African American	4.7	0.8	--
Percent American Indian	1.3	0.5	--
Percent Asian/ Pacific Islander	3.8	0.1	--
Percent Hispanic/Latino	4.3	2.6	--
Median Household Income	$57,318	$42,011	$66,667
Home Ownership Rate	74.6	79.3	86.4
Median Value of Owner Occupied Housing	$122,400	$152,400	$195,300
Persons per household	2.52	2.28	2.23
Percentage Below Poverty Level – Individuals	9.5	12.8	4.9

Approximately 15 to 20 workers will be employed during construction of the Parkers Prairies project.[35] The project will take less than a year to construct. No additional permanent jobs will be created by the project.

Potential Impacts

Socioeconomic impacts resulting from the project will be primarily positive with an influx of wages and expenditures made at local businesses during the construction of the project. Communities near the project should experience short-term positive economic impacts through the use of hotels, restaurants, and other services by the various workers. Expenditures for equipment, fuel, and other supplies and services will benefit businesses in the project area. Indirect positive impacts will accrue due to the increased capacity of the electrical system to reliably serve agricultural, commercial, and industrial users.

Potential negative socioeconomic impacts are anticipated to be minimal. Disruptions of local business due to construction and operation of the Parkers Prairie project are anticipated to be minimal. Potential

[33] Route Permit Application, Table 8-4; see U.S. Census Bureau, State & County QuickFacts, http://quickfacts.census.gov/qfd/states/27/27111.html.

[34] U.S. Census Bureau, American FactFinder, http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

[35] Route Permit Application, Section 8.2.8.

impacts to agricultural operations are discussed in Section 5.7. There is no minority or low-income population which would be negatively and differentially impacted by the project.

Mitigation
Socioeconomic impacts resulting from the Parker Prairie project are anticipated to be primarily positive; accordingly, no mitigative measures are proposed.

5.3 Human Settlements

Transmission lines and substations have the potential to negatively impact human settlements through a variety of means. Transmission structures could change the aesthetics for the project area, introduce new noise sources, displace homes, and lower property values.

Impacts to human settlements resulting from the Parkers Prairie project are anticipated to be minimal. The project will introduce new impacts (aesthetics, noise), but these impacts are not expected to be significant. No residences will be displaced, and, though impacts to property values are possible, it is uncertain what these impacts may be. Impacts to human settlements can be minimized by prudent routing, i.e., by choosing routes and alignments that avoid settlements.

Aesthetics
The project area is primarily agricultural with rural residences and outbuildings. Patches of trees and windbreaks are interspersed. Otter Tail County Road 6 (CSAH 6) runs from the Parkers Prairie substation eastward to where it intersects Minnesota State Highway 29. There is an electrical distribution line running along the north side of CSAH 6. The line is strung on single pole wooden structures approximately 40 ft. in height. The 41.6 kV transmission line which currently serves the Parkers Prairie substation is located on the south side of CSAH 6. This line is also strung on single pole wooden structures approximately 40 ft. in height (**Figure 4**). The Parkers Prairie distribution substation is located near the intersection of CSAH 6 and Resser Road. It is fenced and surrounded by grass, fields, and trees (**Figure 5).**

The aesthetic value of the project area – the natural landscape and human modifications to the landscape – is somewhat a subjective matter and depends upon the perception of the viewer. This said, landscapes which are, for the average person, harmonious in form and use are perceived as having greater aesthetic value. Infrastructure which is not harmonious with a landscape or negatively impacts existing elements of a landscape could negatively affect the aesthetics of the area.

Potential Impacts
The Parkers Prairie project will introduce new, taller transmission line structures into the landscape. The new 115 kV poles will be 60 to 85 ft. in height. This is 20 to 45 ft. taller than the current structures along CSAH 6. Because the poles are taller they will likely be more visible to residences in the area and drivers on CSAH 6. They will create a small, but noticeable negative impact on the aesthetics of the area. If the alignment for the new 115 kV line crosses CSAH 6, it would introduce a new aesthetic impact, as currently electrical lines only parallel CSAH 6; they do not cross it.

The expansion of the Parkers Prairie substation will make it more visible and will create a small negative aesthetic impact. The new 115 kV as it connects to GRE's existing LR-IA 115 kV line, will introduce a new aesthetic impact, but this impact is anticipated to be minimal as there are two existing electrical lines near the proposed switch structure.

There may be positive aesthetic impacts associated with the project. The new 115 kV line will parallel CSAH 6 and will allow for the removal of the existing 41.6 kV line on the south side of CSAH 6. If the alignment for the new 115 kV line is on the north side of CSAH 6 (for all or a portion of its length), then the existing distribution line on the north side will be underbuilt onto the new structures or placed underground. Thus, CSAH 6 would have an electrical line solely on the north side of the road. This would likely be an aesthetic improvement.

Mitigation

It is difficult to mitigate the visibility of taller 115 kV structures along CSAH 6. However, mitigation could include ensuring that the aesthetic impacts of the project are limited to project structures. Thus impacts can be mitigated by ensuring that natural landscapes are not damaged or removed during construction (see Section 5.12 for a discussion of tree removal). Alignments that avoid or minimize the removal of natural landscapes would mitigate aesthetic impacts. An alignment on the north side of CSAH 6 (for all or some portion of the route) could mitigate impacts by consolidating all of the lines along CSAH 6 on one side of road. Finally, aesthetic impacts could be mitigated through their inclusion in individual easement agreements with landowners along the route, e.g., compensation or new plantings / landscaping.

Noise

Noise can be defined as unwanted sound. Noise is measured in units of decibels (dB) on a logarithmic scale. The A weighted decibel scale (dBA) corresponds to the sensitivity range for human hearing. For example, a noise level change of 3 dBA is barely perceptible to average human hearing while a 5 dBA change in noise level is noticeable.

All noises produced by the project must be within Minnesota noise standards (**Table 4**). These standards are promulgated by the Minnesota Pollution Control Agency (MPCA). The standards are organized by the type of environment where the noise occurs (Noise Area Classification, NAC) and the time of day. The noise standards are expressed as a range of permissible dBA within a 1-hour period; L50 is the dBA that may be exceeded 50 percent of the time within an hour, while L10 is the dBA that may be exceeded 10 percent of the time within 1 hour.

The primary noise receptors in the project area would be residences; however, most of the land in the project area is rural and agricultural. Residences are in noise area classification one (NAC 1). Ambient noise in rural areas is commonly made up of rustling vegetation and vehicle traffic.

Table 4. Minnesota Noise Standards[36]

Noise Area Classification (NAC)	Daytime		Nighttime	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

[36] Minnesota Rules 7030.0040, https://www.revisor.leg.state.mn.us/rules/?id=7030.0040. Standards expressed in dBA. Day time is 7:00 a.m. – 10:00 p.m.; night time is 10:00 pm – 7:00 a.m.

Potential Impacts
Potential noise impacts from the Parkers Prairie project can be grouped into three categories: (1) noise due to construction, and noise due to operation of the (2) transmission line and (3) substation.

Construction Noise
Construction noise is expected to occur during daytime hours as the result of heavy equipment operation and increased vehicle traffic associated with the transport of construction personnel and supplies. Any exceedances of the MPCA daytime noise limits would be temporary in nature and no exceedances of the MPCA nighttime noise limits are expected for the project.

Transmission Line Noise
Noise from transmission lines (electrical conductors) is due to small electrical discharges which ionize surrounding air molecules. This phenomenon is known as corona. The level of noise from these discharges depends on conductor conditions, voltage levels, and weather conditions. Noise emissions are greatest during heavy rains, when conductors are consistently wet. However, during heavy rains, the background noise level is usually greater than the noise from the transmission line and few people are in close proximity to the transmission line in these conditions. As a result, audible noise is not noticeable during heavy rains.

In foggy, damp, or light rain conditions, transmission line may produce audible noise higher than rural background levels. During dry weather, noise from transmission lines is an imperceptible, sporadic crackling sound. GRE modeled and estimated noise levels for the Parkers Prairie project (**Table 5**).[37] This modeling indicates that noise levels from the 115 kV line, under worst-case conditions, will be less than 20 dBA.

Table 5. Estimated Transmission Line Noise Levels[38]

L_5 (dBA)	L_{50} (dBA)	Location
17.7	14.2	Edge of right-of-way
18.8	15.3	Directly under the line

Substation Noise
Noises associated with a substation result from the operation of transformers and switchgear. Transformers produce a consistent humming sound, resulting from magnetic forces within the transformer core. This sound does not vary with transformer load. Switchgear produces short-term noises during activation of circuit breakers. These activations are infrequent.

Noise levels for the type of transformer proposed to be installed at the Parkers Prairie substation are in the range of 66 – 70 dBA.[39] GRE modeled and estimated noise levels at varying distances from the transformer.[40] Noise levels would be approximately 50 dBA at a distance of 30 ft. from the transformer.

[37] Route Permit Application, Section 8.2.5.
[38] Route Permit Application, Table 8-3. Estimates calculated using the Bonneville Power Administration corona and fields effect program.
[39] Route Permit Application, Section 8.2.5.
[40] Id.

At the nearest residence (about 395 ft. from the substation), the noise level would be approximately 28 dBA.

Mitigation
Noise impacts from the Parkers Prairie project are anticipated to be minimal; thus, no mitigative measures are proposed. All operational noise levels are predicted to be well within Minnesota noise standards. Route permits issued by the Commission require compliance with these standards. Construction noise levels are anticipated to be with Minnesota noise standards. GRE has indicated that they will work with residents to address any noise-related concerns during construction.[41]

Displacement
Displacement is the removal of a residence or building to facilitate the operation of a transmission line. In general, no residences or buildings are allowed within the right-of-way (ROW) for a transmission line. The ROW is established to ensure safe operation of the line. Displacements are relatively rare and are more likely to occur in densely populated areas.

The project area for the Parkers Prairie project is relatively sparsely populated. There are two residences within the proposed route for the project (within the 300 ft. route width; less than 150 ft. from the centerline of CSAH 6). There are three homes and several outbuildings within 500 ft. of the centerline of the proposed route.[42] The right-of-way for the Parkers Prairies project is 100 ft.

Potential Impacts
No displacements are anticipated for the Parkers Prairie project. However, there is one residence, the Liljegren residence, which could be in the ROW for the 115 kV line (see **Appendix B**). The Liljegren residence is on the north side of CSAH 6. If the alignment for the line were just outside the future potential ROW for CSAH 6, e.g., 65 ft. from the CSAH 6 centerline, then the transmission line ROW would extend to 115 ft. from the CSAH 6 centerline. The Liljegren residence is approximately 110 ft. from the centerline of CSAH 6.[43]

Mitigation
Displacements can be mitigated by choosing routes and alignments which avoid residences and outbuildings. The only scenario under which a displacement might occur for the Parkers Prairie project is if the alignment for the project was on the north side of CSAH 6, and the poles were placed outside the future potential ROW for CSAH 6. Alignments on the south side of CSAH6, and alignments on the north side of CSAH6, either within the current CSAH 6 ROW or just outside the current CSAH ROW, would mitigate any possible displacement of the Liljegren residence (see **Appendix B**).

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

Potential impacts to property values due to transmission lines are related to three main concerns: (1) potential aesthetic impacts of the line, (2) concern over potential health effects from electric and

[41] Id.
[42] Route Permit Application, Section 8.2.7; Appendix B, Figures B-4 through B-7.
[43] Additionally, there is one outbuilding which would be within the transmission line ROW.

magnetic fields (EMF), and (3) potential interference with agriculture or other land uses. Research on the relationship between property values and proximity to transmission lines has not identified a clear cause and effect relationship. Rather, the presence of a transmission line is one of many factors that affect the value of a specific property. The research has revealed trends which are generally applicable to properties near transmission lines:[44]

- When negative impacts on property values occur, the potential reduction in property values is in the range of 1 to 10 per cent.
- Impacts on property values decrease with distance from the line. Thus, impacts on the sale price of smaller properties are usually greater than impacts on the sale price of larger properties.
- Other amenities, such as proximity to schools or jobs, lot size, square footage of a house and neighborhood characteristics, tend to have a much greater effect on sale price than the presence of a power line.
- Negative impacts appear to diminish over time.
- The value of agricultural property is likely to decrease if the power line poles are placed in an area that inhibits farming operations.

Potential Impacts

Impacts to property values due to the Parkers Prairie project, where the primary concern is proximity to residences, could occur. The extent of these impacts is uncertain. There are two residences within the proposed route for the project, and three additional residences within 500 ft. of the centerline of the proposed route. Impacts may be lessened by the fact that two electrical lines already parallel CSAH 6. That is, property values in the area already reflect the existence of electrical lines running along CSAH 6 and next to residences.

Impacts to property values could also occur due to interference with farming operations (see Section 5.7). Transmission line structures, when placed in an agricultural field, have a relatively small footprint. That is, they displace very little farmland. However, they have the potential to interfere with farming operations, such that crop yields and crop choices are negatively impacted. These impacts would be translated to property values.

There are agricultural fields within the proposed route for the project – on the north and south side of CSAH 6. A number of these fields are irrigated. Section 5.12 analyzes the potential adverse impacts on agricultural production due to the project. These impacts could translate into reduced property values.

Mitigation

Impacts to property values can be mitigated by choosing routes and alignments that place the transmission line away from residences and out of agricultural fields. Where possible, the line may cross the road to avoid running near a residence. If the line must pass by a residence, an alignment closer to CSAH 6 would likely reduce property value impacts. For agricultural fields, alignments closer to CSAH 6 would reduce property value impacts. Property value impacts could also be mitigated through their inclusion in individual easement agreements with landowners along the route.

[44] Appendix D; see also the Final Environmental Impact Statement, Arrowhead –Weston Electric Transmission Line Project, Volume I, Public Service Commission of Wisconsin Docket 05-CE-113, October 2000, pg 212-215

5.4 Public Health and Safety

Transmission line projects have the potential to negatively impact public health and safety –during both construction and operation of the project. As with any project involving heavy equipment and high voltage transmission lines, there are safety issues to consider during construction. Potential health and safety impacts include injuries due to falls, equipment use, and electrocution. Potential health impacts related to the operation of the project include health impacts from electric and magnetic fields (EMF), stray voltage, ozone emissions, and electrocution.

Impacts to public health and safety resulting from the Parkers Prairie project are anticipated to be minimal. No adverse health impacts due to EMF, stray voltages, or air emissions are anticipated. The new 115 transmission kV line would have protective devices to safeguard the public from the line if an accident occurred and a structure or conductor fell to the ground.[45] These protective devices are breakers and switches located within connecting substations. The protective equipment would de-energize the transmission line, should such an event occur. In addition, the expanded Parkers Prairie substation would be fenced and access limited to authorized personnel.

Electric and Magnetic Fields (EMF)

Electric and magnetic fields (EMF) are invisible regions of force resulting from the presence of electricity. Naturally occurring EMF are caused by the earth's weather and geomagnetic field. Man-made EMF are caused by any electrical device and found wherever people use electricity (**Table 6**). EMF are characterized and distinguished by their frequencies, i.e., the rate at which the fields change direction each second. All electrical lines in the United States have a frequency of 60 cycles per second or 60 Hertz (Hz). EMF at this frequency level are known as extremely low frequency EMF (ELF-EMF).

Table 6. Typical Magnetic Fields (milliGauss, mG) of Common Appliances[46]

Source	Distance from Source			
	0.5 foot	1 foot	2 feet	4 feet
Baby Monitor	6	1	-	-
Computer Displays	14	5	2	-
Fluorescent Lights	40	6	2	-
Copy Machines	90	20	7	1
Microwave Ovens	200	4	10	2
Vacuum Cleaner	300	60	10	1
Can Opener	600	150	20	2
Color Televisions	NA	7	2	-

Electric fields are created by the electric charge (i.e., voltage) on a transmission line. Electric fields are solely dependent upon the voltage of a line (volts), not the current (amps). Electric field strength is measured in kilovolts per meter (kV/m). The strength of an electric field decreases rapidly as the

[45] Route Permit Application, Section 8.2.1.

[46] EMF Electric and Magnetic Fields Associated with the Use of Electric Power, National Institute of Environmental Health Sciences, 2002, [hereafter NIEHS 2002 Summary] http://www.niehs.nih.gov/health/assets/docs_p_z/results_of_emf_research_emf_questions_answers_booklet.pdf.

distance from the source increases. Electric fields are easily shielded or weakened by most objects and materials, such as trees and buildings.

Magnetic fields are created by the electrical current moving through a transmission line. The magnetic field strength is proportional to the electrical current (amps). Magnetic field strength is typically measured in milliGauss (mG). Similar to electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases. However, unlike electric fields, magnetic fields are not easily shielded or weakened by objects or materials.

Health Studies

A concern related to EMF is the potential for adverse health effects due to EMF exposure. Extremely low frequency EMF do not have the energy to ionize molecules or to heat them. However, they are fields of energy and thus have the potential to produce effects. Electric fields are commonly experienced by the public and easily observable, e.g., static electricity caused by walking across a carpet. Magnetic fields are also commonly experienced, e.g., magnetic fields produced by using a microwave oven or vacuum cleaner, but effects are not readily observable.

In the 1970s, epidemiological studies indicated a possible association between childhood leukemia and EMF levels.[47] Since then, various types of research have been conducted to examine EMF and potential health effects including animal studies, epidemiological studies, clinical studies, and cellular studies. Scientific panels and commissions have reviewed and studied this research data. These studies have been conducted by, among others, the National Institute of Environmental Health Sciences (NIEHS)[48], the U.S. Environmental Protection Agency (EPA)[49], the World Health Organization (WHO)[50], and the Minnesota State Interagency Working Group on EMF Issues (MSIWG)[51]. In general, these studies concur that:

- Based on epidemiological studies, there is an association between childhood leukemia and EMF exposure. There is no consistent association between EMF exposure and other diseases in children or adults.
- Laboratory, animal, and cellular studies fail to show a cause and effect relationship between disease and EMF exposure at common EMF levels. A biological mechanism for how EMF might cause disease has not been established.
- Because a cause and effect relationship cannot be established, and yet an association between childhood leukemia and EMF exposure has been shown, there is:

  (1) Uncertainty as to the potential health effects of EMF,
  (2) No methodology for estimating health effects based on EMF exposure,
  (3) A need for further study of the potential health effects of EMF,
  (4) A need for a precautionary approach in the design and use of all electrical devices, including transmission lines.

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[47] Id., p. 16.
[48] National Institute of Environmental Health Sciences, Electric and Magnetic Fields, http://www.niehs.nih.gov/health/topics/agents/emf/.
[49] Environmental Protection Agency, Electric and Magnetic Fields (EMF) Radiation from Power Lines, http://www.epa.gov/radtown/power-lines.html.
[50] World Health Organization, Electromagnetic Fields, http://www.who.int/peh-emf/en/.
[51] A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options, Minnesota State Interagency Working Group on EMF Issues, http://energyfacilities.puc.state.mn.us/documents/EMF White Paper - MN Workgroup Sep 2002.pdf.

Regulations and Guidelines

There are currently no federal regulations regarding allowable electric or magnetic fields produced by transmission lines in the United States. Thus, regulation of EMF exposure due to high voltage transmission lines falls under the purview of state utility commissions. A number of states have developed state-specific regulations for electric and magnetic fields due to transmission lines (**Table 7**). Additionally, a number of international organizations have adopted standards for electric and magnetic fields (**Table 8**).

The Minnesota Public Utilities Commission has established a standard that limits the maximum electric field under transmission lines to eight (8) kV/m. All transmission lines in Minnesota must meet this standard. The Commission has not adopted a magnetic field standard for transmission lines. However, the Commission has adopted a precautionary approach in siting transmission lines and, on a case-by-case basis considers and requires (through permits) mitigation strategies for minimizing potential impacts from magnetic fields associated with transmission lines.

Table 7. State Electric and Magnetic Field Standards[52]

State	Electric Field (kV/m)		Magnetic Field (mG)
	Within Right-of-Way	Edge of Right-of-Way	Edge of Right-of-Way
Florida	8[a]	2	150[a] (max load)
	10[b]	---	200[b] (max load)
	---	---	250[c] (max load)
Massachusetts	---	---	85[g]
Minnesota	8	---	---
Montana	7[d]	1[e]	---
New Jersey	---	3	---
New York	11.8	1.6	200 (max load)
	11[f]	---	---
	7[d]	---	---
Oregon	9	---	---

[a] 69 kV to 230 kV transmission lines
[b] 500 kV transmission lines
[c] 500 kV transmission lines on certain existing ROW
[d] Maximum for highway crossing
[e] May be waived by the landowner
[f] Maximum for private road crossings
[g] A level above 85 mG is not prohibited, but may trigger a more extensive review of alternatives.

[52] NIEHS, Electric and Magnetic Fields Associated with the Use of Electric Power, Questions and Answers, p. 46, http://www.niehs.nih.gov/health/assets/docs_p_z/results_of_emf_research_emf_questions_answers_booklet.pdf

Table 8. International Electric and Magnetic Field Guidelines[53]

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	General Public	Occupational	General Public	Occupational
IEEE	5	20	9,040	27,100
ICNIRP	4.2	8.3	2,000	4,200
ACGIH	---	25	---	10,000/1,000[a]
NRPB	4.2	---	830	4,200

IEEE – Institute of Electrical and Electronics Engineers, ICNIRP – International Commission on Non-Ionizing Radiation Protection, ACGIH – American Conference of Industrial Hygienists, NRPB – National Radiological Protection Board

[a] for persons with cardiac pacemakers or other medical electronic devices.

Potential Impacts

GRE has modeled and calculated the electric and magnetic fields associated with the Parkers Prairie project. The projected maximum electric field for project is 1.29 kV/m at the transmission line centerline, and 0.21 kV/m at the edge of the transmission line ROW (**Table 9**). The projected maximum magnetic field for the project is 141.25 mG at the transmission line centerline, and 34.28 mG at the edge of the transmission line ROW (**Table 10**). These values are for a temporary, emergency load on the line; average values are considerably less.

The projected maximum electric field for the project (1.29 kV/m) is less than the standard prescribed by the Commission (8 kV/m). The projected magnetic field for the project, at the edge of the transmission line ROW and under average loads, is less than 3 mG; for temporary, emergency loads it is less than 35 mG. These fields are below all state and international standards that have been developed for magnetic fields. These fields are similar to those generated by common appliances and experienced by persons in their homes. Accordingly, based on the scientific evidence to date, no adverse health impacts from electric or magnetic fields are expected for persons living or working near the Parkers Prairie project.

Mitigation

No health impacts due to EMF are anticipated from the Parkers Prairie project; thus, no mitigation measures are proposed. However, consistent with the Commission's precautionary approach to potential EMF impacts, basic mitigation measures are prudent. Electric and magnetic fields diminish with distance from a conductor. Thus, EMF exposure levels can be minimized by routing transmission lines away from residences and other places citizens congregate. Alignments for the Parkers Prairie project that are across the road from residences or closer to the road, will minimize potential EMF impacts.

[53] Id.; ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz – 100kHv), 2010, http://www.icnirp.org/documents/LFgdl.pdf; NRPB guidelines are the 1998 ICNIRP guidelines. The NRPB became the Health Protection Agency (HPA) in 2004, http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1254510609795?p=1219908766891; ACGIH, Documentation of the Threshold Limit Values for Physical Agents, 7th Edition, http://www.acgih.org/store/ProductDetail.cfm?id=654.

Table 9. Calculated Electric Fields (kV/m) for Parkers Prairie 115 kV Transmission Line[54]
(3.28 feet above ground)

Scenario	Distance from Centerline						
	-100'	-50'	-25'	Max.	25'	50'	100'
No Distribution Underbuild Average Load	0.06	0.21	0.50	1.29	0.66	0.19	0.07
No Distribution Underbuild Emergency Load	0.06	0.21	0.50	1.29	0.66	0.19	0.07
With Distribution Underbuild Average Load	0.07	0.19	0.25	0.44	0.38	0.17	0.06
With Distribution Underbuild Emergency Load	0.07	0.19	0.25	0.44	0.38	0.17	0.06

Table 10. Calculated Magnetic Fields (mG) for Parkers Prairie 115 kV Transmission Line[55]
(3.28 feet above ground)

Scenario	Distance from Centerline						
	-100'	-50'	-25'	Max.	25'	50'	100'
No Distribution Underbuild Average Load	0.20	0.64	1.47	2.99	1.75	0.73	0.22
No Distribution Underbuild Emergency Load	9.38	30.04	69.58	141.25	82.63	34.28	10.16
With Distribution Underbuild Average Load	0.49	1.73	5.03	12.65	5.90	2.20	0.60
With Distribution Underbuild Emergency Load	8.29	22.04	40.18	90.09	64.43	31.55	10.26

[54] Route Permit Application, Table 5-1.
[55] Route Permit Application, Table 5-2.

Implantable Medical Devices

Implantable medical devices such as pacemakers, defibrillators, neurostimulators, and insulin pumps are electromechanical devices and may be subject to interference from electric and magnetic fields. Most of the research on electromagnetic interference and medical devices is related to pacemakers. Implantable cardiac devices (pacemakers) are more sensitive to electric fields than to magnetic fields.[56] In laboratory tests, the earliest interference from magnetic fields in pacemakers was observed at 1,000 mG, a field strength greater than that associated with high voltage transmission lines.[57] Therefore, the focus of research has been on electric field impacts.

Electric fields may interfere with an implanted cardiac device's ability to sense normal electrical activity in the heart. In the unlikely event a pacemaker is impacted, the effect is typically a temporary asynchronous pacing (commonly referred to as reversion mode or fixed rate pacing). The pacemaker returns to its normal operation when the person moves away from the source of the interference.

Medtronic and Guidant, manufacturers of pacemakers and implantable cardioverters/ defibrillators, have indicated that electric fields below 6 kV/m are unlikely to cause interactions affecting operation of modern bipolar devices. Older unipolar designs, however, are more susceptible to interference from electric fields, with research suggesting that the earliest evidence of interference occurred in electric fields ranging from 1.2 to 1.7 kV/m.[58]

Potential Impacts

The maximum electric field for the Parkers Prairie project is 1.29 kV/m. This field strength is below the 6 kV/m interaction level for modern, bipolar pacemakers, and at the low end of the range of interaction levels for older, unipolar pacemakers. Thus, there is uncertainty as to the impact on a person with an older, unipolar pacemaker, who would reside, for an extended period of time, directly beneath the proposed 115 kV line. For all others who are temporarily near the line (e.g., driving down CSAH 6), the risk of impact to their pacemakers due to the line is minimal. In general, the risk of interference inhibition of unipolar cardiac pacemakers from high-voltage power lines in everyday life is small.[59] Accordingly, no permanent impacts on implantable medical devices are anticipated as a result of the Parkers Prairie project.

Mitigation

No impacts on implantable medical devices are anticipated from the Parkers Prairie project; thus, no mitigation measures are proposed.

Stray Voltage

Stray voltage is an extraneous voltage that appears on metal surfaces in buildings, barns and other structures, which are grounded to earth. This voltage is also called a neutral-to-earth voltage (NEV). Stray voltage is typically experienced by livestock who simultaneously come into contact with two metal objects (e.g., feeders, waterers, stalls). If there is a voltage between these objects, a small current will flow through the livestock. The fact that both objects are grounded to the same place (earth) would seem to prevent any voltage from existing between the objects. However, this is not the case – a

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[56] Electric Power Research Institute (EPRI), 2004, Electromagnetic Interference with Implanted Medical Devices.
[57] Id.
[58] Toivonen, L., J. Valjus, M. Hongisto, and M. Ritta, 1991, The Influence of Elevated 50 Hz Electric and Magnetic Fields on Implanted Cardiac Pacemakers: The Role of the Lead Configuration and Programming of the Sensitivity, Blackwell Publishing Ltd., Helsinki, Finland.
[59] Scholten, A., S. Joosten, and J. Silney, 2004, Unipolar Cardiac Pacemakers in Electromagnetic Fields of High Voltage Overhead lines, FEMU, University Hospital, Aachen, Germany.

number of factors determine whether an object is, in fact, grounded. These include wire size and length, the quality of connections, the number and resistance of ground rods, and the current being grounded.[60] Thus, stray voltage can exist at any house or farm which uses electricity, independent of whether there is a transmission line nearby.

Stray voltage, if prevalent in an agricultural operation, can affect livestock health. Stray voltage has primarily been raised as a concern on dairy farms because of its potential to effect milk production and quality. Stray voltage is by and large an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms.

Potential Impacts

No impacts due to stray voltage are anticipated from the Parkers Prairie project. The project is a 115 kV transmission line that does not directly connect to residences or farms in the area, and does not change on-farm electrical service. However, transmission lines, when they parallel distribution lines can, in the immediate area of the paralleling, induce current on these lines (additional current, as the distribution lines already carry current). For distribution lines and on-farm electrical service that are properly wired and grounded, these induced currents are of no matter. However, for distribution lines and on-farm service that are not properly wired and grounded, these induced currents could create stray voltage impacts.

There is a possibility, if the new 115 kV were placed on the north side of CSAH 6, that it would parallel the existing LREC distribution line, i.e., the distribution would be underbuilt on the poles that carry the 115 kV line. If this were the case, then the 115 kV line could induce currents on the distribution line. These currents are not anticipated to cause any stray voltage issues in the project area. If, however, there is not proper grounding or wiring on the distribution system or at a farm or residence, these currents could point up this insufficiency.

Mitigation

There are a number of strategies for mitigating stray voltage, including improved grounding.[61] Making good electrical connections and choosing proper wiring materials for wet and corrosive locations will improve grounding and reduce stray voltage levels. GRE indicates that if a customer has a stray voltage concern on their property, they should contact their local distribution cooperative and discuss the situation with technical staff.[62] If warranted, an on-farm investigation will be scheduled.

<u>Induced Voltage</u>

The electric field from a transmission line can reach a nearby conductive object, such as a vehicle or a metal fence, which is in close proximity to the line. This may induce a voltage on the object, which is dependent on many factors, including the weather conditions, object shape, size, orientation, capacitance, and location along the right-of-way. If these objects are insulated or semi-insulated from the ground and a person touches them, a small current would pass through the person's body to the ground. This touch may be accompanied by a spark discharge and mild shock, similar to what can occur when a person walks across a carpet and touches a grounded object or another person.

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[60] Stray Voltage, NDSU Extension Publication #108, http://www.ag.ndsu.edu/extension-aben/epq/files/epq108.pdf.
[61] Id. See also, Stray Voltage, Public Service Commission of Wisconsin, http://psc.wi.gov/utilityinfo/electric/strayvoltage.htm.
[62] Personal Communication, Great River Energy, February 26, 2012.

The major concern with induced voltage is the current that flows through a person to the ground when touching the object, not the level of the induced voltage. Most shocks from induced current are considered more of a nuisance than a danger, but to ensure the safety of persons in the proximity of high-voltage transmission lines, the NESC requires that any discharge be less than 5 milliAmperes (mA). In addition, the Commission's electric field limit of 8 kV/m was designed to prevent serious hazard from shocks due to induced voltage under high-voltage transmission lines. Proper grounding of metal objects under and/or adjacent to the transmission line is the best method of avoiding these shocks.

Potential Impacts

No impacts due to induced voltage are anticipated from the Parkers Prairie project. The 115 kV line will be constructed and operated to meet NESC standards and the Commission's electric field limit of 8 kV/m.

Mitigation

No impacts due to induced voltage are anticipated from the Parkers Prairie project; thus, no mitigation measures are proposed.

Air Quality

Potential air quality impacts due to the Parkers Prairie project are of two types: (1) emissions of ozone and nitrous oxide during operation, and (2) dust caused by construction activities.

Ozone and Nitrous Oxide

Transmission lines have the potential to produce small amounts of ozone (O_3) and nitrous oxide (NO_X). These compounds are created by the ionization of air molecules surrounding the conductor. Ozone production from a conductor is proportional to temperature and sunlight and inversely proportional to humidity.

Ozone and nitrous oxide are reactive compounds that contribute to smog and can have adverse impacts on human respiratory systems.[63] Accordingly, these compounds are regulated and have permissible concentration limits. The State of Minnesota has an ozone limit of 0.08 parts per million (ppm).[64] The federal ozone limit is 0.075 ppm.[65]

Modeling and calculations for the Parkers Prairie project indicates a maximum ozone concentration of 0.006 ppm near the conductor and 0.002 ppm at one meter above the ground.[66] These levels are below state and federal standards. These emissions will add to cumulative concentrations in the project area; however, concentrations of ozone and nitrous oxide are not typically of concern in rural areas.[67]

Construction Dust

Construction of the Parkers Prairie project will create dust and cause emissions from construction vehicles, i.e., diesel exhaust. The magnitude of emissions is dependent on weather conditions and the specific construction activity taking place. Any adverse impacts are anticipated to be temporary.

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[63] Six Common Air Pollutants, U.S. Environmental Protection Agency, http://www.epa.gov/air/urbanair/.
[64] Minnesota Rules 7009.0800, https://www.revisor.mn.gov/rules/?id=7009.0080.
[65] Ground-level Ozone, U.S. Environmental Protection Agency, http://www.epa.gov/glo/actions.html.
[66] Route Permit Application, Section 8.2.4.
[67] Ozone and nitrous oxide are commonly considered urban pollutants; see Six Common Air Pollutants, U.S. Environmental Protection Agency, http://www.epa.gov/air/urbanair/.

Potential Impacts
No significant impacts to air quality are anticipated from the Parkers Prairie project. Ozone and nitrous oxides are calculated to be less that state and federal standards. Impacts due to construction dust are anticipated to be minor and temporary.

Mitigation
No significant impacts to air quality are anticipated from the Parkers Prairie project; thus, no mitigation measures are proposed. The Commission, as a standard permit condition, requires permittees to use best management practices for construction activities. These practices address the control and mitigation of construction dust.

5.5 Public Services

Transmission line projects have the potential to negatively impact public services, e.g., roads, utilities, and emergency services. These impacts are typically temporary in nature, e.g., the inability to fully use a road or utility while construction is in process. However, impacts can be more long term if they change the project area in such a way that public service options are foreclosed or limited.

Temporary impacts to public services resulting from the Parkers Prairie project are anticipated to be minimal. Long-term impacts to utilities and emergency services are not anticipated. There is a possibility, if the alignment of the transmission line were within 60 ft. of the centerline of CSAH 6, that the line could impede a future reconstruction of CSAH 6 by the Otter Tail County Highway Department. If CSAH 6 were reconstructed, and if the poles for the line were within an expanded ROW for CSAH 6, then the county may need to relocate the poles, at county expense, to facilitate the reconstruction.

Roads and Highways
Transmission lines often parallel existing transportation corridors, particularly roads and highways. The sharing of exiting corridors minimizes the proliferation of new infrastructure corridors and their impacts. Paralleling is possible because, in general, transmission lines do not impact the use of roads and highways. The Parkers Prairie project is proposed to parallel CSAH 6 and to cross Minnesota State Highway 29 (MN 29).[68]

Potential Impacts
The Parkers Prairie project will likely cause temporary impacts to CSAH 6 and MN 29 during construction. The movement of materials and machines may cause temporary impediments to travel, e.g., single lane traffic, flagging.

Reconstruction of CSAH 6
The Otter Tail County Highway Department has indicated that it will, eventually, reconstruct CSAH 6. While the county has no current plans for this reconstruction, highways within the county are reconstructed on a 50 to 60 year cycle, and CSAH was last reconstructed in 1981.[69] The county is requesting that a ROW of 120 ft. be reserved for this reconstruction. Thus, it requests that poles for the Parkers Prairie project be greater than 60 ft. from the centerline of CSAH 6.

[68] Route Permit Application, Section 8.2.12. Additionally, the project proposes to cross over the Canadian Pacific Railway. GRE will be required to obtain permission from the railway for this crossing.
[69] Otter Tail County Highway Department, Comment Letter on Scope of Environmental Assessment, December 12, 2011, https://www.edockets.state.mn.us/EFiling/ShowFile.do?DocNumber=20121-69970-02.

If the alignment for the Parkers Prairie project were (1) within the existing CSAH 6 ROW (or directly on the edge of the ROW), or (2) just outside the current CSAH 6 ROW (approximately 55 ft. from centerline, then the transmission line poles could impede reconstruction of CSAH 6. It's possible that some reconstruction activities could occur with the poles in place, but some would be restricted. Otter Tail County estimates that the cost to move the transmission line poles for the Parkers Prairie project so that reconstruction could occur (i.e., 60 ft. or greater from the centerline of CSAH 6) is in range of $700,000 dollars.[70]

Mitigation

Mitigation of temporary impacts to roads and highways can be achieved through planning and adherence to MnDOT and county standards.[71] GRE has indicated that it will coordinate with MnDOT and Otter Tail County on appropriate mitigation measures, e.g., signage, flaggers, public notifications.[72]

Impacts related to the potential reconstruction of CSAH 6 could be mitigated by placing the alignment for the new 115 kV line, in whole or in part, outside of the potential future ROW for CSAH 6.

Utilities

The Parkers Prairie project is proposed to run along CSAH 6. Two electrical lines currently parallel this county road – a 41.6 kV line on the south side of CSAH 6 and an LREC distribution line on the north side of CSAH 6. The 41.6 kV line currently provides power to the Parkers Prairie substation for distribution and use in the surrounding area.

As part of the project, the 41.6 kV line will be removed. Service to an upgraded Parkers Prairie substation will then be provided by a new 115 kV line. If the new 115 kV line runs along the south side of CSAH 6, GRE indicates that the poles for the existing 41.6 kV line will leaned such that construction can occur without disruption of service.[73] If the new 115 kV line runs along the north side of CSAH 6, the distribution line will be underbuilt or buried underground, with no disruption of service.[74]

There is a proposed wind turbine farm which may be constructed in the project area – the Prairie Wind Project.[75] Wind turbines are proposed to be located in areas north and south of CSAH 6, with electrical connections between turbines provided by underground wiring. Thus, electrical lines may run underneath CSAH 6 and the new Parkers Prairie 115 kV line.

Potential Impacts

No impacts to utilities in the project area are anticipated from the Parkers Prairie project. Components in the electrical system in the project area will change as a result of the project, but no adverse impacts to electrical service or other utilities are anticipated.

Mitigation

No impacts to utilities are anticipated from the Parkers Prairie project; thus, no mitigation measures are proposed.

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[70] Id. The county reports paying $700,00 dollars to GRE to move 2.7 miles of 41.6 kV line along CSAH 83.
[71] Route Permit Application, Section 8.2.12.
[72] Id.
[73] Route Permit Application, Section 8.2.7.
[74] Route Permit Application, Section 8.2.11.
[75] Prairie Wind Energy Project, http://energyfacilities.puc.state.mn.us/Docket.html?Id=30591.

Emergency Services
Potential impacts to emergency services in the project area could result from (1) an inability to communicate that there is an emergency or (2) an inability to respond to an emergency.

Potential Impacts
Potential impacts to communications systems due to the Parkers Prairie project are discussed in Section 5.6. No impacts to communications systems are anticipated; therefore no impacts to the community's ability to communicate regarding an emergency are anticipated. During construction of the project, there may be temporary impacts to road and highway which could impede responses to an emergency. However, these impacts are anticipated to be minimal (see discussion above). No impacts to emergency services are anticipated once the project is operational.

Mitigation
No impacts to emergency services are anticipated from the Parkers Prairie project; thus, no mitigation measures are proposed.

5.6 Electronic Interference

Transmission lines have the potential to interfere with the normal operation of electronic devices. Interference can result from electromagnetic noise created by the ionization of air molecules surrounding conductors. This ionization is commonly known as corona. Interference can also result from transmission line poles which block line-of-sight communications.

No impacts to electronic devices are anticipated as a result of the Parkers Prairie project. Interference due to electromagnetic noise is not anticipated. Interference due to line-of-sight obstruction is not anticipated and can be mitigated.

Radio Interference
Corona from transmission line conductors can generate electromagnetic noise in the radio frequency range. This noise may cause interference with radio communications. Amplitude modulation (AM) radio interference typically occurs immediately under a transmission line and dissipates rapidly on either side. If radio interference from transmission line corona does occur, satisfactory reception from AM radio stations can be restored by appropriate modification of the receiving antenna system.[76]

Frequent modulation (FM) radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise decreases in magnitude with increasing frequency and is quite small in the FM broadcast band (88-108 megahertz, MHz). Additionally, the interference rejection properties inherent in FM radio systems make them virtually immune to electromagnetic noise.[77]

Two-way radios used for emergency services typically operate at frequencies greater than 150 MHz.[78] Minnesota is currently moving to a statewide emergency communications system that operates at 800 MHz.[79] Corona-generated electromagnetic noise is minimal at these frequencies.

[76] Route Permit Application, Section 8.2.6.
[77] Id.
[78] Emergency Medical Services Regulatory Board, EMS Radio Project, http://www.emsrb.state.mn.us/comm.asp.
[79] Id.

Potential Impacts
Impacts to radios used in the project area are anticipated to be minimal.

Mitigation
Impacts to AM radios can be mitigated by distance and antenna modifications.

Television
Potential interference with television broadcasts depends on how broadcasts are transmitted and received, e.g., analog, digital, satellite, cable.

Analog and digital television transmissions occur at frequencies greater than 54 MHz.[80] These frequencies are high enough to avoid interference with corona-generated electromagnetic noise. Additionally, digital transmissions are not dependent on waveforms to transfer broadcast content, but rather of packets of binary information, which, in general, are less susceptible to corruption and can be corrected for errors.

Analog transmissions can be subject to multipath reflections that result in a ghosting effect. Reflections, however, typically occur only with large objects (e.g., buildings) which contain metal. Wooden transmission line poles would not cause such an effect. Digital transmissions are susceptible to freezing and pixelation due to multipath reflections and/or low signal strength. Wooden transmission line poles would not cause such an effect.[81]

Satellite television is transmitted in the K_u band of radio frequency (12-18 GHz) and is not susceptible to corona-generated noise.[82] Satellite television is susceptible to line-of-sight obstruction. Even minor obstructions, e.g., rain, can cause loss of signal. If the obstruction is removed, the signal interference will be removed and the broadcast unaffected.

Cable is a redistributed form of satellite broadcast and is generally not susceptible to interference due to the use of shielded coaxial cable. Cable broadcasts can suffer interference if the satellite broadcast suffers interference, e.g., line-of-sight obstruction.

Potential Impacts
Impacts to television broadcasts due to the Parkers Prairie project are anticipated to be minimal. Transmission frequencies are higher than those of corona-generated noise, which makes interference highly unlikely. Multipath reflections due to wooden poles are unlikely. Line-of-sight obstructions could occur if a transmission line pole was directly in the path of a transmission signal (e.g., satellite signal)

Mitigation
Potential impacts to television broadcasts can be mitigated through several means. Use of a different antenna or moving an antenna / satellite dish will typically resolve any impacts. GRE indicates that it will inspect and repair its facilities to ensure a minimum of corona-generated noise and will take all necessary measures to mitigate impacts to television reception in the project area.[83]

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[80] North American Broadcast Television Frequencies, http://en.wikipedia.org/wiki/North_American_broadcast_television_frequencies.
[81] Route Permit Application, Section 8.2.6.
[82] Satellite Television, http://en.wikipedia.org/wiki/Satellite_television.
[83] Route Permit Application, Section 8.2.6.

Internet and Cellular Phones

Wireless internet and cellular phones use frequencies in the ultra high frequency range (900 MHz and greater). The specific UHF frequency used for a cellular phone would depend on the phone service provider's technology. UHF radio frequencies are high enough that the impacts of corona-generated noise would be negligible. Accordingly no impacts to wireless internet systems and cellular phones are anticipated, and no mitigation measures are proposed.

GPS-Based Navigation Systems

Global positioning systems (GPS) are electronic systems that collect and coordinate data from satellites (typically, four satellites) to determine the location of specific GPS receiver on the earth. Because GPS locations can be determined in real time, GPS receivers can be used to control and direct the movements of vehicles, e.g., boats, tractors, cars. Interference with GPS-based navigation systems could lead to adverse impacts, i.e., inaccurate navigation.

GPS systems operate at radio frequencies in the gigahertz range.[84] The frequencies are high enough that impacts of corona-generated noise would be negligible. GPS systems, because they are satellite-based, are susceptible to line-of-sight obstructions. However, because GPS systems use multiple satellite signals to determine a position, interference with one signal would not cause inaccurate navigation. Simultaneous interference with two signals could lead to inaccurate navigation.

Potential Impacts

No impacts to GPS-based navigation systems as a result of the Parkers Prairie project are anticipated. There is a possibility of line-of-sight obstruction, due to a transmission line pole, such that a GPS receiver might have access to only three out of four satellites. This obstruction is not anticipated to cause inaccurate navigation. Additionally, the obstruction would be resolved with the movement of the vehicle, e.g., tractor, such that the GPS received could receive information from all satellites. Thus, any impacts are expected to be minimal and temporary.[85]

Mitigation

No impacts to GPS-based navigation systems as a result of the Parkers Prairie project are anticipated; thus, no mitigation measures are proposed.

5.7 Land-Based Economies

Transmission lines have the potential to impact land-based economies. Transmission lines and poles are a physical presence on the landscape. This presence can prevent or otherwise limit use of the landscape for other purposes. In general, and for safe operation of the line, buildings and tall growing trees are not allowed in transmission line rights-of-way. This limitation can create impacts for commercial businesses and forestry. Additionally, transmission line poles take up space on the ground that could be used for other purposes, e.g., agriculture, mining.

Impacts to land-based economies due to the Parkers Prairie project could range from minimal to significant, depending upon the location and alignment of the proposed 115 kV line. If the line is located on, within, or just outside the current CSAH 6 ROW then impacts to agricultural operations are expected to be minimal. If the 115 kV line is located outside of a future CSAH 6 ROW (65 ft. from the centerline of CSAH 6), impacts to agricultural operations could be significant. If the 115 kV line is located on the north

[84] GPS Signals, http://en.wikipedia.org/wiki/GPS_signals.

[85] Silva, J.M. and Olsen, R.G., Use of Global Positioning System (GPS) receivers under power-line conductors, IEEE Transactions on Power Delivery, October 2002.

side of CSAH 6 near Minnesota State Highway 29, then forestry impacts will be minimal; if located on the south side of CSAH 6, then forestry impacts could be significant.

Agriculture

Potential impacts to agriculture fall generally into two types – temporary and permanent impacts. Temporary impacts are impacts due to construction activities. These activities could temporarily limit the use of fields or could cause impacts to crops and soils, e.g., soil compaction. In general, construction activities will be limited to the transmission line ROW; however, there may be instances where activities impinge on areas outside of the ROW. For example, if the new 115 kV were placed on the south side of CSAH 6, and to keep the existing 41.6 kV line in service, GRE indicates that they would lean the existing 41.6 kV poles away from the road.[86] This leaning could place poles, temporarily, in neighboring agricultural fields. GRE indicates that they will work with landowners to minimize impacts to agricultural operations and will compensate landowners for crop damage and soil compaction that may occur during construction. [87]

Permanent agricultural impacts are impacts due to the physical presence of transmission line poles in agricultural fields. The footprint of a pole can be relatively small – e.g., the footprint for the poles proposed to be used for the Parkers Prairie project is approximately 30 square feet.[88] However, the impact of such poles can be greater than their footprint in that they can (1) impede the use of farm equipment, (2) interfere with aerial spraying, and (3) impede the use of irrigation systems. These physical impacts can result in financial impacts, e.g., loss of farming income, decrease in property value.

Farming Equipment

Transmission line poles in agricultural fields can impede the use of certain farm equipment such that the poles prevent the planting and harvesting of crops. A general estimate of this type of impact can be made by assuming that the amount of land taken out of production is approximately the area of a semicircle with a radius equal to the distance that the pole is in the field. Based on the land removed from production, an estimate of financial impacts can be made. **Table 11** presents such estimates for a 115 kV transmission line in Otter Tail County. These estimates indicate that, in general, if a transmission remains near the edge of field, impacts related to farming equipment impediments are relatively minor – losses of land are in the range of 0.1 acre per mile of transmission line and annual financial impacts are in the range of $40 dollars per mile of transmission line.

Table 11. Estimated Impacts Due to Transmission Poles in Fields, Otter Tail County[89]

Distance Into Field (ft)	Area Impeded per Pole (ft^2)	Area Impeded per Mile of Line (acres)	Average Annual Impact Due to Lost Harvest ($/mile/year)
5	39.27	0.014	4.54
10	157.08	0.054	18.16
15	353.43	0.122	40.87

[86] Route Permit Application, Section 8.3.1.
[87] Id.
[88] Id.
[89] Estimates assume an average span between poles of 350 ft (see Route Permit Application, Section 5.1) and an average value per acre of agricultural products sold in Otter Tail County of $333.90 dollars (see 2007 Census of Agriculture, Otter Tail County, www.agcensus.usda.gov).

Aerial Spraying
Transmission line poles have the potential to interfere with the aerial spraying of crops. If the poles are of sufficient height and placed near fields which are sprayed from the air, the coverage and effectiveness of the spraying could be adversely impacted. The poles for the new 115 kV line will be 20 to 45 ft. taller than poles currently within the proposed route. This incremental height difference could cause an incremental impact to aerial spraying in the project area.

Irrigation Systems
Transmission line poles in agricultural fields can impede the use of irrigation systems. Impacts that result can include: (1) costs to reconfigure an irrigation system to accommodate poles, (2) lost crop revenue due to an inability to irrigate a portion or all of a field. Impacts to irrigation systems will likely be relatively larger than those due to farming equipment impediments. Costs to reconfigure an irrigation system can be in the range of $10,000 – $15,000 dollars for simple modifications (e.g., reducing boom length) and up to $100,000 dollars for significant modifications (e.g., moving the pivot point for an irrigation system).[90] Lost crop revenues due to an inability to properly irrigate can be significant. For example, the inability to irrigate a 40 acre field could result in that field being unusable for many crops. If no crops could be grown, the annual financial impact would be approximately $13,356 dollars.[91]

Potential Impacts
Agricultural fields abut CSAH 6 and run the length of the proposed route, from the Parkers Prairie substation to the intersection with Minnesota State Highway 29. Seven of these fields are irrigated; three on the north side of CSAH 6, four on the south side (**Figure 6**).[92] The irrigation systems have been developed to accommodate CSAH 6, the existing electrical lines along CSAH 6, and shelterbelts. The existing LREC distribution line is generally 50 ft. north of the CSAH 6 centerline, on the edge of the road ROW. The existing GRE 41.6 kV line is generally 45 ft. south of the CSAH 6 centerline, five feet inside of the road ROW.

The distances from the seven irrigation systems to the centerline of CSAH 6 are shown in **Table 12**.[93] Potential impacts to agricultural operations depend upon the location and alignment of the proposed 115 kV line. If the line is located on or within the current CSAH 6 ROW, i.e., where the current electrical lines are placed along CSAH 6, then impacts are expected to be minimal. If the line is located outside the current CSAH 6 ROW (55 ft. from the centerline of CSAH 6), then there will be minor impacts to agricultural operations. These impacts would be related to the inability to use farming equipment to cultivate entire fields. Transmission line poles would impede the use of farming equipment, thus taking farm land out of production.

If the 115 kV line is located outside of future CSAH 6 ROW (65 ft. from the centerline of CSAH 6), impacts to agricultural operations could be significant. On the north side of CSAH 6, an alignment at 65 ft. would likely interfere with irrigation systems #1, #2, and #3. System #1 has an estimated closest approach of 60-65 ft. System #2 has an estimated closest approach of 60 ft. (**Figure 7**). System #3 has an estimated closest approach of 61 ft., with an irrigation well at 72 ft. from the CSAH 6 centerline (**Figure 8**). Impacts could include costs to reconfigure the irrigation system and loss of farming revenue.

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[90] Irrigation Information, Great River Energy, Personal Communication, January 30, 2012 [hereafter Irrigation Information]. Information also gathered by site visit and review of photography, direct and aerial.
[91] Estimate = (40 acres) x ($333.90 dollars/acre); see Table 11. This estimate is likely low as irrigated crops, in general, have a greater value than non-irrigated crops.
[92] Irrigation Information.
[93] Id.

Figure 6. Irrigation Systems along CSAH 6 / Proposed Route

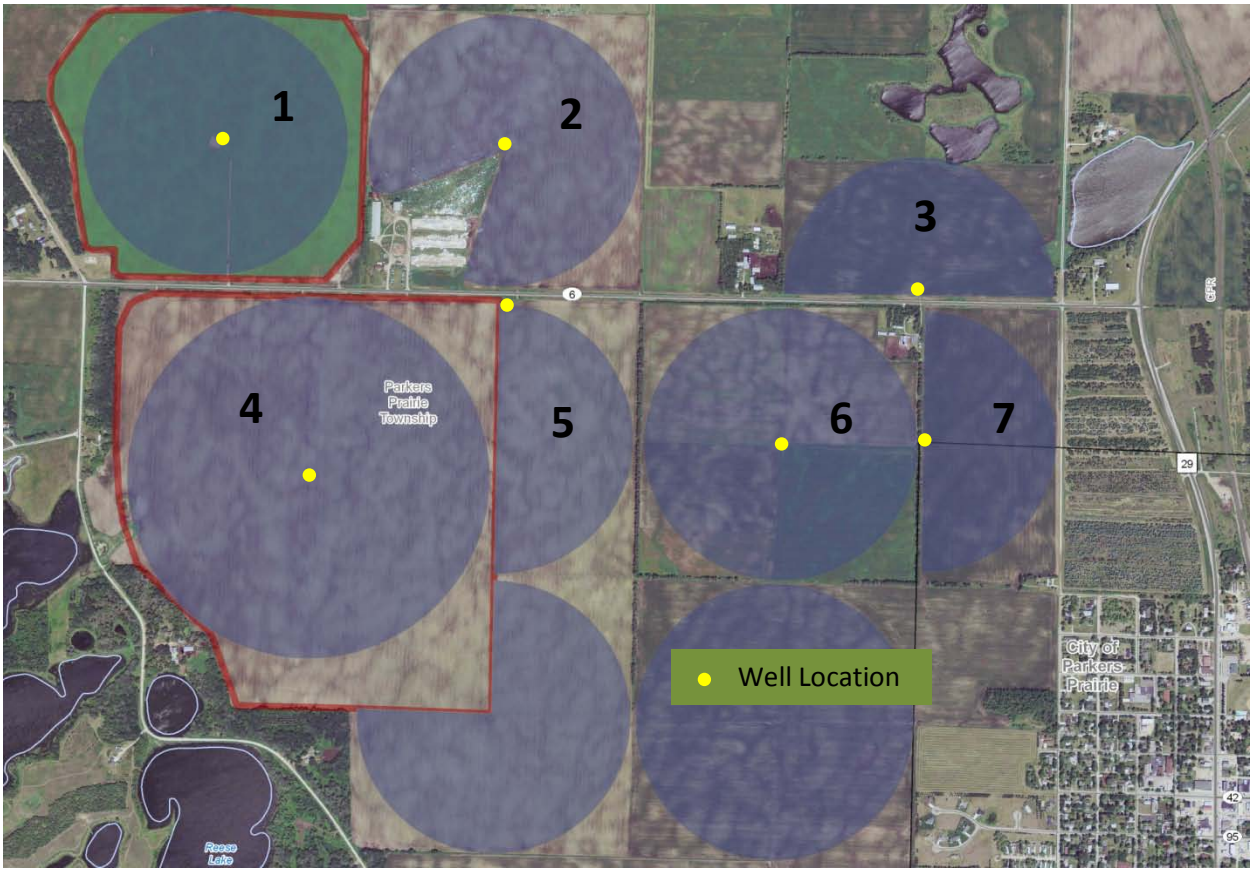

Table 12. Estimated Distance from Irrigation System to CSAH 6 Centerline (Closest Approach)

Irrigation System[94]	Estimated Closest Approach (ft)	System Type
1	60-65	Full radius with pivot arm extension
2	60	7/8 radius
3	61	Half radius
4	67	Full radius with pivot arm extension
5	65-70	Half radius
6	69	Full radius
7	76	Half radius

On the south side of CSAH 6, an alignment at 65 ft. could potentially interfere with irrigation systems #4, #5 ,and #6. The estimated closest approach for these systems is in the range of 65 – 70 ft. Thus, though impacts are not expected, there is uncertainty as to their possible extent. The irrigation well for irrigation system #5 is 82 ft. south of the CSAH 6 centerline.[95]

[94] See Figure 6 for numbering of irrigation systems.
[95] Irrigation Information.

An alignment at 65 ft. from the centerline of CSAH 6 would introduce impacts, independent of and in addition to impacts to irrigation systems, due to the inability to cultivate entire fields. Transmission line poles would impede the use of farming equipment. An alignment at 65 ft. would create relatively more impacts than an alignment at 55 ft.

Figure 7. Irrigation System 2

Mitigation

Potential impacts to agricultural operations could be mitigated by (1) choosing an alignment that is closer to the centerline of CSAH 6 and (2) placing the new 115 kV on one side of CSAH 6 or the other to avoid potential conflicts with irrigation systems. Impacts to irrigation systems #1, #2, and #3 – the systems for which impacts appear likely and significant if the alignment were at 65 ft. – could be avoided by placing the new 115 kV line closer to the centerline of CSAH 6 or to the south side of CSAH 6 in this area. Impacts to agricultural operations could also be mitigated through their inclusion in individual easement agreements with landowners along the route.

<u>Forestry</u>

Potential impacts to forestry operations are due to the removal of trees. In general, and for safe operation of the line, tall growing trees are not allowed in transmission line rights-of-way. Removal of trees directly impacts the resource which is being sold by forestry operations.

Potential Impacts

Approximately 12% of Otter Tail County is forested.[96] There are no traditional forestry operations in the proposed route for the Parkers Prairie project. That is, operations where trees are harvested for paper, pulp, and energy. However, there is a tree farm, the Plants Beautiful Nursery (Dittberner Tree Farm), which is located within the proposed route for the project. The nursery is located in the southwest corner of the intersection of CSAH 6 and Minnesota State Highway 29. The nursery sells, via wholesale and retail, a variety of trees as nursery stock.[97]

Figure 8. Irrigation System 3 and Well

Currently, a number of trees, primarily pine trees, are within the ROW for the existing 41.6 kV transmission line (**Figure 9**). If the new 115 kV line were placed on the south side of CSAH 6, it would impact operations at the nursery. If the line were placed at an alignment of 55 ft. from the CSAH 6 centerline, approximately 100 pine trees would need to be would be removed.[98] The value of these trees, in the nursery stock trade, is uncertain. If the alignment were placed at 65 ft., tree removal impacts would likely be relatively greater.

Mitigation

Potential impacts to forestry operations can be mitigated by (1) choosing an alignment that is closer to the centerline of CSAH 6 and (2) placing the new 115 kV on one side of CSAH 6 or the other to avoid potential conflicts with forestry operations. Impacts to the Plants Beautiful Nursery could be mitigated

[96] Route Permit Application, Section 8.3.2.
[97] Plants Beautiful Nursery, http://www.plantsbeautifulnursery.com/index.html.
[98] Tree Information, Great River Energy, Personal Communication, January 30, 2012.

by placing the new 115 kV line on the north side of CSAH 6. As there already trees within the ROW for the existing 41. 6 kV line, all alignments on the south side of CSAH 6 will result in impacts due to tree removal. Alignments at distances further from CSAH 6 (55 ft., 65 ft.) will increase impacts due to tree removal. Impacts to forestry operations can also be mitigated through their inclusion in individual easement agreements with landowners along the route.

Figure 9. Trees in 41.6 kV Right-of-Way, Dittberner Tree Farm

Mining

Impacts to mining operations can occur where transmission lines interfere with access to and the ability to remove minerals (or other resources, e.g., peat). There are no known mining resources in the Parkers Prairie project area. Accordingly, no impacts to mining operations are anticipated and no mitigation measures are proposed.

Tourism and Other Commerce

Potential impacts to tourism and other commercial ventures can occur when transmission lines interfere with the operation of these ventures. For example, transmission lines could change the aesthetic of a tourist destination such that visitors to the destination and associated commerce decrease.

Tourism in the Parkers Prairie area includes fishing, boating, camping, golfing, snowmobiling, and cross-country skiing.[99] Businesses in the area provide a variety of services and supplies.[100]

[99] Parkers Prairie Tourism, http://www.parkersprairie.net/tourism.htm.
[100] Parkers Prairie Business Directory, http://www.parkersprairie.net/BusinessDirectory.htm.

There are no tourist attractions or businesses in the project area, other than the land-based economies discussed elsewhere in this section. Accordingly, no impacts to tourism or other commercial ventures are anticipated and no mitigation measures are proposed.

5.8 Archaeological and Historic Resources

Transmission lines have the potential to Impact to archaeological and historic resources. Archaeological resources can be impacted by the disruption or removal such resources during the construction of a line. Historic resources can be impacted by the placement of line such that impairs or decreases the historic value of the resource. No impacts to archaeological or historic resources are anticipated as a result of the Parkers Prairies project.

Potential Impacts
Great River Energy, through Westwood Professional Services, has conferred with the Minnesota Historical Society (MHS) concerning the probability of cultural resources (archaeological and historic resources) in the Parkers Prairie project area.[101] MHS indicated that there are no historic properties and no known or suspected archaeological resources in the project area.[102] A monument related to the District 50 White Oak School was identified west of the Parkers Prairie substation. This monument will not be impacted by the Parkers Prairie project.

Mitigation
No impacts to archaeological or historic resources are anticipated and thus no mitigation measures are proposed. GRE indicates that should archaeological sites or resources be identified during construction of the new 115 kV line, work will be stopped and MHS staff consulted on how to proceed. [103] Consultation with the State Historic Preservation Office (SHPO, an office within MHS) concerning resources encountered during construction is a standard HVTL route permit condition (see **Appendix C**).

5.9 Zoning and Land Use Compatibility

Transmission lines have the potential to adversely impact existing land uses and to be incompatible with future land uses, i.e., zoning. No impacts to existing land uses or zoning are anticipated as a result of the Parkers Prairie project.

Potential Impacts
Potential impacts to existing land-based economies are discussion in Section 5.7. In general, the land along the proposed route is used for agricultural purposes. There are existing electrical lines along both side of CSAH 6. Thus, the Parkers Prairie project is not incompatible with existing land uses. This does not mean that there are no potential impacts related to the project; there are, and they are discussed throughout this document. However these impacts are not wholly new to the project area – i.e., there are already electrical lines on both sides of CSAH 6, successfully co-existing with current land uses. Additionally, the potential impacts of the project can, by several means and to a great extent, be mitigated.

The Parkers Prairie project will cross land designated by Otter Tail County as shoreland (**Map B-6**)[104] This land is primarily on the eastern end of the project area, near Cora Lake. According to Otter Tail

[101] Route Permit Application, Section 8.4.
[102] Id.
[103] Id.
[104] Route Permit Application, Section 8.7.

County's shoreland management ordinance, the Parkers Prairie project is exempt from the provisions of the ordinance.[105] Accordingly, the project is not incompatible with zoning in the project area.

Mitigation
No impacts to existing land uses or zoning are anticipated as a result of the Parkers Prairie project. Thus, no mitigation measures are proposed.

5.10 Water Resources

Transmission lines have the potential to impact water resources, primarily though construction activities which move, remove, or otherwise handle vegetative cover and soils. Changes in vegetative cover and soils can change runoff and water flow patterns such that surface waters, groundwater, and wetlands are adversely impacted.

There are two water resources of note in the project area – a wetland in Section 10 of Parkers Prairie Township, and Cora Lake, which spans sections 10 and 15 of Parkers Prairie Township.[106] Neither of these resources is within the proposed route. Potential impacts to water resources due to the Parkers Prairie project are anticipated to be minimal.

Surface Waters
The Parkers Prairie project is located in the Red Eye / Leaf River watershed of the Upper Mississippi River Basin.[107] The watershed has 995 miles of rivers and streams, and 108 lakes greater than ten acres in size.[108] There are no public waters, lakes, rivers, or streams with the proposed route for the Parkers Prairie project (**Map B-7**).[109] Cora Lake is in the project area, but east of the proposed route (east of the proposed switch connection with GRE's existing LR-IA 115 kV transmission line). The soils in the project area are well drained; agricultural fields require irrigation to be productive. Thus, there is little or no ditching along the proposed route.

Potential Impacts
During construction of the Parkers Prairie project, there is potential for adverse impacts to surface waters due to vegetation clearing, ground disturbances, grading, and construction traffic. These activities can speed water flow and expose previously undisturbed soils, increasing erosion and the potential for sediment to reach surface waters. Construction activities are discussed in Section 4. The project will require little or no grading. Disturbed soils will generally be limited to pole locations. Areas outside pole locations may be disturbed by construction traffic and by removal of vegetation (see Section 5.12). Though there will be impacts to soils and vegetation due to construction of the project, there are no surface waters in the proposed route. Thus, impacts to surface water due to the Parkers Prairie project are expected to be minimal.

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[105] The Shoreland Management Ordinance of Otter Tail County, Minnesota, Section IV.13.A, http://www.co.otter-tail.mn.us/land/shoreland/SMOEFFECTIVE6-1-2011_Final.pdf,
[106] Route Permit Application, Figure B-9.
[107] Basins and Major Watersheds in Minnesota, http://www.pca.state.mn.us/index.php/view-document.html?gid=14171.
[108] Water Quality in the Upper Mississippi River Basin, 2008 Monitoring Status Report, http://www.pca.state.mn.us/index.php/view-document.html?gid=6067.
[109] Route Permit Application, Section 8.5.2. Analysis based on review of Minnesota Department of Natural Resources data.

Mitigation
Potential impacts to surface waters can be mitigated by using best management practices for construction of the project. The Minnesota Pollution Control Agency (MPCA) has indicated the project will likely require a construction stormwater permit from the MPCA, including the preparation of a stormwater pollution prevention plan (SWPPP).[110] Such a plan would require measures designed to mitigate potential impacts to surface waters. Permittee adherence to MPCA guidance and best management practices is a standard HVTL route permit condition (see **Appendix C**).

Groundwater
The Parkers Prairie project is located in the central groundwater province of the State of Minnesota. [111] This province, in general, has good availability of groundwater and makes possible enterprises that rely on withdrawals of groundwater, e.g., irrigated agricultural fields.

Excavation for the placement of transmission line poles for the project is not expected to impact groundwater. Accordingly, and for the reasons noted in the above discussion of surface waters, no impacts to groundwater are anticipated due to the Parkers Prairie project and no mitigation measures are proposed.

Wetlands
Wetlands provide valuable ecological services such as floodwater retention, nutrient assimilation, sediment entrapment, and wildlife habitat. Wetlands can be found in a variety ecoregions and vary with soil, hydrology, and vegetation.[112] They are typically seasonal in their extent. Wetlands in Minnesota are protected federally under Section 404 of the Clean Water Act or by the State of Minnesota under the Wetland Conservation Act.

Potential Impacts
A review of the National Wetland Inventory (NWI) indicates that there are no wetlands in the proposed route for the Parkers Prairie project.[113] There is an NWI wetland north of the proposed route, near its intersection with Minnesota State Highway 29 (**Map B-7**). As there are no wetlands within the proposed route, no impacts to wetlands are anticipated as a result of the Parkers Prairie project.

Mitigation
No impacts to wetlands are anticipated; thus, no mitigation measures are proposed.

5.11 Soils

Transmission lines have the potential to impact soils directly by moving them, or indirectly by removing vegetative cover such that they are more susceptible to movement by wind and/or water. Soils in the project area have been shaped extensively by glaciation. Soils are generally well drained and tend to be sandy loams or loamy sands.[114] Soils in the project area are used predominantly for agricultural production. Impacts to soils due to the Parkers Prairie project are anticipated to be minimal and temporary.

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[110] Minnesota Pollution Control Agency, Comment Letter on Scope of Environmental Assessment, December 2, 2011, https://www.edockets.state.mn.us/EFiling/ShowFile.do?DocNumber=20121-69970-02.
[111] Ground Water Provinces, http://www.dnr.state.mn.us/groundwater/provinces/index.html.
[112] Types of Wetlands, http://www.dnr.state.mn.us/wetlands/types.html.
[113] Route Permit Application, Section 8.5.2.
[114] Route Permit Application, Section 8.6.3.

Potential Impacts
Construction of the Parkers Prairie project will result in minor, temporary impacts to soils in the project area. Construction activities will move and handle soils to place transmission line poles. Soil will be moved to expand the footprint of the Parkers Prairie substation. Vegetation will be cleared to facilitate construction of the project. This clearing will temporarily expose soils to the elements, which could cause soil erosion. Loss of soils during construction could adversely impact water resources in the area and could cause losses to agricultural operations along the route.

Construction and operation of the project, to the extent that it requires the removal of shelterbelts, could increase soil erosion on farms along the proposed route. Shelterbelt trees provide protection against wind erosion. Removal of these trees would allow winds to reach fields unabated and would likely increase soil erosion rates.

Mitigation
Potential impacts to soils can be mitigated by using best management practices for construction of the project. These include practices to minimize disruptions to soils and vegetation and to revegetate or otherwise cover exposed soils in a timely fashion.[115] The Minnesota Pollution Control Agency (MPCA) has indicated the project will likely require a construction stormwater permit from the MPCA, including the preparation of a stormwater pollution prevention plan (SWPPP).[116] This plan would include measures to minimize soil erosion and loss. Common mitigation measure employed for transmission line projects include:

- Seeding to establish temporary and permanent vegetative cover on exposed soil.
- Using mulch to form a temporary and protective cover on exposed soils. Mulch can help retain moisture in the soil to promote vegetative growth, reduce evaporation, insulate the soil, and reduce erosion. A common mulch material used is hay or straw.
- Erecting or using sediment control fences that are intended to retard flow, filter runoff, and promote the settling of sediment out of runoff via ponding behind the sediment fence.
- Using erosion control blankets and turf reinforcement mats that are typically single or multiple layer sheets made of natural (wood) and/or synthetic materials that provide structural stability to bare surfaces and slopes.

Mitigation measures, e.g., erosion control, revegetation, are standard HVTL route permit conditions (see **Appendix C**).

Potential impacts to soils due to the removal of shelterbelt trees can be mitigated by (1) selecting alignments that avoid shelterbelts such that they are not removed, (2) trimming shelterbelts on a regular basis instead of removing them, and (3) if shelterbelts must be removed, replanting the transmission line ROW and ROW edges with low growing species that are compatible with the line. Low growing species may not provide as much protection from soil erosion as existing shelterbelts, but they would aid in mitigating potential erosion impacts.[117]

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[115] Route Permit Application, Section 8.6.3.
[116] Minnesota Pollution Control Agency, Comment Letter on Scope of Environmental Assessment, December 2, 2011, https://www.edockets.state.mn.us/EFiling/ShowFile.do?DocNumber=20121-69970-02.
[117] Shelterbelt effectiveness depends upon the porosity and height of the shelterbelt during those parts of the year when winds are high and soils are susceptible to erosion. See Windbreak/Shelterbelt Establishment, http://efotg.sc.egov.usda.gov//references/public/MN/380mn.pdf.

5.12 Flora

Transmission lines have the potential to impact flora, primarily through the removal of trees. Other flora may also be impacted (e.g., shrubs, plantings). Additionally, flora may be impacted by disruptions due to construction and the possible introduction of non-native species.

Potential impacts to flora due to the Parkers Prairie project depend upon the alignment for the route and those mitigation measures which are agreeable to landowners and GRE. Impacts could be significant if the alignment for the project is on the south side of CSAH 6. Impacts would be relatively less with an alignment of the north side of CSAH 6. An alignment that uses both sides of CSAH 6, i.e., that moves the line from one side of the road to the other, would have relatively greater potential to mitigate impacts to specific properties.

Potential Impacts

The Parkers Prairie project area lies within the Hardwoods Hills ecological subsection of the Eastern Broadleaf Forest province in west central Minnesota.[118] Presettlement vegetation was a mix of tallgrass prairie, aspen-oak land, and savanna. Agriculture is currently the most important land use in the project area, and there are few remnants of presettlement vegetation.[119] Forested areas, wetlands, and grasslands are interspersed with agricultural fields.

The proposed route for the project follows CSAH 6 from the Parkers Prairie substation eastward, crossing Minnesota State Highway 29, to a connection with GRE's existing 115 kV LR-IA line. Along this route there are five areas of trees and brush that could be significantly impacted by the project (**Figure 10**). These areas consist of shelterbelts for agricultural fields, shelterbelts and plantings around residences, and a tree farm (**Table 13**).

Table 13. Treed Areas along Proposed Route

Treed Area[120]	Parcel / Property	Description
1	Douma Parcel	Extended Shelterbelt
2	Carlson Parcel	Field Shelterbelt
3	Jahnke Parcel	Field and Residential Shelterbelt
4	Liljegren Parcel	Residential Shelterbelt
5	Dittberner Parcel	Tree Farm

Of the five treed areas, four are on the south side of CSAH 6 and one is on the north.[121] These areas contain trees which co-exist with the existing electrical lines along CSAH 6. Trees have been allowed to grow in the ROW for GRE's 41.6 kV line on the south side of CSAH 6. Trees have also been allowed to grown in the ROW for the LREC distribution line on the north side or CSAH 6. GRE indicates that for the

[118] http://www.dnr.state.mn.us/ecs/222/index.html
[119] Id. See also Route Permit Application, Figure B-8.
[120] See Figure 10 for numbering of treed areas. These areas may include trees, shrubs, and brush.
[121] These areas do not contain the only trees in the proposed route; there are individual trees and small groups of trees that could be impacted by the project. However, these impacts are anticipated to be relatively minor.

new 115 kV line, trees and other vegetation will be removed from the ROW.[122] This removal is necessary for the safe and reliable operation of the 115 kV line.[123] However, GRE also indicates that, through negotiated agreements with individual landowners, low growing trees and other plantings may be allowed in the 115 kV transmission line ROW.[124] For example, GRE currently allows and regularly trims trees within the 41.6 kV line ROW.

For the purposes of this document, realizing that tree-loss impacts can be negotiated with individual landowners, it is assumed that all trees within the new 115 kV transmission line ROW will be removed. Thus, the analysis that follows assumes the worst-case scenario, the removal of all trees within the 115 kV line ROW.

Figure 10. Treed Areas along CSAH 6 / Proposed Route[125]

Treed Area 1

Treed area #1, the Douma parcel, is on the south side of CSAH 6 across from the existing Parkers Prairie substation. If the new 115 kV line where on the south of CSAH 6, approximately 7 oak trees would need to be removed (**Figure 11**).[126] This would be true at a distance of 55 ft. from the centerline of CSAH 6 and at 65 ft. The oak trees range in size from 10 to 22 inches in diameter.[127] No oak trees would need

[122] Route Permit Application, Section 6.4.
[123] Id.
[124] Id.
[125] Areas indicated are not to scale and are for illustration and discussion purposes only.
[126] Tree Information, Great River Energy, Personal Communication, January 30, 2012 [hereafter Tree Information].
[127] Id.

to be removed if the alignment were within the current CSAH 6 ROW (e.g., on the same alignment as the existing 41.6 kV line). There are currently guy wires which extend into the parcel and facilitate the turning of the line at this corner. If the line were on the south side of CSAH 6, guy wires would be used for the new 115 kV line.

Figure 11. View of Treed Area 1

Treed Area 2

Treed area #2, the Carlson parcel, is on the south side of CSAH 6. This area is a Siberian Elm shelterbelt which has, to date, been trimmed on a scheduled basis to accommodate the existing 41.6 kV line (**Figure 12**). The trees in the shelterbelt have a width, at their crown, of approximately 25 ft. The shelterbelt runs for approximately 3,400 ft. along CSAH 6 and agricultural fields. If the new 115 kV line were on the south side of CSAH 6, this shelterbelt would be removed. This would be true at a distance of 55 ft. from the centerline of CSAH 6 and at 65 ft. It would also be true if the alignment were within the current CSAH 6 ROW (e.g., on the same alignment as the existing 41.6 kV line).

Figure 12. View of Treed Area 2

Treed Area 3

Treed area #3, the Jahnke parcel, is on the south side of CSAH 6. This area includes a field shelterbelt and a shelterbelt with additional plantings around the Jahnke residence. The trees in the shelterbelt have, to date, been trimmed on a scheduled basis to accommodate the existing 41.6 kV line (**Figure 13**). The field shelterbelt runs for approximately 2,200 ft. along CSAH 6 and agricultural fields. If the new 115 kV line were on the south side of CSAH 6, all of the field shelterbelt would be removed. This would be true at a distance of 55 ft. from the centerline of CSAH 6 and at 65 ft. It would also be true if the alignment were within the current CSAH 6 ROW (e.g., on the same alignment as the existing 41.6 kV line).

With respect to the trees surrounding the Jahnke residence, if the alignment were on the south side of CSAH 6 at distance of 55 ft. from the centerline, approximately 72 hardwood trees and nine pine trees would be removed (**Figure 14**).[128] The hardwoods are primarily ash and box elder and range in size from 6 to 20 inches in diameter. A treed buffer approximately 30 ft. in width would remain between the new 115 kV ROW and the Jahnke residence.[129] If the alignment were on the south side of CSAH 6 at distance of 65 ft. from the centerline, approximately 25 additional hardwood trees would be removed (for a total

[128] Id.

[129] Id. Estimates of width for the remaining treed buffer are based on a site visit by GRE staff. Mr Jahnke, in his comment letter on the scope this document, estimated the remaining treed buffer would be smaller and in the range of zero to ten feet. See, Mr. Bruce Jahnke, Comment Letter on Scope of Environmental Assessment, https://www.edockets.state.mn.us/EFiling/ShowFile.do?DocNumber=20121-69970-02.

of 97 hardwood and nine pine trees).[130] A treed buffer approximately 20 ft. in width would remain between the new 115 kV ROW and the Jahnke residence.[131]

Figure 13. View of Treed Area 3, Field Shelterbelt

Treed Area 4

Treed area #4, the Liljegren parcel, is on the north side of CSAH 6. This area is a shelterbelt for a residence. The trees in this area are within the ROW for the LREC distribution; however, the majority of trees are not directly under the line (**Figure 15**). This shelterbelt runs for approximately 600 ft. along CSAH 6. The area is mix of hardwoods, evergreens, and smaller brush. If the alignment for the new 115 kV line were on the north side of CSAH 6, within the current CSAH 6 ROW (e.g., on the same alignment as the existing LREC distribution line), approximately 0.6 acres of trees would be removed. If the alignment were at a distance of 55 ft. from the centerline, approximately 0.7 acres of trees would be removed. If the alignment were at distance of 65 ft. from the centerline, approximately 0.8 acres of trees would be removed.

[130] Id.
[131] Id.

Treed Area 5

Treed area #5, the Dittberner parcel, is on the south side of CSAH 6. This area is a tree farm and nursery – the Plants Beautiful Nursery (Dittberner Tree Farm). Potential impacts to this treed area and business are discussed in Section 5.7. Currently, a number of trees, primarily pine trees, are within the ROW for the existing 41. 6 kV transmission line (**Figure 9**). If the new 115 kV line were placed on the south side of CSAH 6, at an alignment of 55 ft. from the CSAH 6 centerline, approximately 100 pine trees would need to be would be removed.[132] If the alignment were placed at 65 ft., tree removal impacts would likely be slightly greater.

Figure 14. View of Treed Area 3, Residence Shelterbelt

Mitigation

Potential impacts to flora, primarily tree removal, can be mitigated by: (1) choosing an alignment that avoids treed areas, (2) choosing an alignment closer to CSAH 6, (3) replanting on the transmission line ROW and/or ROW edge with low growing species, or (4) providing compensation to individual landowners through negotiated easement agreements. Even if the new 115 kV line were placed on an existing alignment, i.e., on the same alignment as the LREC distribution line or GRE 41.6 kV line, impacts would occur. This is due to the assumption that the trees within the new 115 kV ROW would be managed differently than they are currently managed by LREC and GRE.

[132] Id.

Figure 15. View of Treed Area 4

5.13 Fauna

Transmission lines have the potential to impact fauna through a variety of means including temporary displacement, habitat loss, and, for avian species, collision with transmission line conductors. Potential impacts to fauna due to the Parkers Prairie project are anticipated to be minimal. Impacts are most likely to result from loss of habitat, e.g., loss of shelterbelts.

Potential Impacts

The Parkers Prairie project area lies within the Hardwoods Hills ecological subsection of the Eastern Broadleaf Forest province in west central Minnesota.[133] Habitat within this subsection has been greatly reduced by settlement and agriculture. However, areas of forest and prairie still exist and potholes provide habitat for waterfowl and shorebirds. The area is part of larger migratory corridor for forest birds and waterfowl.[134] Wildlife within the project area includes deer, small mammals, frogs and salamanders, waterfowl, shorebirds, and perching birds. [135]

In general, fauna within the project area are anticipated to have the ability to remove themselves from the potential dangers of project construction and to exist while temporarily displaced from the area. Potential impacts due to construction and displacement are anticipated to be minimal.

[133] http://www.dnr.state.mn.us/ecs/222/index.html
[134] Id.
[135] Minnesota Department of Natural Resources, AniMap, http://www.dnr.state.mn.us/maps/animap/index.html.

If the new 115 kV line is placed on an alignment that requires the removal of shelterbelts, then impacts to fauna will likely result due to the loss of habitat. The magnitude of these impacts is uncertain. The ability of shelterbelts to successfully serve as habitat for a species depends on many factors including the vegetative complexity of the shelterbelt and its size.[136] Shelterbelts along CSAH 6 are, for the most part, narrow and designed to aid agricultural operations, e.g., by minimizing soil erosion. The shelterbelts around residences (treed areas #3 and #4, discussed above) are relatively wider and could support a greater range and number of species.

Avian species could be impacted by the Parkers Prairie project through collision with transmission line conductors. Collision is more likely for large-bodied birds with long wing spans such as swans, geese, ducks, and cranes. Frequency of collision depends upon the number of birds crossing through the project area and the likelihood that they will utilize the area, e.g., for food, water, resting. Impacts to avian species due to collision with the 115 kV conductors of the Parkers Prairie project are anticipated to be minimal. Electrical lines already exist on both sides of CSAH 6. Though the new 115 kV lines will be taller than these lines, the incremental impact on avian species is expected to be minimal. Because the project area is used primarily for irrigated agriculture, the relative likelihood that avian species will utilize the project area is small when compared to surrounding habitat offerings, e.g., potholes, lakes, forested areas, grasslands.

Mitigation
Potential impacts to fauna due to the Parker Prairie project could be minimized by choosing an alignment for the route that minimizes habitat loss, i.e., loss of shelterbelts.

5.14 Rare and Unique Natural Resources

Potential impacts to rare and unique natural resources (flora and fauna) from the Parkers Prairie project could result from displacement, habitat loss, and, for avian species, collision with transmission line conductors.

The U.S. Fish and Wildlife Service indicates that there are no federally listed species or proposed critical habitat within the project area.[137] The Minnesota Department of Natural Resources indicates that there are no known occurrences of rare natural resources in the project area.[138] Accordingly no impacts to rare and unique natural resources due to the Parkers Prairie project are anticipated and no mitigative measures are proposed.

[136] Yahner, R. H., Small Mammals in Farmstead Shelterbelts: Habitat Correlates of Seasonal Abundance and Community Structure, Journal of Wildlife Management, 47(1), p. 74-84, 1983.
[137] Route Permit Application, Section 8.5.4. The USFWS does indicate that the gray wolf, which was recently removed from the threatened and endangered species list, is present in Otter Tail County.
[138] Id.

6.0 Comparison of Alignment Alternatives

In the alternative permitting process, applicants are not required to provide any routes for review other than their proposed, preferred route. However, alternatives can be brought forward during the scoping processes by concerned citizens or local governments. For the Parkers Prairie project, one project alternative was raised through the scoping process; however, this alternative was not carried forward into the scoping decision and this environmental assessment (see **Appendix A**). Thus, there is one route being evaluated for the Parkers Prairie project – a route centered on CSAH 6, with a route width of 300 ft. (150 ft. on each side of the CSAH 6 centerline), from the Parkers Prairie substation eastward to a connection with GRE's existing LR-IA 115 kV line (**Figure 1**).

The Commission will issue a permit for a route and an anticipated alignment for the Parkers Prairie project. The Commission may issue a route permit with a route width of 300 ft. (the width requested by GRE) or a smaller width. The Commission's identification of a route and anticipated alignment is intended to minimize adverse human and environmental impacts of the project.[139]

The potential impacts of the Parkers Prairie project can, to a great extent, be mitigated by the choice of the alignment for the project. These impacts, mitigations, and alignments are discussed in Section 5. This section of the EA attempts to synthesize the analysis of Section 5 and compares four possible alignment alternatives for the project. The alignments alternatives are:

- Alignment 1 – an alignment that is on the south side of CSAH 6, 55 ft. from the centerline, for the entire route. This is the alignment proposed by GRE in their route permit application.

- Alignment 2 – an alignment that is on the north side of CSAH 6, 55 ft. from the centerline, for the entire route.

- Alignment 3 – an alignment that is on the south side of CSAH 6, 55 ft. from the centerline to just past the Liljegren residence, then crossing to the north side of CSAH 6 (55 ft. from the centerline) for the remainder of the route.

- Alignment 4 – an alignment that is on the north side of CSAH 6, 55 ft. from the centerline to just before the Liljegren residence, then crosses to the south side of CSAH 6, and then, once past the Liljegren residence, back to the north side for the remainder of the route. This alignment is a variation on alignment #2, but crossing over and back to avoid the Liljegren residence

These alignments are shown on the maps in **Appendix B**. Each alignment offers relative advantages and disadvantages with respect to adverse impacts. Some alignments may require specialty structures or specific construction measures. The estimated costs of these structures and measures are shown in **Table 14**.

Alignment 1

Alignment alternative #1 is on the south side of CSAH 6 and is the alignment proposed by GRE in their route permit application. This alternative mitigates impacts to residences – there are three residences on the north side of CSAH 6 (one within the proposed route); there is one residence on the south side of CSAH 6 and it is within the proposed route (Jahnke residence). This alternative also mitigates potential impacts to agricultural operations. In general, irrigators on the south side of CSAH 6 are farther from the road and thus less likely to be impacted by the new 115 kV line.

[139] Minnesota Statute 216E.02, Subd 1, https://www.revisor.mn.gov/statutes/?id=216E.02.

This alternative does not mitigate impacts to shelterbelts and trees. Relative to other alignments, this alignment has the greatest impacts to shelterbelts and trees. The alignment impacts four out of the five treed areas along the route, with three areas impacted significantly. The estimated cost of this alignment is that proposed by GRE in their route permit application – $1.471 million dollars (**Table 15**).

Table 14. Estimated Costs of Specialty Structures and Construction Measures[140]

Structure / Measure	Costs (dollars or dollars/mile)
Angled road crossing – laminate posts, no guying	$76,000
Right angle road crossing – steel posts	$110,000
Distribution line underbuild	$90,000/mile
Distribution line underground	$80,000/mile

Alignment 2

Alignment alternative #2 is on the north side of CSAH 6 and would require the existing distribution line to be underbuilt on the new 115 kV poles or placed underground. This alignment could mitigate aesthetic impacts of the project by placing all of the electrical lines along CSAH 6 on one side of the road or by removing the distribution line (placing it underground). This alignment would place the line relatively closer to residences (three residences on the north side of CSAH 6; one within the route).

This alignment would avoid impacts to irrigation systems only to the extent that it can be placed on or very near the CSAH 6 road right-of-way. The three irrigation systems on the north side of the road are relatively close to the existing distribution line. These systems would be significantly impacted by an alignment 60 ft or more from the CSAH 6 centerline. This alignment mitigates impact to shelterbelts and trees; it avoids all treed areas on the south side of CSAH 6. It does impact a residential shelterbelt on the north side of CSAH 6 (Liljegren residence). The estimated cost of this alignment is in the range of $168,000 – $189,000 dollars more expensive than alignment alternative #1 (**Table 15**).

Alignment 3

Alignment alternative #3 begins on the south side of CSAH 6 at the Parker Prairie substation and crosses to the north side of CSAH 6, just past the Liljegren residence, for the remainder of the route. The alignment mitigates impacts to residences; it runs on the opposite side of CSAH 6 for three homes and the same side for one. This one home (near the intersection with Minnesota State Highway 29) is outside of the proposed route. This alignment mitigates potential impacts to agricultural operations by proceeding primarily on the south side of CSAH 6. There is the potential for impacts to irrigation system #3 when the line crosses the road, as this system is near the existing distribution line (see Section 5.7). These impacts can be mitigated, however, by keeping the alignment on or very near the CSAH 6 road ROW, and by using structures which do not have to be guyed to facilitate the road crossing.

This alignment impacts field shelterbelts on the south side of CSAH 6, but mitigates impacts to residential shelterbelts (Liljegren residence, Jahnke residence) and to the Dittberner Tree Farm. The estimated cost of this alignment is in the range of $116,500 – $244,000 dollars more expensive than alignment alternative #1 (**Table 15**).

[140] Cost Information, Great River Energy, Personal Communication, February 16, 2012 [hereafter Cost Information].

Table 15. Estimated Project Costs for Alignment Alternatives

Alignment	Project Costs (dollars)	Difference from Alignment 1 Project Costs (dollars)
1	1,471,000	---
2	1,660,000 (underbuild)[141] 1,639,000 (underground)	189,000 168,000
3	1,587,500 (underbuild)[142] 1,715,000 (underground)	116,500 244,000
4	1,812,000 (underbuild)[143] 1,791,000 (underground)	341,000 320,000

Alignment 4

Alignment alternative #4 is on the north side of CSAH 6, with a crossing over and back to avoid a residential shelterbelt, and would require the existing distribution line to be underbuilt on the new 115 kV poles or placed underground. This alignment could mitigate aesthetic impacts of the project by placing the electrical lines along CSAH 6 primarily on one side of the road or by removing the distribution line (placing it underground). This would mitigate some impacts to residents, with two residences across the road from the line, and two on the same side of the road as the line.

This alignment would avoid impacts to irrigation systems only to the extent that it can be placed on or very near the CSAH 6 road right-of-way. The three irrigation systems on the north side of the road are relatively close to the existing distribution line. These systems would be significantly impacted by an alignment 60 ft or more from the CSAH 6 centerline. This alignment mitigates impact to shelterbelts and trees; it avoids all treed areas along CSAH 6. The crossing over and back of CSAH 6 avoids the shelterbelt at the Liljegren residence. The estimated cost of this alignment is in the range of $320,000 – $341,000 dollars more expensive than alignment alternative #1 (**Table 15**).

[141] Cost estimate assumes 2.1 miles of distribution underbuild or underground

[142] Cost estimate assumes 0.45 miles of distribution underbuild or 2.1 miles of underground, with one angled road crossing. If the angled road crossing could be achieved with guying, then the cost estimate would be less by $76,000 dollars.

[143] Cost estimate assumes 2.1 miles of distribution underbuild or underground, with two angled road crossings. If the angled road crossings could be achieved with guying, then the cost estimate would be less by $134,000 dollars (2 X $76,000).