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Abstract

Great River Energy (GRE) and Minnesota Power (MP) submitted a combined application to the Minnesota Public Utilities Commission for a Certificate of Need (CN) and a high voltage transmission line (HVTL) Route Permit to construct approximately 37 miles of new 115 kV transmission line; approximately 16 miles of existing 69 kV line between the Cedar Valley and the Gowan substations will be rebuilt to 115 kV. Between the Gowan and Cromwell substations, approximately 21 miles of existing Great River Energy 69 kV transmission line will be rebuilt on double circuit structures with the project's 115 kV line. These transmission lines are located entirely in Minnesota, in St. Louis and Carlton counties.

Minnesota Power proposes to construct a new 115 kV Switching Station (Savanna Switching Station) a few miles northeast of Floodwood, Minnesota. Modifications to accommodate the new 115 kV lines will be required at Lake Country Power's existing Cedar Valley Substation and at Great River Energy's existing Cromwell Substation.

Two separate approvals from the Minnesota Public Utilities Commission are required for the construction/operation of the Savanna transmission line project – a certificate of need (CN) and a route permit. The Applicants submitted a combined CN and HVTL Route Permit application to the Commission on February 10, 2010. The CN portion of the application was accepted as complete by the

Commission on April 13, 2011, while the HVTL Route Permit portion of the application was accepted on April 4, 20.

The Energy Facility Permitting staff of the Department of Commerce has elected to combine its environmental review responsibilities under the Certificate of Need process with the environmental review procedures under the HVTL Route Permit procedures (Minnesota Rule 7849.1900, Subpart 1). The result is a single environmental review document, an Environmental Assessment.

The environmental assessment addresses the issues required in Minnesota Rules 7849.1500, subpart 1 and Minnesota Rules, 7850.3700, subpart 4, and as determined in the Scoping Decision of June 10, 2011.

Persons interested in these matters can register their names on the Project Docket webpage at http://energyfacilities.puc.state.mn.us/Docket.html?Id=31883 or by contacting Bill Storm, Energy Facilities Permitting, 85 7th Place East, Suite 500, St. Paul, Minnesota 55101, phone (651) 296-9535, e-mail: bill.storm@state.mn.us. Documents of interest can be found at the above website or by going to https://www.edockets.state.mn.us/EFiling/search.jsp and entering “10” and “973” for the CON docket and “10” and “1307” for the HVTL Route docket as the year and project identification search criteria.

Following the release of this Environmental Assessment, a Public Hearing will be held in the project area.

Acronyms, Abbreviations and Definitions

ACSS	Aluminum Conductor Steel Supported
AC	Alternate Current
ALJ	Administrative Law Judge
BMP	best management practice
BPA	Bonneville Power Association
CEF	Considered Eligible Findings
COE	Corps of Engineers
Commission	Minnesota Public Utilities Commission
CN	Certificate of Need
CSAH	County State Aid Highway
dBA	A-weighted sound level recorded in units of decibels
DC	Direct Current
DG	Distributed Generation
DNR	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
GRE	Great River Energy
HVTL	high voltage transmission line
Hz	Hertz
kV	kilovolt
kV/M	Kilovolt per meter
kWh	Kilowatt hour
mA	milliAmperes
MCBS	Minnesota County Biological Survey
MDH	Minnesota Department of Health
mG	milligauss
MHz	Mega Hertz
mg/L	milligrams per liter – equivalent to parts per million (ppm)
Mn DNR	Minnesota Department of Natural Resources
Mn DOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MSIWG	Minnesota State Interagency Working Group
MW	Mega Watt
NAC	noise area classification

NERC	North American Electric Reliability Council
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
PUC	Public Utilities Commission
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
WPSC	Wisconsin Public Service Commission
WSR	Wild and Scenic River

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1.0 Introduction

Great River Energy (GRE) and Minnesota Power (MP), the Applicants, have made a joint application to the Minnesota Public Utilities Commission (Commission) for a Certificate of Need (CN) for the construction of the Savanna Project pursuant to Minnesota Statute Section 216B.243 and Minnesota Rules 7849.0020 – 7849.0400.

The Energy Facility Permitting (EFP) staff is tasked with conducting environmental review on applications for certificate of need and route permits. The intent of the environmental review process is to inform the public, the applicant, and decision-makers about potential impacts and possible mitigations for the proposed project and its alternatives.

This document meets the environmental review requirements of both the certificate of need procedures and the HVTL route permit process by a) providing information in Section 2 on the regulatory framework, certificate of need and route permit processes; b) describing in Section 3 the proposed project; c) considering alternatives means of meeting the stated need in Section 4; d) describing alternatives to the proposed route in Section 5; e) summarizing in Section 6 the potential effects on people and the environment of the proposed route; f) comparing the potential impacts of the route alternatives in Section 7; and g) discussing the unavoidable impacts in Section 8.

1.1 Project Description

The Savanna Transmission Line project consists a new 115 kilovolt (kV) switching station and rebuilding approximately 37 miles of transmission line between the Cedar Valley Substation north of Floodwood, Minnesota and the Cromwell Substation south of Cromwell, Minnesota (**Figure 1**).

Modifications to accommodate the new 115 kV lines will be required at Lake Country Power's Cedar Valley Substation and at Great River Energy's Cromwell Substation.

1.2 Project Purpose

The need for the project was first identified in the Minnesota Biennial Transmission Projects Report, beginning in 2003.

The Applicants have stated that the proposed upgrade of the area transmission network is required to address three concerns: 1) low voltage conditions on the 69 and 115 kV systems under certain outages; 2) lack of redundancy of the 115 kV line in the Floodwood area; and, 3) the age of the 69 kV system that was constructed in the 1950s.

A detailed description of the electrical consumption and forecast demand in the area is provided in Section 5 of the Applicants' combined Certificate of Need and Route Permit Application.

1.3 Sources of Information

Much of the information used in this Environmental Assessment is extracted directly from documents prepared by Great River Energy and Minnesota Power. This includes the Certificate of Need and the HVTL Route Permit Application, February 10, 2011 Discussion of Electromagnetic Field (EMF) issues came primarily from the white paper developed by the Interagency Task Force led by the Minnesota Health Department, the National Institute for Environmental Health and the World Health Organization. Additional information comes from earlier Energy Facility Permitting environmental review documents in similar dockets, other state agencies, such as the Department of Natural Resources, and additional research. First hand information was gathered by site visits along the proposed line.

2.0 Regulatory Framework

In Minnesota, most high voltage transmission line projects go through a two stage regulatory process. First, application is made to the Commission for a Certificate of Need (CON). If a CN is granted, the utility must then obtain a Route Permit from the Commission that designates a specific route for the line.

2.1 Certificate of Need

Before any large HVTL can be constructed in Minnesota, the Commission must determine that they are necessary and in the best interest of the state. The certificate of need process includes environmental review and public hearings, and typically takes 12 months. This process is the only proceeding in which a no-build alternative and the size, type, timing, system configuration and voltage of the proposed project will be considered.

On February 10, 2001, GRE and MP submitted a combined Certificate of Need and Route Permit Application to the Commission. A copy of the certificate of need application, along with other relevant documents, can be reviewed at the Energy Facility Permitting web page at:

http://energyfacilities.puc.state.mn.us/Docket.html?Id=31883

The Energy Facility Permitting staff is responsible for administering the environmental review process. The Commission is responsible for determining if the transmission lines proposed are needed.

Potential routes that the transmission lines would follow, if approved, are put forth and evaluated in the HVTL Route Permit proceeding (See Below). The transmission line routes will be determined through the HVTL route permit process, which is proceeding concurrently with the certificate of need process.

Environmental Review
The environmental review process under the certificate of need procedures includes public information/scoping meetings and the preparation of an environmental review document, the Environmental Report (ER). The environmental report is a written document that describes the human and environmental impacts of the proposed project, alternatives to the project and methods to mitigate anticipated adverse impacts. The ER must be prepared before the Commission can make a decision on the certificate of need application.

2.2 Route Permit

Minnesota Statutes Section 216E.03, subd. 2, provides that no person may construct a HVTL without a route permit from the Commission. A HVTL is defined as a transmission line of 100 kV or more and greater than 1,500 feet in length in Minnesota Statutes Section 216E.01, subd. 4. The proposed transmission lines are HVTLs and therefore a route permit is required prior to construction.

On February 10, 2001, GRE and MP submitted a combined Certificate of Need and Route Permit Application to the Commission. The HVTL route permit application for the proposed Savanna

transmission line rebuild was pursuant to the provisions of the Alternative Permitting Process outlined in Minnesota Rules 7849.2900. The alternative permitting process includes environmental review and public hearings, and typically takes six months. A copy of the route permit application, along with other relevant documents, can be reviewed at the Energy Facility Permitting web page at:

http://energyfacilities.puc.state.mn.us/Docket.html?Id=31883

The EFP staff is responsible for evaluating the HVTL route permit application and administering the environmental review process. The Commission is responsible for selecting the transmission lines routes and issuing the HVTL route permit.

Environmental Review

Environmental review under the alternative permitting process includes public information/scoping meetings and the preparation of an environmental review document, the Environmental Assessment (EA) (Minn. R. 7850.3700). The environmental assessment is a written document that describes the human and environmental impacts of the transmission line project (and selected alternative routes) and methods to mitigate such impacts.

The Commissioner of the Department of Commerce (Commissioner) determines the scope of the EA. The EA must be completed and made available prior to the public hearing.

2.3 Combining Processes

Minnesota Rule 7849.1900, Subpart 1, provides that in the event an applicant for a certificate of need for a HVTL applies to the Commission for a HVTL route permit prior to the time the EFP staff completes the environmental report, the Department may elect to prepare an environmental assessment in lieu of the required environmental report. If the documents are combined, EFP staff includes in the EA the analysis of alternatives required by part 7849.1500, but is not required to prepare an environmental report under part 7849.1200.

As two concurrent environmental reviews are required – one for the CN application and one for the route permit application – Department staff elected to combine the environmental review for the two applications (Minn. Rules 7849.1900). Thus, this environmental assessment (EA) has been prepared to meet the requirements of both review processes.

2.4 Scoping Process

On April 21, 2011, the EFP staff sent notice of the place, date and times of the Initial Public Information and Scoping meeting to those persons on the General List, the agency technical representatives list and the project contact list.

Notice of the public meeting was also published in the local newspapers.

On Wednesday, May 18, 2011, the Energy Facility Permitting staff held two public information/scoping meetings at the Fine Lakes Township Hall in Wright, Minnesota. The meetings included two sessions, one starting at 2:00 p.m. and another starting at 6:00 p.m. 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 alternatives and impacts that should be considered during preparation of the environmental review document. Written comments were due no later than Wednesday, June 1, 2011.

Approximately 12 people attended the public information and scoping meetings; 5 individuals took the opportunity to speak on the record. A court reporter was present to document oral statements. Nine written comments were received.

A variety of questions were asked and answered during the oral discussion; topics included: specifics on which lines and poles will be removed, and design/construction of any new poles; specifics on the proposed alignment; the concepts of route width and right-of-way (ROW) width; sources of power generation for this project; and timeline and milestones of the application review process.

The major areas of concern for scoping expressed during the public comment period included: health and safety issues, property values, compensation for easements, and flexibility in siting the final alignment.

Alternative routes, alternative route segments and modifications to the proposed alignment were also discussed during the scoping meeting and in comments received during the scoping comment period.

There was no Advisory Task Force established for this routing docket.

After consideration of the public comments, the Commissioner issued his Scoping Decision on June 14, 2011. A copy of this order is attached in the **Appendix A**. These items and issues, along with the typical HVTL routing impacts, were incorporated into the Scoping Decision.

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 (see a sample Route Permit in **Appendix B**).

2.5 Public Hearing

The Commission is required by Minn. Rule 7849.5710 subp 1, to hold a public hearing once the EA has been completed. It is anticipated that this hearing will be held in late October, 2011, in the project area, and will be conducted by an Administrative Law Judge (ALJ). The hearing will be noticed separately. Interested persons may comment on the EA at the public hearing. Persons may testify at the hearing without being first sworn under oath. The ALJ will ensure that the record created at the hearing is preserved and will provide EFP with a summary of testimony from the hearing.

Comments received 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. A final decision on a route permit will be made by the Commission at an open meeting within a couple of months after the public hearing, depending on scheduling opportunities. The process anticipates a decision within six months of the Application.

If issued a certificate of need and route permit by the Commission, the Applicants may exercise the power of eminent domain to acquire the land necessary for the project pursuant to Minnesota Statute 216E.12 and Minnesota Statute 117.

2.6 Other Permits

The Public Utilities Commission HVTL route permit is the only State permit required for routing of high voltage transmission lines, but other permits may be required for certain construction activities, such as river crossings. **Table 1** includes a list of supplementary permits that may be required for GRE and MP to complete this project.

Table 1. Potential Required Permits

Permit	Jurisdiction
Local Approvals	
Road Crossing/ROW Permits	County, Township, City
Lands Permits, Building Permits	County, Township, City
Overwidth Loads Permits	County, Township, City
Driveway/Access Permits	County, Township, City
Minnesota State Approvals	
Endangered Species Consultation	Minnesota Department of Natural Resources (DNR) – Ecological Services
Licenses to Cross Public Waters and Lands	DNR – Lands and Minerals
Utility Permit	Minnesota Department of Transportation (MnDOT)
Wetland Conservation Act	Board of Water and Soil Resources
National Pollutant Discharge Elimination System (NPDES) Permit	Minnesota Pollution Control Agency (MPCA)
Federal Approvals	

Permit	Jurisdiction
Section 10 Permit	US Army Corps of Engineers (Corps)
Section 404 Permit	Corps
Permit to Cross Federal Aid Highway	Federal Highway Administration
Spill Prevention, Control and Countermeasure (SPCC) Plan	Environmental Protection Agency
United States Fish and Wildlife Service (USFWS)	Endangered Species Consultation
Other Approvals	
Crossing Permit	Burlington Northern Santa Fe (BNSF)
Crossing Permit	Other Utilities such as Pipelines

Once the Commission issues a Route Permit, local zoning, building and land use regulations and rules are preempted per Minn. Statute 216E.10, subd 1. However, the Applicants are still required to obtain relevant permissions, such as road crossing permits.

2.7 Applicable Codes

The transmission line, regardless of route location, must meet all requirements of the National Electrical Safety Code (NESC) and the Rural Utilities Service (RUS) Design Manual for High Voltage Transmission Lines. These standards are designed to protect human health and the environment. They also ensure 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 normal routine operational and maintenance is performed.

Utilities must comply with the most recent edition of the National Electric Safety Code, 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. See Minn. Statute 326B.35 and Minn. Rule 7826.0300 subp 1.

The NESC is a voluntary utility developed set of standards intended to ensure that the public is protected. The NESC covers electric supply stations and overhead and underground electric supply and communication lines, and is applicable only to systems and equipment operated by utilities or similar systems on industrial premises. For more information, go to standards.ieee.org/faqs/NESCFAQ.html#q1. The RUS provides leadership and capital to "upgrade,

expand, maintain, and replace America's vast rural electric infrastructure." For more information, go to http://www.usda.gov/rus/electric/index.htm.

2.8 Issues Outside the Scope of the EA

The EA will not consider the following:

- Any route or substation alternatives not specifically identified in the scoping decision
- The impacts of specific energy sources, such as carbon outputs from coal-generated facilities.
- The manner in which landowners are paid for transmission rights-of-way easements.

3.0 Proposed Project

The project is located in St. Louis and Carlton counties, near the communities of Cedar Valley, Floodwood, Gowan, and Cromwell (**Figure 1**). **Table 2** below summarizes the proposed project location.

Table 2. Project Location

County/Township	PLS Township (N)	PLS Range (W)	PLS Sections
St. Louis / Cedar Valley	53	21	6, 7, 17, 20-21, 29-28, 32-33-34
St. Louis / Floodwood	51	20	4-3, 10-11, 15-14, 22-23, 27-26, 34-35
St. Louis / Fine Lakes	50	20	3-2, 10-11, 9, 16-15, 21-22, 28-27, 33
Carlton / Red Clover	49	20	4, 9, 16, 21, 28, 32-33,
Carlton / Eagle	48	20	4-5, 8-9, 17-16, 20-21, 29-28, 32-33
Carlton / Kalevala	47	20	5-4

The project consists of two 115 kV transmission lines, a new switching station, and modifications to two existing substations. The first 115 kV line will run between Lake Country Power's (LCP) Cedar Valley Substation located north of Floodwood, Minnesota, and a new 115 kV Switching Station (Savanna Switching Station) to be located just northeast of Floodwood. The second 115 kV line will run between the new Savanna Switching Station and the GRE Cromwell Substation located south of Cromwell, Minnesota.

The total length of these two 115 kV lines is approximately 37 miles.

The new Savanna 115 kV Switching Station would be located in Section 32 of Van Buren Township, a few miles northeast of Floodwood, Minnesota. Modifications to accommodate the new 115 kV lines will be required at Lake Country Power's Cedar Valley Substation and at Great River Energy's Cromwell Substation.

The Applicants propose to construct the following facilities:

- Construct the new Savanna 115 kV Switching Station in Section 32 of Van Buren Township.
- Rebuild approximately seven miles of existing Great River Energy 69 kV transmission line to single circuit 115 kV between Lake Country Power's existing Cedar Valley Substation in Cedar Valley Township and the new Savanna Switching Station.

- Rebuild approximately nine miles of existing Great River Energy 69 kV transmission line to single circuit 115 kV between the new Savanna Switching Station and Lake Country Power's existing Gowan Substation in Floodwood Township.

- Rebuild approximately 21 miles of existing Great River Energy 69 kV transmission line to double circuit 115/69 kV between the Lake Country Power Gowan Substation and Great River Energy's existing Cromwell Substation in Kalevala Township.

- Modify the Lake Country Power Cedar Valley Substation and Great River Energy Cromwell Substation to accommodate the 115 kV transmission lines.

3.1 Project Segments

The proposed Savanna transmission line project measures approximately 37 miles in length, starting at the Cedar Valley Substation, through the Savanna Swiching Station and Gowan Substation, and terminating at the Cromwell Substation.

Figures 2 through 6 illustrate the proposed HVTL route. **Appendix C** (Key Map Book) contains the proposed route over lay with aerial photographs.

Cedar Valley Substation to Savanna Switching Station
On the north end of the project, the first new 115 kV line begins at the Cedar Valley Substation in Section 36 of Cedar Valley Township. The line follows Trunk Highway (TH) 73 for approximately four miles, goes cross country east ¼ mile then south ½ mile to Parantala Road/County Road (CR) 732, follows Parantala Road/CR 732 for ¾ mile, then turns south along Stremel Road/CR 192 for approximately two miles then connects into the new Savanna Switching Station.

For the segment of line from the Savanna Switching Station to the LCP Cedar Valley Substation, which is proposed to be rebuilt from 69 kV to single-circuit 115 kV, the Applicants believe that it will be necessary to keep the 69 kV line energized until the new 115 kV line can be energized; this would necessitate constructing the new 115 kV line adjacent to the 69 kV line.

At Stremel Road/CR 192 (Appendix C Key Map Book, pages 37-39): the Applicants propose an offset of 15 to 20 feet west of the existing line, which is located a few feet outside of the road ROW. This will allow the new line to be safely constructed and for both lines to remain intact until the new 115 kV line is energized and the existing line can then be deconstructed.

At Parantala Road/CR 732 (Appendix C Key Map Book, pages 39-40): and the corner of Stremel Rd/CR 192, the Applicants propose that the line be located on the south side of Parantala Road/CR 732 to avoid a potential clearance issue with MP's 230 kV 98 line and to avoid placing the new 115 kV line closer to the cemetery located in Section 17 of Van Buren Township. According to Van Buren Township, the cemetery has begun to expand to the east and this expansion will continue in the future. In order to span the existing and future expansion of the cemetery, H-frame structures would be required.

Cross-country between Parantala Road/CR 732 and TH 73 (Appendix C Key Map Book, page 40): the Applicants propose that the line cross from the south side of Parantala Road/CR732 to the north and continue parallel on the east and north side of the existing 69 kV line with an offset of 15 to 20 feet. This offset may be slightly wider near corner angle structures to allow the new line to be safely constructed and accommodate existing and new guy wires and anchors that would be used to support the angle structures. The maximum offset in this segment will be 30 feet by existing Structure #465. In addition, a corner configuration is proposed at existing Structure #476, which should limit the need to place stub poles and guy wires across TH 73 or the driveways located south of Structure #476.

Along TH 73: (Appendix C Key Map Book, pages 41-44): the Applicants propose to place the new line east of the existing 69 kV line with an offset that ranges from 15 to 35 feet. This will allow numerous angles that currently exist along this segment in the existing line to be replaced with tangent (non-angle) structures.

Savanna Switching Station to Gowan Substation

The second new 115 kV line exits the Savanna Switching Station and runs south about ¼ mile to County State Aid highway (CSAH) 29, follows CSAH 29 east for one mile, then turns south across the St. Louis River to Hill Road. The line follows Hill Road south for two miles, turns east on CSAH 8 for one mile, then turns south along CR 965 for approximately 3.5 miles, continues cross county for about one mile across the St. Louis River and the Burlington Northern Santa Fe railroad tracks to Hingley Road. It follows Hingley Road for about ½ mile to the LCP Gowan Substation,

Gowan Substation to Cromwell Substation

The double circuit 115/69 kV construction begins here as the second 115 kV line (now on double circuit structures with the upgraded 69 kV line) continues south past the LCP Gowan Substation along Hingley Road for 1.75 miles, turns west along CSAH 86 for one mile, then turns south along Hingley Road again for approximately three miles. The line then goes cross country to the southwest for about ¼ mile, goes west along CR 822 for about ½ mile, then turns south along Highway 73 for six miles. Then the line turns west for ½ mile along CR 122, turns south for two miles (cross country), then follows Highway 73 again south for five miles. The line turns east for ¼ mile along CSAH 4, and then turns south for ½ mile along CR 129 into the Great River Energy Cromwell Substation.

The Savanna to Cromwell portion of the line will cross the St. Louis River northeast of Floodwood and north of Gowan in the same locations that the existing 69 kV line presently crosses the river.

Savanna Switching Station

Minnesota Power proposes to construct the new Savanna 115 kV Switching Station near Floodwood, MN. Minnesota Power has an option to purchase 25 acres of land in the NE ¼ of the NE ¼ of Section 32 of Van Buren Township (**Figure 7**), and would own all common facilities associated with the switching station (land, fence, etc.). It is anticipated that the fenced-in area of the 115 kV switching station will be approximately 250 feet by 300 feet.

The facilities at the Savanna Switching Station will include:

- Four 115 kV, SF6 Circuit Breakers

- One 115kV, 27 MVAR Capacitor Bank
- 115 kV Switches
- Electrical Equipment Enclosure
- Structural Steel
- Bus work and fittings
- SCADA/Relay/Control Equipment
- Conduit
- Grounding

Cedar Valley Substation
The Cedar Valley Substation was recently rebuilt and can accommodate a 115 kV circuit. LCP will need to change out the substation transformer to allow operation of the substation at 115 kV.

Cromwell Substation
Great River Energy will provide a 115 kV line termination at the existing Cromwell Substation to accommodate the 115 kV line from Savanna.

Minnesota Power 9 Line Floodwood Tap
If the proposed Savanna project is implemented, the 9 Line Tap will become a network facility; the resulting power flow on the 10 mile segment of this line, between the new Savanna Switching Station and the existing 9 Line Tap switches (located near Meadowlands), will increase significantly under certain system conditions. This is because the power flowing on the line will no longer be limited simply to what is needed for the Floodwood area because power needed to support the area transmission system may also flow on the line. To accommodate the increased power flow, this segment of the 9 Line Tap will need to be upgraded so that it has adequate capacity. The upgrade will involve replacing or modifying some structures to increase conductor clearance, which would increase capacity by allowing the line to operate at a higher thermal limit. Alternatively, reconductoring this 10 mile segment of the 9 Line Tap may be a more cost-effective solution. Either way, all the work will be done within the existing ROW.

Because the voltage of the line will not change, a permit from the Commission for this upgrade is not required. As per Minn. Rules 7850.1500, subp. 3, Minnesota Power will notify the Commission in writing at least 30 days before work begins on the upgrade.

3.2 Route Width

The Applicants are requesting that the Commission authorize a route that is 300 feet in width, 150 feet either side of the centerline of the existing 69 kV transmission line. Designating a route 300 feet in width, the Applicants believe, will provide the flexibility to accommodate features along the route (vegetation and structures, existing and proposed road rights-of-way, etc.) that may have changed since the 69 kV line was originally constructed. A route wider than the required ROW affords the Applicants flexibility to move structures from the existing 69 kV centerline, while remaining within the permitted route if there is a logical and reasonable alternative location for the new transmission centerline.

The Applicants request a width of 1,040 feet in the vicinity of the Savanna Switching Station location to accommodate the lines in and out of the station. This width includes the existing 69 kV line ROW, the entire switching station property, and a 200 foot buffer on the north, east, and south sides of the property. The additional ROW is required to allow for some flexibility in the final design of the switching station and in how the transmission lines enter the station.

3.3 Right-of-Way Requirements

The Applicants propose that the majority of the new lines would follow the alignment of the existing 69 kV lines, but note that an approximately 15 foot offset from the existing pole locations may be required in some areas (Savanna Switching Station to the Cedar Valley Substation) in order to keep the existing 69 kV line energized during construction activities.

The necessary easement width is 50 feet on each side of the transmission centerline; however, in areas where the line follows an existing distribution line or roadway, the easement may overlap with existing easements and/or the road right-of-way. Great River Energy has existing easements for the majority of the 69 kV line and anticipates that only minimal additional property will be required when the line is upgraded to 115 kV.

Structures

The majority of the two new 115 kV lines will consist of single-pole wood structures spaced approximately 350 to 400 feet apart. For the single circuit portion of the project (Cedar Valley Substation to Savanna Switching Station and Savanna Switching Station to LCP Gowan Substation), the 115 kV spans will be longer than the existing 69 kV spans, therefore fewer poles will be required. The structures will typically range in height from 60 to 85 feet above ground, depending upon the terrain and environmental constraints (such as highway crossings, river and stream crossings, and required angle structures). The average diameter of the wood structures at ground level is 20 inches.

Small sections of the existing line near the two St. Louis River crossings have distribution underbuild, which would be attached to new 115 kV transmission line structures spaced 250 to 350 feet apart.

H-Frame design structures may be used in areas with rugged topography and where longer spans are required to avoid or minimize impacts to wetlands or waterways. Span lengths average 600 to 800 feet, with 1,000-foot spans possible with certain topography. Structure heights typically range from 60 to 85 feet with taller structures required for exceptionally long spans and in circumstances requiring additional vertical clearance exceeding the National Electrical Safety Code (NESC) and other agency requirements.

Typical 115 kV structure types (single circuit, single circuit with underbuild, double circuit and H-Frame) are shown in **Figure 8**.

Conductors

The single circuit structures will have three single conductor phase wires and one shield wire, and the double circuit structures will have six single conductor phase wires and one shield wire.

It is anticipated that the phase wires will be 477 thousand circular mil aluminum conductor steel reinforced (ACSR) with seven steel core strands and 26 outer aluminum strands on the 115 kV line between the Cedar Valley Substation and the Savanna Switching Station, and on the upgraded 69 kV line on the 115/69 kV double circuit structures between the LCP Gowan Substation and the Great River Energy Cromwell Substation.

It is anticipated that the phase wires will be 477 thousand circular mil aluminum conductor steel supported (ACSS) with seven steel core strands and 26 outer aluminum strands on both the single circuit and double circuit segments of the 115 kV line from the Savanna Switching Station to the Great River Energy Cromwell Substation.

The shield wire will be 0.528 optical ground wire for all transmission line segments. **Table 3** below summarizes the proposed structures.

Table 3. Summary of Transmission Structures

Line Type	Structure Type	Structure Material	Right-of-Way Width (feet)	Structure Height (feet)	Structure Base	Span Between Structures (feet)
115 kV Single Circuit	Single pole, horizontal braced post insulator	Wood, 20" diameter at ground level	100	60-85	Direct Embedded for tangents and self-supporting for angle structures/dead-end structures	350-400
69/115 kV Double Circuit	Single Pole, Davit Arm	Wood, 20" diameter at ground level	100	60-85	Direct embedded for tangents and self-supporting for angle/dead-end and switch structures	350-400
115 kV Single Circuit	Double Pole Vertical insulators	Wood, 20" diameter at ground level	100	60-85	Direct embedded for tangents and self-supporting for angle/dead-end and switch structures	600-800

Right-of-Way Acquisition

Although GRE has existing easements for approximately 89 percent of the route (and prescriptive easement rights for the remainder), the Applicant's intent is to amend the existing easement or enter into new easements with the landowners to update the language to reflect typical provisions included in today's easements.

In the event the Commission should authorize an alternative route requiring new ROW, the Applicants will be required to obtain new easements.

Great River Energy will have a ROW agent or title specialist complete a search of the public records of all lands involved in the project. This search will result in a title report to determine the legal description of the property, the owner(s) of record of the property, and other information regarding easements, liens, restrictions, encumbrances, and other conditions of record. Once this information has been verified and the easement and parcel exhibit has been prepared, a ROW agent will contact the property owners or their representative to provide information about the project and discuss the easement and how it may affect their property.

Great River Energy will complete the preliminary survey work of the existing transmission line after landowner notification. Soil investigations will be performed after the owner has granted permission. As the design of the transmission line nears completion, the survey crews will stake the transmission centerline.

The ROW agent will begin the negotiating process by presenting the parcel specific documents and project information, including the easement and parcel exhibit, along with an offer of compensation for the easement rights requested. The property owner will be allowed a reasonable amount of time in which to consider the offer and to present material to GRE that the owner believes is relevant to determining the value of the property.

During easement negotiations, GRE will also discuss ingress and egress to and from the transmission line during construction, tree and vegetation removal, potential damage and its mitigation and the project schedule. The offer of compensation will include compensation for trees and/or vegetation that needs to be removed for the project.

The ROW agent will work with the landowner to negotiate the terms of a new easement that are acceptable to the landowner and GRE. In some instances, a negotiated settlement cannot be reached and the landowner may choose to have an independent third party determine the value of the rights taken. Such valuation is made through the utility's exercise of the right of eminent domain pursuant to Minn. Statute 117.

Minnesota Power has entered into a Purchase Agreement for the site of the proposed Savanna Switching Station (east twenty-five acres of the NE¼-NE¼ of Section 32, Township 52N, Range 20W, St. Louis County, Minnesota) located approximately 1.75 miles northeast of Floodwood, Minnesota. The Purchase Agreement is contingent on a final route permit and land use and environmental approvals for the site. Minnesota Power will request surveys and soil investigations to determine whether the site meets its substation criteria and will then develop a more site-specific design.

During the switching station construction phase, any affected property owners will be advised of construction schedules and needed access to the site. To construct, operate and maintain the proposed switching station, all vegetation will be cleared from the station's footprint area, from the station's driveway area and from a buffer area outside the station's fence. Vegetation on the property outside of the switching station footprint, driveway, and buffer will be left undisturbed, except where it must be impacted to allow for transmission line access to the switching station.

3.4 Project Construction and Maintenance

Procedures to be used for construction, maintenance and restoration of the transmission lines and switching station are discussed below. Substation upgrades involve replacing existing equipment with new equipment or adding more equipment to an existing site, all occurring within the existing substation property.

Transmission Lines - Construction

After land rights have been secured, landowners will be notified prior to the start of the construction phase of the project, including an update on the project schedule and other related construction activities.

The first phase of construction activities will involve survey staking of the transmission line centerline and/or pole locations, followed by removal of trees and other vegetation from the ROW. As a general practice, low-growing brush or tree species are allowable at the outer limits of the easement area. Taller tree species that endanger the safe and reliable operation of the transmission facility will be removed. In developed areas and to the extent practical, existing low growing vegetation that will not pose a threat to the transmission facility or impede construction may remain in the easement area, as agreed to during easement negotiations.

The NESC states that "vegetation that may damage ungrounded supply conductors should be pruned or removed." Trees beyond the easement area that are in danger of falling into the energized transmission line (danger trees) will be removed or trimmed to eliminate the hazard as shown below, as allowed by the terms in the existing or the new easement that is acquired. Danger trees generally are those that are dead, weak or leaning towards the energized conductors. In special circumstances, tree trimming agreements may be possible to minimize tree removal based on negotiations with individual landowners.

All materials resulting from the clearing operations will be chipped on site and spread on the ROW, stacked in the ROW for use by the property owner, or removed and disposed of as agreed to with the property owner during easement negotiations.

The final survey staking of pole locations may again occur after the vegetation has been removed and just prior to the structure installation.

The second phase of construction will involve structure installation and stringing of conductor wire. During this phase, underground utilities are identified through the required One Call process to minimize conflicts with the existing utilities along the routes.

If temporary removal or relocation of fences is necessary, installation of temporary or permanent gates would be coordinated with the landowner. The ROW agent may work with the property owner for early harvest of crops, where possible, with compensation to be paid for any actual crop losses. During the construction process, it may be necessary for the property owner to remove or relocate equipment and livestock from the ROW.

Transmission line structures are generally designed for installation at existing grades. Therefore, structure sites will not be graded or leveled unless it is necessary to provide a reasonably level area for construction access and activities. If vehicle or installation equipment cannot safely access or perform construction operations properly near the structure, minor grading of the immediate terrain may be necessary.

Great River Energy will employ industry-specific best management practices (BMPs). BMPs address ROW clearance, erecting transmission line structures and stringing transmission lines. BMPs for each specific project are based on the proposed schedules for activities, prohibitions, maintenance guidelines, inspection procedures and other practices. In some cases these activities, such as schedules, are modified to incorporate BMP construction that will assist in minimizing impacts for sensitive environments. Any contractors involved in construction of the transmission line will be advised of these BMP requirements.

Actual line construction will begin with removal of existing structures closest to the location of the new structures, unless an off-set is necessary so the existing transmission line can remain energized, whereas it would be left in place.

The new structures are installed directly in the ground, by augering or excavating a hole typically 7 to 10 feet deep and 2 to 3 feet in diameter for each pole. Any excess soil from the excavation will be spread and leveled near the structure or removed from the site, if requested by the property owner or regulatory agency.

The new structures will then be set and the holes back-filled with the excavated material, native soil, or crushed rock. In poor soil conditions, a galvanized steel culvert is sometimes installed vertically with the structure set inside. Great River Energy does not expect to use concrete foundations, but if it were to be required, the size of the hole for concrete foundations depends largely on soil type. Based on the known soil types in northeastern Minnesota, it is anticipated that the average structure depth of a typical 65 foot long pole would be approximately 8.5 feet deep. Drilled pier foundations may vary from 4 to 8 feet in diameter. Concrete trucks are normally used to bring the concrete in from a local concrete batch plant.

After a number of new structures have been erected, GRE will begin to install the new static wire by establishing stringing setup areas within the ROW. These stringing setup areas are usually located every two miles along a project route and occupy approximately 15,000 square feet of land. Conductor stringing operations require brief access to each structure to secure the conductor wire to the insulators or to install shield wire clamps once final sag is established. Temporary guard or clearance structures are installed, as needed, over existing distribution or communication lines, streets, roads, highways, railways or other obstructions after any necessary notifications are made or permits obtained. This ensures that conductors will not obstruct traffic or contact existing energized conductors or other cables and also protects the conductors from possible damage.

Crossing of rivers, streams and wetlands may require specific methods during construction. The transmission lines will cross a number of wetlands and will span the St. Louis River in two places.

Great River Energy intends to place structures in generally the same location along the road ROW to cross the St. Louis River. Construction equipment will not be allowed to drive across waterways except under special circumstances and only after discussion with the appropriate resource agency. Where waterways must be crossed to pull in the new conductors and shield wires, workers may walk across, use boats, or drive equipment across ice in the winter. In areas where construction occurs close to waterways, BMPs help prevent soil erosion and ensure that equipment fueling and lubricating occur at a distance from waterways.

Switching Station - Construction

Once the final design is complete and the necessary property is acquired, construction will begin on the switching station. A detailed construction schedule will be developed based upon availability of crews, outage restrictions for any transmission lines that may be affected, weather conditions, spring load restrictions on roads, and any restrictions placed on certain areas for minimizing permanent impacts from construction.

Construction of a new facility begins with site preparation work, which involves clearing, grading and leveling the site with heavy equipment to prepare the site to support electrical equipment and associated facilities. This may include replacement of site soils depending on existing soil conditions found and those identified in the Soil Exploration Report or Geotechnical Investigation. Topsoil will be removed, stockpiled and re-spread onsite. Any excess soil will be offered to the adjacent landowners or removed from the site. Once the site is graded, a perimeter fence, typically chain link, is installed to secure the site. All switching station equipment will be contained within the fenced area. Concrete foundations are placed throughout the switching station to support the switching station equipment. An electrical equipment enclosure will be installed to house protective relaying and control equipment. Erection of steel structures follows the foundation installation. These structures are built using rolled I-beams and/or tubular steel materials. Beams are used for mounting electrical conductors, disconnects and equipment. Bare copper conductor is buried around the perimeter of the fence and within the fence to properly ground all of the equipment and provide safety of personnel. Large high-voltage equipment, such as circuit breakers and associated control cables, are installed following completion of these steel structures. The final step is to properly test and commission each electrical device.

Minnesota Power will utilize erosion control methods to minimize runoff during construction of the switching station as part of the BMP plan. A SWPPP will be prepared and implemented in compliance with the NPDES.

The proposed switching station will be constructed in compliance with the applicable codes, the Occupational Safety and Health Act, and local regulations. Utility workers and contractors will be committed to safe working practices. The switching station will be reviewed for local conditions and will include provisions in design beyond the minimum provisions for safety established in the various regulatory codes, where warranted. The switching station design will allow future maintenance to be accomplished with a minimum impact on switching station operation and allow adequate clearance to work safely.

Transmission Lines – Operation and Maintenance

Access to the ROW of a completed transmission line is required to perform periodic inspections, conduct maintenance and repair damage. Regular maintenance and inspections will be performed during the life of the transmission line to ensure its continued integrity. Generally, the Applicants will inspect the transmission lines at least once every other year. Inspections will be limited to the ROW and to areas where obstructions or terrain may require off-ROW access.

If problems are found during inspection, repairs will be performed and damage restoration will occur or the landowner will be provided reasonable compensation for any damage to the property.

The ROW will be managed to remove vegetation that interferes with the operation and maintenance of the transmission line. Native shrubs that will not interfere with the safe operation of the transmission line will be allowed to reestablish in the ROW. The Applicants' practice provides for the inspection of 115 kV transmission lines every two years to determine if clearing is required. ROW clearing practices include a combination of mechanical and hand clearing, along with herbicide application, where allowed, to remove or control vegetation growth. Noxious weed control with herbicides will be conducted on a two-year cycle around structures and anchors.

Operating and maintenance costs associated with these transmission lines are estimated to be on the order of $50,000 per year. Actual transmission line specific maintenance costs will depend on setting, the amount of vegetation management necessary, storm damage occurrences, structure types, age of the line, etc. The project facilities will primarily be routed along road ROW, which will minimize tree maintenance required.

Switching Station – Operation and Maintenance

Over the life of the switching station, annual inspections will be performed for safety, and quarterly inspections will be performed to maintain equipment and make necessary repairs. Routine maintenance will be conducted as required to remove undesired vegetation that may interfere with the safe and reliable operation of the switching station.

Transmission Lines – Restoration

During construction, limited ground disturbance at the structure sites may occur. Staging areas for temporary storage of materials and equipment are established under agreements with the property owner or agency. Typically, a previously-disturbed or developed area is used, and includes sufficient space to lay down material and pre-assemble some structural components or hardware and store construction equipment. Portions of the ROW or property immediately adjacent to the ROW may be used for structure laydown and framing prior to structure installation. Additionally, stringing setup areas are used to store conductors and equipment necessary for stringing operations. Disturbed areas are restored to their original condition to the maximum extent practicable, or as negotiated with the landowner.

Post-construction reclamation activities will include removing and disposing of debris, removing all temporary facilities, including staging and laydown areas, employing appropriate erosion control measures, reseeding areas disturbed by construction activities with vegetation similar to that which was removed with a seed mixture certified as free of noxious or invasive weeds and restoring the areas to their original condition to the extent possible. In cases where soil compaction has occurred, the

construction crew or a restoration contractor has a variety methods to alleviate the compaction, depending on the desire of the landowners.

The ROW agent contacts the landowners once construction is completed to determine if the clean-up measures have been to their satisfaction and if any other damage may have occurred. If damage has occurred to crops, fences or the property, the Applicants will compensate the landowner. In some cases, an outside contractor may be hired to restore the damaged property as near as possible to its original condition.

In those areas where the new 115 kV line is off-set (i.e., placed on a new, adjacent ROW), once the 69 kV line is completely removed, the holes would be backfilled with soil and leveled. If poles are removed in yard areas, the disturbed area would be seeded. Any final outstanding damages would be reconciled to the property owner's satisfaction. The transmission line easements would be released from the property and ROW maintenance would be discontinued.

Switching Station – Restoration

Upon completion of construction activities, Minnesota Power will restore the remainder of the site. Post-construction reclamation activities include the removing and disposing of debris, dismantling all temporary facilities (including staging areas), employing appropriate erosion control measures and reseeding areas disturbed by construction activities with vegetation similar to that which was removed as appropriate.

3.5 Project Implementation

The Applicants desire to commence construction of the Savanna Switching Station as early as late 2011 and complete it in late 2012. Construction of the first 115 kV transmission line may begin as early as late 2011 on the north end with the rebuild of approximately seven miles of existing 69 kV line to single circuit 115 kV between the Cedar Valley Substation and the Savanna Switching Station. Construction of the second 115 kV transmission line will begin with the rebuild of approximately 21 miles of existing 69 kV line to double circuit 115/69 kV between the Gowan Substation and the Cromwell Substation in 2012-2013. Construction of the second 115 kV transmission line will continue with the rebuild of approximately nine miles of existing 69 kV line to single circuit 115 kV between the Savanna Switching Station and the Gowan Substation in 2013-2014.

The Applicants anticipate that construction will take approximately three years and that the entire project will be energized sometime in the fourth quarter of 2014. Portions of the project may be energized while work continues on other portions.

Project Costs

The Applicants have estimated that the transmission line and substation improvements would cost approximately $29 million, as outlined below on **Table 4**.

Table 4. Project Costs

Estimated Pre- and Post Construction costs	Estimated Construction Costs – 115 kV HVTL	Estimated Switching Station Costs	Estimated Substation Modification Costs	Total Estimated Project Cost
$4,640,000	**$20,720,000**	**$2,600,000**	**$1,075,000**	**$29,035,000**

4.0 Alternatives to the Proposed Project

In addition to need, the CN process reviews possible alternatives to the proposed project that may be able to fill that need. A general description of these alternatives is required per Minn. R. 7849.1500, Subp. 1 (B). The requirements of this rule include an investigation into the feasibility of the following alternatives:

- The no-build alternative,
- Demand side management,
- Purchased power,
- Facilities of a different size or using a different energy source than the source proposed by the applicant,
- Generation rather than transmission,
- Renewable energy sources

The following section discusses the feasibility and availability of potential alternatives to the transmission line which could eliminate the need for the proposed project. None were found to be a feasible alternative to the proposed project.

4.1 No Build Alternative

Under the no build alternative none of the existing structures would be replaced and the transmission line would continue to be operated at 69 kV. There would be no construction of the new Savanna Switching Station, nor would improvement to the existing substations be completed.

The proposed project is a baseline reliability project that will insure a continuous supply of secure and reliable electric energy. Locations benefited by the proposed project include Floodwood, Meadowlands, Cedar Valley, Gowan, Grand Lake, Cromwell, Wright, Tamarack, Palisade, the Big Sandy Lake area, Aitkin, McGregor, Mahtowa, Barnum, Wrenshall, and all areas in between these locations.

Under this alternative, peak-demand periods could result in localized voltage collapse or damage to equipment. The Applicants state they would need several hours to restore electric service to customers in the area under such a scenario, and once service was restored the company may need to institute rotating blackouts to insure that voltage would not collapse again. Furthermore, it is likely that there would be a negative effect on the local economy due to the unreliable electrical service in the area.

If the proposed project or one of its alternatives is not constructed, utility studies indicate that as load continues to grow, electric security in the project area will decrease, which will lead to reduced reliability throughout the region.

Because this project was designed to solve the electrical network deficiencies, delays in implementation of the project would affect three separate systems: the Blackberry-Cloquet 115 kV system, the Thomson-Riverton 115 kV system, and the Four Corners-Cromwell 69 kV system.

This is not a feasible alternative. This alternative does not address the voltage support issues that are being experienced in the area. Under this alternative it is likely that there would be an unacceptable negative effect on the local economy due to the unreliable electrical service in the area.

4.2 Conservation alternative

This alternative would seek to address the need of approximately 25 MW (near term winter peak load levels) with Demand Side Management. The alternative would use a slate of energy conservation measures that would ultimately reduce load in the area to a level allowing the current system to operate in a reliable manner. This conservation effort would most likely be phased in, and would be above and beyond the companies' current efforts. In addition, any load growth occurring in the area would also need to be met through aggressive conservation effort.

GRE and MP have obtained significant energy savings from various conservations programs, including the Conservation Improvement Program (CIP) as required by Minnesota Statutes 216B.241. While the companies anticipate future savings from the continuation of these efforts, conservation alone will not be sufficient to address the significant reliability issue that exists in the area.

In comments on the Certificate of Need Application, Department analyst Christopher Shaw states the following:

> *Based on the 2009 peak demand, the Department calculates that the load in the affected area would have to be reduced by 22.4 MW in order for the existing infrastructure to reliably serve the affected area. Minnesota Power's demand savings for its entire Conservation Improvement Program (CIP) system-wide was 1.3 MW in 2010.3 The demand savings for the GRE's 3 member cooperatives in the affected area was 6 MW in 2009. While energy conservation will continue to be an effective alternative for meeting future needs, it would not be able to address issues related to existing demand at levels necessary to address the identified need.*

This is not a feasible alternative given that an unrealistic amount of conservation would have to be achieved in the project area to meet the needs that would otherwise be met by the proposed project.

4.3 Purchased Power

Another alternative generally reviewed in a Certificate of Need case is whether the Applicants could purchase power to meet the increased load growth in the area. Typically, this would be more relevant in a power plant application. In this transmission application, purchased power would not solve any system inadequacies in the area. Power, produced or purchased, would have to be transferred and delivered along an arguably inadequate transmission system.

This is not a feasible alternative as there would still be voltage support issues in the area and it is likely that GRE and MP would have to upgrade the transmission line in order to deliver purchased power to the area.

4.4 Facilities of a Different Size or Type

Size in the context of the certificate of need application refers to the quantity of power transfers that the transmission infrastructure improvements enable, while type refers to the transformer nominal voltages, rated capacity, surge impedance loading, and nature (AC or DC) of power transported.

Transmission lines of other voltages will not serve the need for this area; 69 kV lines will not meet the future load growth needs in the area; 161 kV lines would require new 115/161 kV transformers to be able to connect them to the existing transmission system, a significantly more expensive option when compared to 115 kV; 230 kV and 345 kV lines are generally used for transferring large amount of power over long distances or providing a back bone for 161 kV or 115 kV transmission systems and are therefore not appropriate options.

In comments on the Certificate of Need Application, Department analyst Christopher Shaw states:

> *…regarding the Applicants' proposed size, the addition of the proposed facility would allow the transmission system to provide reliable electric service to the Affected Load Centers at 212 MW of demand (an increase of about 100 MW) during N-1 conditions. With the proposed addition, the transmission system could serve the affected load centers beyond 2025. The Department concludes that the Applicants' proposed size is reasonable.*

Concerning type, the Department states:

> *…the Applicants propose to construct two 115 kV lines with a total length of approximately 37 miles and a new switching station. Beyond the Cromwell-to-Four Corners 69 kV system, there was no other transmission or sub-transmission in the area at a lower voltage because the transmission in the area is sparse and spread out. The Applicants also discuss their consideration of a 230 kV alternative on page 6-2 – 6-3 of the Petition. While a 230 kV line could also provide a solution, the Applicant's proposed 115 kV solution, as discussed above, would resolve transmission inadequacies beyond 2025. Therefore, the additional costs of the 230 kV solution are not justified. In addition, undergrounding the transmission line is not a viable solution to the proposed line*

Regarding timing, the Department concluded that:

> *…the Applicants' proposed timing is reasonable because it would place transmission improvements in place as soon as possible in an area that already experienced historical demand greater than the ability of the infrastructure to reliably provide service (i.e. N-1). The Applicants indicate that acceptable voltage levels can be maintained during an N-1 and coincident peak loading condition through manual adjustments by system operators.*

The Applicants also considered a lower voltage solution (non-CN facilities) and concluded that beyond the Cromwell-to-Four Corners 69 kV system, there was no other transmission or sub-transmission in the area at a lower voltage because the transmission in the area is sparse and spread out.

The Department concluded that non-CN facilities were not a reasonable alternative.

4.5 Upgrading Existing Transmission Lines

The proposed project involves an upgrade of the existing 69 kV lines between Cedar Valley, Gowan, and Cromwell. The rebuild of an existing line would utilize existing ROW corridors and upgrade aging infrastructure. To provide the new endpoint required for the project, the existing Minnesota Power Floodwood distribution substation would require a significant and costly expansion to be comparable to the proposed Savanna Switching Station in terms of reliability.

The Applicants concluded that, rather than upgrading the existing facility, it makes more sense to build a new facility in a more ideal location for similar or less cost. The new Savanna Switching Station will, however, be designed with space for a distribution transformer to serve the customers in Floodwood when the existing distribution station reaches the end of its useful life.

4.6 Generation Alternatives

Any generation alternative to the transmission line would be required to address system inadequacies in the three different areas of the proposed transmission rebuild (Floodwood area, Cromwell-Gowan-Four Corners 69 kV loop, and Cromwell-Mahtowa-Wrenshall area), meet the current approximately 25 MW (near term winter peak load levels) shortfall, and provide the reactive power requirements of the industrial loads in the Floodwood area.

It is unlikely that new generation could totally eliminate the need for rebuilding the existing 69 kV system. In order to reduce or minimize the need for the proposed upgrades to the transmission system, the generation would have to be local or distributed generation (DG). This DG would have to be placed strategically to mitigate specific overloads and low voltages across the three areas.

The $29 million proposed project would increase by over 100 MW the amount of load that could be served; it is likely that any DG alternatives, designed to provide 100 MW of power, would cost several times the cost of the proposed project.

Small generators, of the type reasonably considered for distributed generation alternatives (typically 1.5 or 2 MW diesel or natural gas-fueled generators) would not be sufficient to meet the need in the Floodwood area, as the main load in that area is an industrial load consisting of a number of large electric motors. To start these large motors, large amounts of reactive power and inrush current are required. Because small generators alone are simply not capable of supplying reactive power and current on the order required by such large electric motors, distributed generation cannot eliminate the need for new transmission such as that provided by the proposed project.

Renewable Generation Alternative

The transmission line in question will not interconnect any particular generation resource. Moreover, the transmission line is not needed to interconnect or transmit power from a new generation resource.

Rather, the line will transmit electricity from the existing grid generally to the local area. Therefore, the renewable preference statutes (Minnesota Statutes §216B.243, subd. 3a and Minnesota Statutes §216B.2422, subd. 4) do not apply.

5.0 Alternative Routes and Route Segments

Alternative routes, alternative route segments and modifications to the GRE/MP's proposed alignment were discussed during the scoping meeting and in comments received during the scoping comment period. Three of these alternatives, as described below, were incorporated in the scope of this EA and are evaluated herein.

Goodell alternative route segment

A resident located along the south side of Hingeley Road (County State Aid Highway 86 - CSAH) in Section 15, Township 50 north, Range 20 west, requested that an *alternative route segment* be considered in a portion of the proposed Savanna HVTL route (**Appendix C Key Map Book, Goodell Alternative Route Segment Maps 1 and 2**). The alternative route segment lies within the portion of the proposed route that includes a rebuild of approximately nine miles of existing GRE 69 kV line to double-circuit 115/69 kV line, south of Lake Country Power's Gowan Substation.

The Goodell Alternative Route Segment would modify an approximately one mile segment of the proposed route along CSAH 86 (Hingeley Road) where the road runs west from the intersection of Norlund Road (Township Road 5004) in Fine Lakes Township. The current proposal consists of utilizing the existing 69 kV ROW that runs along the south side of CSAH 86; the Goodell Alternative Route Segment would relocate this ROW so that it follows the north side of CSAH 86.

The stated purpose of this alternative route segment is to reduce the impact to resident, developed parcels along this segment of the proposed HVTL rebuild.

An additional option included in the request is consideration of moving the Lake Country Power distribution line (which is also located along the south side of CSAH 86) to the north side of CSAH 86 as a possible distribution under build with the proposed 115 kV transmission line.

Lund alternative route segment

Several members of the Lund family, who own four forty-acre parcels along the west side of Stremel Road (County Road 192) requested that an *alternative route segment* be considered in a portion of the proposed Savanna HVTL route (**Appendix C Key Map Book, Lund Alternative Route Segment Maps 1, 2 and 3**).

The Lund Alternative Route Segment lies within the portion of the proposed rebuild route that GRE has stated will need an "off-set" of the centerline due to the need to keep the existing 69 kV line energized; the consequence of this off-set is the creation of an addition HVTL ROW to the west of the existing ROW.

The Lund Alternative Route Segment would modify an approximately two mile segment of the proposed route along Stremel Road/CR 192, between the proposed Savanna Switching Station north to Parantala Road/County Road 732 in Van Buren Township. The current 69 kV line runs along the west side of Stremel Road/CR 192 from the proposed switching station to Parantala Road/County Road 732; the

Lund Alternative Route Segment would relocate this ROW so that it follows the east side of Stremel Road/CR 192.

An additional option included in the request is consideration of so called "hot work" methods of construction (i.e., hot stick, leaning the existing poles, etc.) that would allow the new 115 kV to remain in the existing ROW.

The Lund family has established a memorial site in a stand of tamaracks to honor a deceased sibling. The memorial and tamarack stand are to the west of the existing 69 kV ROW; this area lies within, or very near to, the proposed new 115 kV ROW. The stated purpose of this alternative route segment or alternative construction methodology is to eliminate the impact to the tamarack stand and memorial therein.

Cedar Valley Substation to Savanna Switching Station Alternative Route Segment

GRE has stated that the section of the proposed route between the existing Cedar Valley Substation and the proposed Savanna Switching Station will be "off-set" from the existing 69 kV line ROW due to the need to keep the 69 kV line energized during construction of the new 115 kV HVTL, in essence creating a new ROW for this section of the proposed project.

The creation of new ROW or expansion of existing ROW, as proposed, makes the evaluation of similar alternatives practicable. This route alternative segment would follow the MP 115 kV 9 line east-northeast out of the proposed Savanna Switching Station for approximately one mile to the point where the MP 9 line crosses the MP 230 kV 98 line. At this point, the route alternative segment would turn northwest and follow the MP 98 line for approximately six miles to a point just (1/4 mile) east of the Cedar Valley Substation. The route then makes a short (1/4 mile) cross-country run to the west to tie into the Cedar Valley Substation (**Appendix C Key Map Book, Cedar Valley-Savanna Alternative Route Segment Maps 1 through 10**).

A route width of 700 feet centered on the MP 9 and MP 98 line will provide adequate room to evaluate placing the new ROW on either side of the existing ROWs.

The purpose of this alternative route segment is to allow the existing 69 kV to remain energized during construction of the new 115 kV HVTL, maintain the concept of paralleling/overlapping of existing ROWs, and utilizes, to a greater degree, public lands over privately owned lands.

6.0 Potential Impacts of the Proposed Route

The construction of a transmission line involves both short and long-term impacts. An impact is a change in the status of the existing environment as a direct or indirect result of the proposed action. Direct impacts are caused by the action and occur at the same time and place. Indirect impacts are caused by the action and occur later or are further removed in distance, but are still reasonably foreseeable.

Impacts may be negative or positive and temporary or permanent or long-lasting. Short-term impacts are generally associated with the construction phase of the project and can include crop damage, soil compaction, and noise. Long-term impacts can exist for the life of the project and may include land use restrictions or modifications. Measures that would be implemented to reduce, minimize, or eliminate potential impacts are discussed under the appropriate topic and highlighted as necessary in this section.

It may be possible to mitigate potential impacts by adjusting the proposed route, selecting a different type of structure or pole, using different construction methods, or implementing any number of post-construction practices. The Commission can require route permit applicants to use specific techniques to mitigate impacts or require certain mitigation thresholds or standards to be met through permit conditions.

There are a number of potential impacts associate with HVTLs that must be taken into account on any transmission line project. Minnesota Rule 7850.4100, A through N, identifies 14 factors that the Commission must consider when designating a route for a HVTL.

6.1 Description of Environmental Setting

The Minnesota Department of Natural Resources and the U.S. Forest Service have developed an Ecological Classification System (ECS); this system is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The system uses associations of biotic and environmental factors, including climate, geology, topography, soils, hydrology, and vegetation.

The project area falls within the Tamarack Lowlands Subsection which forms a relatively flat plain. Level to gently rolling topography is typical of this region with lowland hardwoods and conifers making up most common forest communities. Land use in the project area includes a mix of public, residential, business, open space, forestry and agricultural lands. The residential areas within the project area are primarily single-family homes of varying density. Open space areas include forest, wetlands and areas of cultivated land.

Glacial lacustrine (lake deposited) sediments occupy much of the parent material in this subsection. Glacial drift within the region ranges from 100 to 300 feet thick, with some of the thickest sediments are located at the northern edge of the region. The bedrock beneath these sediments is Middle Precambrian (Early Proterozoic) argillite, siltstone, quartzite, or graywacke, weakly metamorphosed. There is also

Cretaceous shale, sandstone, and clay near the southwest end of the region and along the border with the Mesabi Range.

Soils include extensive areas of histosols (peats) over both fine-textured (silt and clay-rich) and sandy lacustrine deposits. Alluvial soils are present along major rivers.

Vegetation in the lowlands is dominated by lowland conifers (black spruce, tamarack, and white cedar) and lowland hardwoods (black ash). Sedge meadows are also extensive. Uplands support aspen-birch and upland conifer forest.

Forestry is the most important land use within the Tamarack Lowlands. There are some areas in the lake plain where agriculture is important, although most of the subsection is marginal for agriculture. Fire was probably important, both on the hardwood-conifer dominated uplands and in wetlands. Windthrow was probably important in the conifer swamps. In this type of flat, lacustrine setting, natural water-level fluctuations and flooding behind beaver dams often causes extensive tree mortality.

6.2 Socioeconomic

According to 2010 Census data, Carlton County is 89.7 percent Caucasian, while St. Louis County is 93.0 percent Caucasian.

The proposed route does not contain disproportionately high minority populations or low-income populations. Population and economic characteristics are presented in **Table 5.**

Table 5. Population and Economic Profile,

LOCATION	POPULATION 1990	POPULATION 2009	CHANGE (%)	PER CAPITA INCOME	POPULATION BELOW POVERTY LEVEL (%)
State of Minnesota	4,375,099	5,266,214	16.9%	$30,090	9.7
St. Louis County	198,213	197,767	0.0%	$18,982	12.4
Carlton County	29,259	34,327	14.7%	$18,073	12.4
Cedar Valley Township, St. Louis County	210	249	15.6%	$16,569	12.4
Van Buren Township, St. Louis County	178	179	0.0%	$16,509	12.4
Floodwood Township, St. Louis County	345	306	-11.3%	$17,805	12.4
Fine Lakes Township,	150	142	-5.3%	$16,015	12.4

LOCATION	POPULATION 1990	POPULATION 2009	CHANGE (%)	PER CAPITA INCOME	POPULATION BELOW POVERTY LEVEL (%)
St. Louis County					
Eagle Township, Carlton County	529	603	12.2%	$19,078	12.4
Kalevala Township, Carlton County	285	342	16.6%	$19,254	12.4
Cromwell	221	203	-8.1%	$16,605	12.4

Approximately 15 to 20 workers will be required by GRE and MP for transmission line construction. The transmission crews are expected to spend approximately 6 months constructing the project.

There will be short-term impacts to community services as a result of construction activity and an influx of contractor employees during construction of the various segments of the project. Both utility personnel and contractors will be used for construction activities. The communities near the project should experience short-term positive economic impacts through the use of the hotels, restaurants and other services by the various workers.

It is not expected that additional permanent jobs will be created by the project. The construction activities will provide a seasonal influx of economic activity into the communities during the construction phase, and materials such as concrete may be purchased from local vendors. Long-term beneficial impacts from the project include increased local tax base resulting from the incremental increase in revenues from utility property taxes.

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, increased tax revenue and increased opportunities for business development.

Short-term impacts to existing socioeconomic resources would be relatively minor. The construction, operation and maintenance of the transmission line would not have a significant effect on agricultural operations. The project construction would not cause permanent impacts to leading industries within the project area.

The relatively short-term nature of the project construction and the number of workers who would be hired from outside of the project area should result in short-term positive economic impacts in the form of increased spending on lodging, meals and other consumer goods and services. It is not anticipated that the project would create new permanent jobs during construction, but would create temporary jobs that would provide a short-term influx of income to the area.

If local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in Carlton and St. Louis counties would contribute to the total personal income of the region. Additional personal income would be generated for residents in the county and the state by circulation and recirculation of dollars paid out by the applicants as business expenditures and state and local taxes. Expenditures made for equipment, energy, fuel, operating supplies and other products and services would benefit businesses in the counties and the state. Indirect impact may occur through the increased capability of the applicants to supply energy to commercial and industrial users, which would contribute to the economic growth of the region.

There is no indication that any minority or low-income population is concentrated in any one area of the project, or that the transmission line would cross through an area occupied primarily by any minority group.

Long-term beneficial impacts to the county's tax base, as a result of the construction and operation of the transmission line, would be the incremental increase in revenue from utility property taxes which is based on the value of the project. The availability of reliable power in the area would have a positive effect on local businesses and the quality of service provided to the general public.

Property Values

One of the first concerns of many residents near existing or proposed transmission lines is how that proximity could affect the value of their property. Those concerns are addressed in this case by comparing similar transmission lines in similar communities.

The Shenehon Company of Minneapolis, a business and real estate valuation company, performed a study on property values in the Maple Grove area relative to proximity to transmission lines. Their conclusions were included in the GRE application for a permit for a 115 kV line in Plymouth and Maple Grove in Hennepin County, EQB Docket No. 03-65-TR-GRE PMG. According to the report, "it is our opinion that single source power lines do not cause a measurable and significant diminution in value to typical single-family homes in Maple Grove … homes defined as larger "family" homes exhibit a slightly larger incremental decrease in selling price. However, given the inexact nature of real estate markets in general, we cannot conclude that the entire difference is attributed to proximity to the power line, or that the difference is considered significant."

In the Final Environmental Impact Statement on the Arrowhead-Weston Electric Transmission Line Project, the Wisconsin Public Service Commission addressed the issue of property value changes associated with high voltage transmission lines[1]. This document looked at approximately 30 papers, articles and court cases covering the period from 1987 through 1999.

> *In general there are two types of property value impacts that can be experienced by property owners affected by a new transmission line. The first is a potential economic*

[1] 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

> *impact associated with the amount paid by a utility for a right-of-way (ROW) easement. The second is the potential economic impact involving the future marketability of the property.*
>
> *However, substantial differences may exist between people's perceptions about how they would behave and their actual behavior when confronted with the purchase of property supporting a power line.*
>
> *The presence of a power line may not affect some individual's perceptions of a property's value at all. These people tend to view power lines as necessary infrastructure on the landscape, similar to roads, water towers and antenna. They generally do not notice the lines nor do they have strong feelings about them.*

The Final EIS provides six general observations from the studies it evaluated. These are:

- The potential reduction in sale price for single family homes may range from 0 to 14 per cent.
- Adverse effects on the sale price of smaller properties could be greater than effects 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.
- The adverse effects appear to diminish over time.
- Effects on sale price are most often observed for property crossed by or immediately adjacent to a power line, but effects have also been observed for properties farther away from the line.
- The value of agricultural property is likely to decrease if the power line poles are placed in an area that inhibits farm operations.

Later, the Final EIS stated, "In coastal states, such as California and Florida, the decrease in property values can be quite dramatic; in states within the Midwest (Minnesota, Wisconsin and the Upper Peninsula of Michigan), the average decrease appears to be between 4 and 7 percent."

Finally, the EIS succinctly summarizes the dilemma in its closing paragraph which stated, "It is very difficult to make predictions about how a specific transmission line will affect the value of specific properties."

Mitigative Measures

Socioeconomic impacts resulting from the project would be primarily positive with an influx of wages and expenditures made at local businesses during the project construction. Mitigative measures are not necessary.

In the matter of property values, potential impact would typically be a negotiated settlement in an easement agreement between the Applicants and the landowner. In this case, the incremental differences between properties with the existing 69 kV and the same properties with the proposed 115 kV HVTL would be difficult to discern.

6.3 Displacement

The proposed project maximizes the use of existing transmission line corridors – the proposed route uses existing transmission rights-of-way for all but approximately 7 miles (the portion identified as possibly requiring a fifteen foot "off-set" between the new Savanna Switching Station and the existing Cedar Valley Substation) of its length. The use of existing transmission line corridors was an important factor for this project because using existing corridors reduces transmission line proliferation and impacts to residences.

Potential Impacts

There is no structure along the route of this project that would require relocation. Displacement of residential homes or businesses is not anticipated.

Mitigative Measures

Since no relocations would occur, no mitigative measures are required.

6.4 Anticipated Noise Impacts

Noise is measured in units of decibels ("dB") on a logarithmic scale. The A weighted decibel (dBA) scale 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. Two sources of noise would be associated with the completed project: conductors and substations.

Land use activities associated with residential, commercial, and industrial land are grouped together into Noise Area Classifications (NAC). Residences, which are typically considered sensitive to noise, are classified as NAC 1. Each NAC is assigned both daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) noise limits for land use activities within the NAC. Table 8 shows the Minnesota Pollution Control Agency (MPCA) daytime and nighttime limits in dBA for each NAC (**Table 6**). The limits 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.

Table 6. MPCA Daytime and Nighttime Noise Limits

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

Typical noise sensitive receptors along the route would include residences, churches, and schools; however, most of the land use along the route is rural agricultural land. Current average noise levels in these areas are typically in the 30 to 40 dBA range and are considered acceptable for residential land use activities. Ambient noise in rural areas is commonly made up of rustling vegetation and infrequent vehicle pass-bys. Higher ambient noise levels, typically 50 to 60 dBA, would be expected near roadways, urban areas and commercial and industrial properties in the project area. Conductor and substation noise would comply with state noise standards.

Noise concerns for this Project may be associated with both the construction and operation of the energy transmission system. 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 to and from the work area. Any exceedences of the MPCA daytime noise limits would be temporary in nature and no exceedences of the MPCA nighttime noise limits are expected for this project.

Operational noise would be associated with the transmission conductors and transformers at substations that may produce audible noise under certain operational conditions. The level of noise depends on conductor conditions, voltage level and weather conditions. Noise emission from a transmission line occurs during heavy rain and wet conductor conditions. In foggy, damp or rainy weather conditions, transmission lines can create a subtle crackling sound due to the small amount of electricity ionizing the moist air near the wires. During heavy rain, the general background noise level is usually greater than the noise from a transmission line and few people are in close proximity to the transmission line in these conditions. For these reasons, audible noise is not noticeable during heavy rain. During light rain, dense fog, snow and other times when there is moisture in the air, the proposed transmission lines may produce audible noise higher than rural background levels. During dry weather, audible noise from transmission lines is an imperceptible, sporadic crackling sound.

Noise levels produced by a 115 kV transmission line are generally less than outdoor background levels and are therefore not usually audible. Additionally, noise levels from the proposed 115/69 kV double circuit transmission lines are expected to be only slightly higher than the existing 69 kV transmission lines in the project area. Therefore, noise levels from the new line and double circuit line should not be noticeably greater than existing levels.

The EPRI “Transmission Line Reference Book, 345kV and Above”, Chapter 6, provides empirically-derived formula for predicting audible noise from overhead transmission lines. Computer software

produced by the Bonneville Power Administration (BPA)(BPA, 1977) is also frequently used to predict the level of audible noise from power transmission lines that is associated with corona discharge. Audible noise is predicted for dry and wet conditions, with wet conditions representing a worst case. These procedures are considered to be reliable and represent International best practice.

Typical noise sensitive receptors along the route will include residences, churches, and schools; however, most of the land use along the route is rural timber, wetland or agricultural land. Current average noise levels in these areas are typically in the 30 to 40 dBA range and are considered acceptable for residential land use activities. Ambient noise in rural areas is commonly made up of rustling vegetation and infrequent vehicle pass-bys. Higher ambient noise levels, typically 50 to 60 dBA, will be expected near roadways, urban areas and commercial and industrial properties in the Project area.

The industry standard for utilities is calculated based on L50 and L5 for audible noise emissions. The worst-case scenario is when the transmission line is exposed to heavy rain conditions (one inch per hour). Anticipated levels for heavy rain conditions for a typical 115 kV line based on the results from the Bonneville Power Administration Corona and Field Effects Program version 3 (U.S. Department of Energy, Bonneville Power Administration (BPA), Undated) are listed in Table 7.

Table 7. BPA Program Results – Heavy Rain Case Noise from HVTL

L_5	L_{50}	Location
17.7 dBA	14.2 dBA	edge of right-of-way
18.8 dBA	15.3 dBA	directly under line

BPA has developed a general guideline based upon public response to AC transmission line audible noise. The guideline indicates that numerous complaints can be expected if the line noise exceeds approximately 58.5 dBA and that few complaints should be expected if audible noise is limited to 52.5 dBA.

Transformer Substation Noise

The nearest residence to Lake Country Power's Cedar Valley Substation is approximately 400 feet away and there is a buffer of trees between the residence and the substation. The new 115 kV transformer will be similar in size to the existing 69 kV transformer it will replace, and there should be no perceptible changes in noise at the substation.

The nearest residence to the proposed Savanna Switching Station is approximately 1,100 feet away, and the site is shielded by existing wooded vegetation. There will be no transformer at the switching station and construction and operation of the proposed switching station will have negligible impact on the surrounding residences.

The nearest residence to Great River Energy's Cromwell Substation is approximately 500 feet away. The substation is also shielded by existing wooded vegetation and modifying the substation to

accommodate the 115 kV transmission line will not result in perceptible changes in noise for the residences.

Potential Impacts

Noise concerns for this project may be associated with both the construction and operation of the energy transmission system. 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 to and from the work area. Any exceedance of the MPCA noise limits will be temporary in nature.

Operational noise will be associated with the transmission conductors and transformers at substations that may produce audible noise under certain operational conditions. The level of noise depends on conductor conditions, voltage level and weather conditions.

Transmission lines can cause audible noise due to corona discharges from the conductors. This noise, which resembles a subtle crackling sound due to the small amount of electricity ionizing the moist air near the wires, is typically only within the threshold of human hearing during rainy or foggy conditions, and even then is largely imperceptible due to background noise. During light rain, dense fog, snow and other times when there is moisture in the air, the proposed transmission lines may produce audible noise higher than rural background levels. During dry weather, audible noise from transmission lines is an imperceptible, sporadic crackling sound.

Mitigative Measures

The Applicants have stated that in an effort to mitigate noise levels associated with construction activities, work would be limited to daytime hours between 7 a.m. and 10 p.m. on weekdays. Occasionally there may be construction outside of these hours or on a weekend if the company is required to work around customer schedules, line outages, or has been significantly impacted due to other factors. Heavy equipment would also be equipped with sound attenuation devices such as mufflers to minimize the daytime noise levels.

No mitigation measures are required for the operational phase of the line as operational noise levels are not predicted to exceed the state noise limits.

6.5 Radio and Television Interference

Corona on transmission line conductors can generate electromagnetic noise at frequencies at which radio and television signals are transmitted. This noise can cause interference (primarily with AM radio stations and the video portion of TV signals) with the reception of these signals depending on the frequency and strength of the radio and television signal. However, this interference is often due to weak broadcast signals or poor receiving equipment.

The most significant factor with respect to radio and television interference is not the magnitude of the transmission line induced noise, but how the transmission line induced noise compares with the strength of the broadcast signal. Very few radio noise problems have resulted from existing 115 kV transmission lines, as broadcast signal strength within a radio station's primary coverage area is great enough that adequate signal to noise ratios are maintained.

If radio interference from transmission line corona does occur with AM radio stations presently providing good reception, satisfactory reception can be obtained by appropriate modification of (or addition to) the receiving antenna system.

Interference with FM broadcast station reception is generally not a problem because:

- corona generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 megahertz (MHz)), and
- the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel tower) may experience interference because of signal blocking effects. Movement of either mobile unit so that the metallic structure is not immediately between the two units should restore communications. This would generally require a movement of less than 50 feet by the mobile unit adjacent to a metallic tower. Noise in the frequency range of cellular type phones is almost non-existent and the technology used by these devices is superior to that used in two-way mobile radio.

As in the case with AM radio interference, corona-generated noise could cause interference with TV picture reception because the picture is broadcast as an AM signal. The level of interference depends on the TV signal strength for a particular channel (TV audio is an FM signal that is typically not impacted by transmission line radio frequency noise).

Due to the higher frequencies of the TV broadcast signal (54 MHz and above), 115 kV transmission lines seldom result in reception problems within a station's primary coverage area. In the rare situation that the proposed transmission line would cause TV interference within a broadcast station's primary coverage area where good reception is presently obtained, Xcel Energy has stated that it would work with the affected party to correct the problem. Usually any reception problem can be corrected with the addition of an outside antenna.

Mitigative Measures

No interference issues are anticipated with this project, however, should such interferences be identified, the Applicants would be required to resolve the problem as a condition of the HVTL Route Permit.

6.6 Aesthetics

Because the proposed project will mainly follow existing 69 kV transmission line routes, the project will have nominal effects on the visual and aesthetic character of the area. The structures will be about 60 to 85 feet tall and will have a span of approximately 350 to 400 feet. A maximum span of 400 feet will be used between the structures, which will still keep the conductor within the right-of-way under blowout conditions. The usual right-of-way required for these types of structures is 100 feet wide.

The existing transmission line structures vary in height between 50 to 55 feet. By comparison, the proposed transmission line structures will generally be slightly taller. The overall spacing of the poles will be comparable to the current layout, which varies greatly by engineering and land use constraints.

The proposed transmission line will cross the St. Louis River in two different locations. Crossing the St. Louis River will not perceptibly change the existing viewshed of the area because the proposed route will follow the existing transmission line ROW. The potential aesthetic impact resulting from new, somewhat taller, structures will be imperceptible to most viewers.

Like the existing 69 kV transmission line, the new single circuit and double circuit transmission line will be visible to area residents. The majority of the landscape in the project area is undeveloped. The visual effect will depend largely on the perceptions of the observers. The visual contrast added by the transmission structures and lines may be perceived as a visual disruption or as points of visual interest. The transmission lines and substations that already exist in the project area will limit the extent to which the new line and substation are viewed as a disruption it the area's scenic integrity.

Potential Impacts

Although the transmission line would be visible throughout most of its length, it is not incompatible with its setting amongst existing transmission lines, public transportation corridors and residential development along the route.

Mitigative Measures

Although the proposed line will alter views of surrounding land uses, the proposed route predominantly uses existing corridors and avoids residences and businesses to the greatest extent practicable. The Applicants will work with landowners to identify concerns related to the transmission line aesthetics.

6.7 Public Health and Safety Including EMF

Proper safeguards would need to be implemented for construction and operation of the facility. The project would be designed to comply with local, state, NESC and GRE/MP standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials and ROW widths. The Applicants' construction crews and/or contract crews would comply with local, state, NESC and utility standards regarding installation of facilities and standard construction practices.

Established industry safety procedures would be followed during and after installation of the transmission line. This would include clear signage during all construction activities.

The transmission line would be equipped with protective devices to safeguard the public from the transmission line if an accident occurs and a structure or conductor falls to the ground. The protective devices are breakers and relays located where the transmission line connects to the substation. The protective equipment would de-energize the transmission line, should such an event occur. In addition, the substation facilities would be fenced and access limited to authorized personnel.

The MnDOT Office of Aeronautics was contacted by the Applicants for information on the possible effects of the proposed project on airports or airstrips in the project area. In an e-mail dated 12/10/10, MnDOT indicated that there are no public airports near the corridor, and the structures appear short enough that they would not impact navigable airspace.

The proposed project is over 12 miles from the Moose Lake Carlton County Airport and approximately 18 miles from the Cloquet Carlton County Airport.

Electric and Magnetic Fields

Voltage transmitted through any conductor produces both an electric field and a magnetic field in the area surrounding the wire. The electric field associated with HVTLs extends from the energized conductors to other nearby objects. The magnetic field associated with HVTLs surrounds the conductor. Together, these fields are generally referred to as electromagnetic fields, or EMF. These effects decrease rapidly as the distance from the conductor increases.

Electric Fields

Voltage on any wire (conductor) produces an electric field in the area surrounding the wire. The electric field associated with a high voltage transmission line extends from the energized conductors to other nearby objects such as the ground, towers, vegetation, buildings and vehicles. The electric field from a transmission line gets weaker as one moves away from the transmission line. Nearby trees and building material also greatly reduce the strength of transmission line electric fields.

The intensity of electric fields is associated with the voltage of the transmission line and is measured in kilovolts per meter (kV/M). Transmission line electric fields near ground are designated by the difference in voltage between two points (usually 1 meter). **Table 8** provides the electric fields at maximum conductor voltage for the proposed transmission lines. Maximum conductor voltage is defined as the nominal voltage plus five percent.

Table 8. Calculated Electric Fields (kV/m)

Scenario	Max. Operating Voltage (kV)	Distance to Proposed Centerline										
		-300'	-200'	-100'	-50'	-25'	Max.	25'	50'	100'	200'	300'
115/69 kV Double Circuit	121/72.5	0.003	0.01	0.02	0.06	0.47	0.96	0.14	0.04	0.02	0.01	0.003
115 kV Single Circuit Savanna to Cromwell	121	0.01	0.02	0.06	0.21	0.46	1.29	0.63	0.19	0.07	0.02	0.01
115 kV Single Circuit Savanna to Cedar Valley	121	0.01	0.02	0.06	0.21	0.49	1.40	0.65	0.19	0.07	0.02	0.01

There is no federal standard for transmission line electric fields. The Commission, however, has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. *In the Matter of the Route Permit Application for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota*, Docket No. ET-2/TL-08-1474, Order Granting Route Permit (*adopting* ALJ Findings of Fact, Conclusions and Recommendation at Finding 194 (April 22, 2010 and amended April 30, 2010)) (September 14, 2010). The standard was designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater.

The maximum electric field, measured at one meter above ground, associated with the project is calculated to be 1.40 kV/m (115 kV single circuit).

Stray Voltage

When an electric field reaches a nearby conductive object, such as a vehicle or a metal fence, it induces a voltage on the object. The magnitude of this voltage is dependent on many factors, including the object's capacitance, shape, size, orientation and location, resistance with respect to ground, and the weather conditions. If the object is insulated or semi-insulated from the ground and a person touches it, a small current would pass through the person's body to the ground. This might be accompanied by a spark discharge and mild shock, similar to what can occur when a person walks across a carpet and touches an object or person.

The main concern with induced voltage is not the magnitude of the voltage induced, but the current that would flow through a person to the ground should the person touch the object. To ensure the safety of persons in the proximity of high voltage transmission lines, the NESC requires that any discharge be less than five (5) milliAmperes (mA). The Applicants used computer modeling to estimate the spark discharge from a typical school bus (40' long × 8.5' wide × 12.75' high) stopped at mid-span under a

typical 115/69 kV double circuit line. The modeling showed that the spark discharge would be less than 2 mA under worst-case conditions.

This is less than the 5 mA NESC limit, and unlikely to register even as an annoyance. The Applicants would also ensure that any fixed conductive object in close proximity or parallel to the project, such as a fence or other permanent conductive fixture, would be grounded so any discharge would be less than the 5 mA NESC limit.

Implantable Medical Devices

High intensity electrical fields can have adverse impacts on the operation of implantable medical devices (IMDs) such as pacemakers and defibrillators. While research has shown that the magnetic fields associated with high voltage transmission lines do not reach levels at which they could cause interference with such devices, it is possible that the electric fields associated with some high voltage transmission lines could reach levels high enough to induce sufficient body currents to cause interference. However, modern "bipolar" cardiac devices are much less susceptible to interactions with electric fields. Medtronic and Guidant, manufacturers of pacemakers and other IMDs have indicated that electric fields below 6 kV/m are unlikely to cause interactions affecting operation of most of their devices. The older "unipolar" designs of cardiac devices are more susceptible to interference from electric fields. Research from the early 1990s indicates that the earliest evidence of interference was in electric fields ranging from 1.2 to 1.7 kV/meter.

Table 8 shows that the electric fields for the entire project's structure alternatives are well below levels at which modern bipolar devices are susceptible to interaction with the fields. For older style unipolar designs, the electric fields do exceed levels that research from the 1990s has indicated may produce interference. However, recent research conducted in 2005 concluded that the risk of interference inhibition of unipolar cardiac devices from high voltage power lines in everyday life is small. In 2007, Minnesota Power and Xcel Energy conducted studies with Medtronic, Inc. under 115 kV, 230 kV, 345 kV, and 500 kV transmission lines to confirm these 2005 findings. The analysis was based on real life public exposure levels under actual transmission lines in Minnesota and found no adverse interaction with pacemakers or IMDs.

The analysis concluded that although interference may be possible in unique situations, device interference as a result of typical public exposure would be rare. In the unlikely event that a pacemaker is impacted, the effect is typically a temporary asynchronous pacing (commonly referred to as reversion mode or fixed rate pacing). The pacemaker would return to its normal operation when the person moves away from the source of the interference.

Magnetic Fields

Current passing through any conductor, including a wire, produces a magnetic field in the area around the wire. The magnetic field associated with a high voltage transmission line surrounds the conductor and decreases rapidly with increasing distance from the conductor. The magnetic field is expressed in units of magnetic flux density, expressed as milligauss (mG).

The magnetic field profiles around the proposed transmission lines for each structure and conductor configuration being considered for the project is shown in **Table 9.** Magnetic fields were calculated for each section of the project under three system conditions: the expected peak and average current flows as projected for the year 2015 under normal (system intact) conditions and peak current flow for the year 2025 under normal (system intact) conditions. The peak magnetic field values are calculated at a point directly under the transmission line and where the conductor is closest to the ground. The same method is used to calculate the magnetic field at the edge of the right-of-way. The magnetic field profile data show that magnetic field levels decrease rapidly as the distance from the centerline increases (proportional to the inverse square of the distance from source).

The magnetic field produced by the transmission line is dependent on the current flowing on its conductors. Therefore, the actual magnetic field when the project is placed in service is typically less than shown in the charts. This is because the charts represent the magnetic field with current flow at expected normal peak based on projected regional load growth through 2025, the maximum load projection timeline available. Actual current flow on the line will vary, so magnetic fields will be less than peak levels during most hours of the year.

Table 9. Calculated Magnetic Flux Density (milligauss)

Scenario	Max. Operating Voltage (kV)	Line Current (Amps)	Distance to Proposed Centerline										
			-300'	-200'	-100'	-50'	-25'	Max.	25'	50'	100'	200'	300'
115/69 kV Double Circuit Peak Load)	121/72.5	115 kV: 68.8 69 kV: 45.2	0.03	0.07	0.33	1.27	3.15	4.85	2.00	0.67	0.17	0.05	0.02
115/69 kV Double Circuit Conductor Limit	121/72.5	115 kV: 1266 69 kV: 950	0.44	1.09	5.11	20.80	53.54	85.86	36.03	11.45	2.36	0.597	0.288
115 kV Single Circuit Savanna to Cromwell Line Peak Load	121	68.8	0.08	0.18	0.67	2.12	4.76	9.13	5.60	2.41	0.73	0.19	0.09

115 kV Single Circuit Savanna to Cromwell Line Conductor Limit	121	1266	1.52	3.36	12.40	39.04	87.57	167.96	102.95	44.04	13.42	3.51	1.57
115 kV Single Circuit Savanna to Cedar Valley Line Peak Load	121	12.1	0.02	0.03	0.12	0.38	0.87	1.74	1.03	0.43	0.13	0.03	0.02
115 kV Single Circuit Savanna to Cedar Valley Line Conductor Limit	121	950	1.14	2.53	9.36	29.82	68.41	136.47	80.99	34.00	10.14	2.64	1.18

It can be noted that magnetic fields are not singularly associated with power lines. Every person has exposure to these fields to a greater or lesser extent throughout each day, whether at home or in schools and offices. The following table (**Table 10**) contains field readings for a number of selected, commonly encountered items. These reading represent median readings, meaning one might expect to find an equal number of readings above and below these levels.

Table 10. Magnetic Fields (milligauss) From Common Home and Business Appliances

Type	Distance From Source in Feet			
	0.5	1	2	4
Computer Display	14	5	2	-
Fluorescent Lights	40	6	2	-
Hairdryer	300	1	-	-
Vacuum Cleaners	300	60	10	1
Microwave Oven	200	40	10	2
Conventional Electric Blanket	39.4 peak 21.8 average			

Low EMF Electric Blanket	2.7 peak .09 average

Source: EMF In Your Environment, EPA 1992

Potential Impacts

There are no federal or Minnesota state regulations for the permitted strength of a magnetic field on a transmission line; however both Florida and New York have standards ranging from 150 to 250 mG. **Table 11** summarizes the international and state guidelines for ELF and EMF that current exist.

Table 11. ELF EMF International and State Guidelines

ELF-EMF Guidelines Established by Health & Safety Organizations		
Organization		**Magnetic Field**
American Conference of Governmental and Industrial Hygienists (ACGIH) (Occupational)		10,000 mG (for general worker) 1,000 mG (for workers with cardiac pacemakers)
International Commission on Non-Ionizing Radiation Protection (ICNIRP) (General Public, Continuous Exposure)		833 mG
Non-Ionizing Radiation Committee of the American Industrial Hygiene Association		4,170 mG
Institute of Electrical and Electronics Engineers (IEEE) Standard C95.6 (General Public, Continuous Exposure)		9,040 mG
U.K., National Radiological Protection Board (NRPB)		833 mG
Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)		3,000 mG
State Standards and Guidelines		
State	**Line Voltage**	**Magnetic Field (Edge of ROW)**
Florida	69-230 kV	150 mG
	230-500 kV	200 mG
	>500 mG	250 mG
Massachusetts		85 mG
New York		200 mG

The effect of EMF on human health has been the subject of study for over 25 years. Of particular concern is the link between EMF exposure and cancer. Numerous panels of experts have convened to review research data on whether EMF is associated with adverse health effects. The studies have been conducted by the National Institute of Environmental Health Sciences (NIEHS), the USEPA, the World Health Organization (WHO), and the Minnesota State Interagency Working Group (MSIWG) on EMF issues. Studies regarding EMF exposure and childhood leukemia and other cancer risks have had mixed results. Some organizations have determined that a link between EMF and cancer exists while others have found this link to be weak or nonexistent.

In 1992, Congress initiated U.S. EMF Research and Public Information Dissemination (EMF RAPID). EMF RAPID program studied whether exposure to electric and magnetic fields produced by the generation, transmission, or use of electric power posed a risk to human health.

Program conclusions were presented to Congress on May 4, 1999 as follows:

- The scientific evidence suggesting that EMF-EMF exposures pose any health risk is weak.
- Epidemiological studies have serious limitations in their ability to demonstrate a cause and effect relationship whereas laboratory studies, by design, can clearly show that cause and effect are possible. Virtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal relationship between exposure to ELF-EMF at environmental levels and changes in biological function or disease status. The lack of consistent positive findings in animals or mechanistic studies weakens the belief that this association is actually due to ELF-EMFs, but it cannot completely discount the epidemiological findings.
- The NIEHS concludes that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the Unite States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern (NIEHS, 1999).

In October 1996, a National Research Council Committee of the National Academy of Sciences released a report which corroborated the findings of EMF RAPID. The report concluded:

> *Based on comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard.*

Currently the USEPA states the following viewpoint of the associated health effects of EMF on its website (USEPA: Electric and Magnetic Fields (EMF) Radiation form Power Lines, 2009):

> *Much of the research about power lines and potential health effects is inconclusive. Despite more than two decades of research to determine whether elevated EMF exposure, principally due to magnetic fields, is related to an increased risk of childhood leukemia, there is still no definitive answer. The general scientific consensus is that, thus far, the evidence available is weak and is not sufficient to establish a definitive cause-effect relationship (USEPA, 2009).*

In 2001, the World Health Organization (WHO) International Agency for Research on Cancer classified power-frequency EMF as a "possible carcinogenic to humans." Currently the WHO states the following viewpoint of the associated health effects of EMF on its website (WHO, 2009):

> *Extensive research has been conducted into possible health effects of exposure to many parts of the frequency spectrum. All reviews conducted so far have indicated that exposures below the limits recommended in the INNIRP (1998) EMF guidelines, covering the full frequency range from 0-300 GHz, do not produce any known adverse health effect. However, there are gaps in knowledge still needing to be filled before better health risk assessments can be made (WHO, 2009).*

In September of 2002, the MSIWG on EMF Issues, published "A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options," referred to as the "White Paper." The MSIWG was formed to examine the potential health impacts of EMFs and to provide useful, science-based information to policy makers in Minnesota. Work Group members included representatives from the Department of Commerce, the Department of Health, the Pollution Control Agency, the Public Utilities Commission, and the Environmental Quality Board (MSIWG, 2002). The White Paper concluded the following findings:

- Some epidemiological results do show a weak but consistent association between childhood leukemia and increasing exposure to EMF (see the conclusion of IARC and NIEHS). However, epidemiological studies alone are considered insufficient for concluding that a cause and effect relationship exists, and the association must be supported by data from laboratory studies. Existing laboratory studies have not substantiated this relationship (see NTP, 1999; Takebe et al., 2001), nor have scientists been able to understand the biological mechanism of how EMF could cause adverse effects. In addition, epidemiological studies of various other diseases, in both children and adults, have failed to show any consistent pattern of harm from EMF.
- The Minnesota Department of Health concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects. However, as with many other environmental health issues, the possibility of a health risk from EMF cannot be dismissed. Construction of new generation and transmission facilities to meet increasing electrical needs in the State is likely to increase exposure to EMF and public concern regarding potential adverse health effects.
- Based upon its review, the Work Group believes the most appropriate public health policy is to take a prudent avoidance approach to regulating EMF. Based upon this approach, policy recommendations of the Work Group include:
    - Apply low-cost EMF mitigation options in electric infrastructure construction projects;
    - Encourage conservation;
    - Encourage distributed generation;
    - Continue to monitor EMF research;
    - Encourage utilities to work with customers on household EMF issues; and
    - Provide public education on EMF issues (MSIWG, 2002).

As noted above, research has not been able to establish a cause and effect relationship between exposure to EMFs and adverse health effects. However, a general consensus has been formed to continue research on the health effects of EMFs. At this time, there are no federal standards in the United States to limit EMF exposure.

Continued Research

It is important to note that although expert panels and agencies, such as the ones discussed above, have not yet identified any viable cause and effect relationships between exposure to EMFs and adverse health effects, hypotheses have existed and continue to be researched.

For example, Dr. David O. Carpenter during the recent public hearing proceedings for the proposed 345 kV transmission line from Brookings County, South Dakota, to Hampton, Minnesota, provided pre-filed direct testimony regarding his findings on health effects associated with EMF. Dr. Carpenter is a public health physician and Director of the Institute for Health and the Environment at the University of Albany, SUNY. He researched and wrote a document titled, *Setting Prudent Public Health Policy for Electromagnetic Field Exposures*. Carpenter concludes "there is strong scientific evidence that exposure to magnetic fields from power lines greater than 4 milligauss (mG) is associated with an elevated risk of childhood leukemia" and that some studies have indicated that there is scientific evidence to suggest that exposures above 2 mG could increase leukemia risks. Carpenter goes on to suggest that "lifetime exposure to magnetic fields in excess of 2 mG is associated with an increased risk of neurodegenerative diseases in adults, including Alzheimer's disease and amyotrophic lateral sclerosis (ALS)."

Additionally, during his recent testimony on the proposed 345 kV HVTL in response to whether EMF similar to power line exposure can effect biological tissue, he states the following:

> *Any one of these actions [actions that alter cell tissue] might be responsible for the carcinogenic and/or neurodegenerative actions of EMFs. As with many environmental agents, however, assuming that only one mechanism of action exists would be a mistake, particularly where more than one disease is involved. It is more likely that multiple mechanisms of action would contribute to disease.*

EMF as it relates to public health and safety continues to be researched and reviewed.

Stray voltage has been raised as a concern on some dairy farms because it can impact operations and milk production. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm. In those instances when transmission lines have been shown to contribute to stray voltage, it was found that the electric distribution system directly serving the farm or the facilities themselves were directly under and parallel to the transmission line. These circumstances are considered in modern day routing/installing of transmission lines and can be readily avoided.

Mitigative Measures

As per the MDH White Paper recommendations concerning "prudent avoidance," utilities routinely provide information on the issue to the public, interested customers and employees.

This information contains references to studies, and provides data to help explain the relative impact of transmission line exposure to other EMF exposures most people experience throughout the day at home or at work. The Applicants stated in the application that they would use structure designs that minimize magnetic field levels and, where practicable, site facilities in locations affecting the fewest number of people.

6.8 Recreation

Recreational opportunities in Carlton and St. Louis counties include hiking, biking, canoeing, boating, fishing, camping, equestrian riding, swimming, hunting, riding ATVs and snowmobiles, and nature observation.

Recreational resources in the vicinity of the project are listed in **Table 12**.

Table 12. ELF EMF International and State Guidelines

Type	Resource
State	St. Louis River Savanna State Forest Fond Du Lac State Forest Wawina Peatland SNA Floodwood WMA Ricehaven WMA Carl Sandell WMA Mervin WMA Kettle Lake WMA
County/Regional	Island Lake County Park Carlton County Memorial Forest Snowmobile Trails

Potential Impacts

Because the proposed transmission line project is an upgrade to an existing line, there will be little additional impact on recreation. The transmission line crosses the St. Louis River, but does not cross state forest lands, SNAs or any WMAs.

However, where rebuilt lines are constructed, the visual setting for people biking, hiking, boating or birding near the new lines may be slightly affected. It is also possible that clearing vegetation underneath the utility lines will decrease the wildlife habitat within the immediate vicinity, potentially impacting viewing opportunities for the short term. Again, because there is an existing line in place, vegetation clearing will be limited.

The proposed route crosses snowmobile trails in both St. Louis and Carlton counties. The trails are located within Van Buren Township in St. Louis County and Red Clover Township in Carlton County. The proposed transmission line will likely stay within the same ROW corridor, therefore it will not significantly affect the visual field of snowmobilers. This recreational use will not be impacted by the proposed project.

Rebuilding the existing utility line along an existing transmission ROW will minimize any additional impacts to recreational resources. Because structures will be placed within existing utility ROW, impacts to previously undisturbed parks or management areas is unlikely. Permanent disturbance of wildlife habitat will also be minimized, avoiding impacts to hunting and wildlife observation.

The project will involve two crossings of the St. Louis River. Utility lines are already part of this landscape, and because the existing transmission line will be rebuilt within the same ROW, the recreational uses of these resources will not be affected. No significant changes to the visual setting or recreational uses for people using this section of the river are expected. The Applicants will coordinate with the DNR to ensure utility line construction will not impact the surrounding natural resources.

No impacts to local recreational resources such as the golf courses, museums, city parks, or campgrounds, are expected.

Mitigative Measures

Because no impacts to recreation are anticipated, no mitigation is necessary or proposed.

6.9 Land-based Economies

Agriculture

The transmission line would cross approximately 5.7 miles of agricultural land. There is no prime farmland along the proposed route. Some agricultural land will be temporarily removed from production during transmission line construction, but permanent agricultural land conversion associated with the transmission line will be minimal. Landowner compensation will be established by individual easement agreements. In general, agricultural areas surrounding transmission line poles can still be farmed. Because the proposed transmission line is along an existing route, impacts will be limited to the existing utility corridor.

Potential Impacts

The project will result in permanent and temporary impacts to agricultural land. Permanent impacts will occur as a result of structure placement (poles) along the route centerline. The area of impact will be the footprint of the pole itself and the area immediately surrounding the pole (approximately 30 square feet), although the majority of the ROW easement will be available for agricultural cultivation.

During construction, temporary impacts, such as soil compaction and crop damages within the ROW, are likely to occur.

No long-term impacts are anticipated to the agricultural economy from the project.

Mitigative Measures

The Applicants have stated that they will work with landowners to minimize impacts to all farming operations along the route, and will compensate landowners for any crop damage and soil compaction that may occur during construction. Areas disturbed during construction will be repaired and restored to pre-construction contours as required so that all surfaces drain naturally, blend with the natural terrain and are left in a condition that will facilitate natural revegetation, provide for proper drainage and prevent erosion.

The Applicant's stated in the HVTL Route Permit application that specific mitigation measures may include:

- Movement of crews and equipment will be limited to the ROW to the greatest extent possible, including access to the route. Contractors employed by the Applicants will limit movement on the ROW to minimize damage to grazing land, crops, or property. If movement outside of the ROW is necessary during construction, permission will be obtained and any crop damage will be paid to the landowner.

- When weather and ground conditions permit, deep ruts that are hazardous to farming operations will be repaired or compensation will be provided as an alternative if the landowner desires. Such ruts will be leveled, filled and graded or otherwise eliminated in an approved manner. In hay meadows, alfalfa fields, pastures and cultivated productive lands, compacted soils will be loosened and ruts will be leveled by scarifying, harrowing, disking, or by other approved methods. Damage to ditches, tile drains, terraces, roads and other features of the land will be corrected using approved methods and indigenous plants where necessary. The land and facilities will be restored as nearly as practicable to their original conditions.

- ROW easements will be purchased through negotiations with each landowner affected by the Project. Restoration or compensation will subsequently be made for reasonable crop damages or other property damage that occurs during construction or maintenance as negotiated.

- Construction will be scheduled during periods when agricultural activities will be minimally affected to the extent possible or the landowner will be compensated accordingly.

- Fences, gates and similar improvements that are removed or damaged will be promptly repaired or replaced.

Some temporary construction space will be needed for the project. For temporary marshalling yards, which will provide space to store material and equipment, the Applicants will lease the space by agreement with the respective landowner(s), remove and properly dispose of all material and debris, and repair all damages and perform restoration, as necessary. It is anticipated that minimal temporary construction space on property immediately adjacent to the ROW and on private property will be needed, with the exception of limited equipment access.

Forestry

Both St. Louis and Carlton counties are heavily forested; public agencies manage just under half of these forested lands. The proposed transmission line crosses wooded areas, some of which are privately-owned woodlots and shelterbelts. The transmission line would cross approximately 5.6 miles of upland forested land.

Potential Impacts

Because the route follows existing ROW for much of its length, clearing of trees would be minimal. Impacts to forested areas and shelterbelts along the rebuild portion of the route would be incidental, and would be limited to the amount necessary to permit safe and reliable operation of the transmission line. Due to safety concerns, any trees that would grow taller than 15 feet within the ROW would need to be removed beneath overhead lines. Additionally, a 10-foot radius around each structure would be kept free of woody vegetation.

Mitigative Measures

The forest resources located along the proposed route alignment will not be significantly affected from a composition or economic standpoint. Because the proposed route follows an existing transmission line, additional forest impacts due to additional ROW acquisition and subsequent clearing will be minimal. Clearing of the ROW in forested areas will be limited to the amount necessary to permit the safe and reliable operation of the transmission line.

The Applicant's stated in the HVTL Route Permit application that specific mitigation measures may include the following:

- Clearing for access to the ROW that is necessary for passage of construction equipment will be limited to only those trees necessary.

- Vegetation within these temporary access points will be restored.

- Native shrubs that will not interfere with the safe operation of the transmission line will be allowed to reestablish in the ROW.

- Great River Energy will replace or compensate for windbreaks as determined through negotiations with individual landowners.

Mining

According to the Minnesota Department of Transportation (MnDOT) county pit maps for St. Louis and Carlton counties, there are gravel pits, rock quarries and commercial aggregate sources in the vicinity of the project. Because no existing gravel and rock resources are being utilized within the proposed route, no impacts are anticipated. Unknown resources that may exist along the proposed route would be situated in close proximity to existing utility and roadway ROW, making development unlikely.

Potential Impacts

Since there are no mineral mining or "known but undeveloped resources" along the proposed route, the project has no potential impact on mineral mines.

Additionally, the project would be constructed in the existing ROW and the number of transmission line poles may be reduced. Any potential aggregate resources in the ROW would have already been impacted in terms of their availability for development. Therefore, there would be no additional impacts on potential aggregate resources in the project area.

Mitigative Measures

Because no impacts are anticipated, no mitigation is required.

6.10 Commercial, Industrial, Residential Land Use

The project covers a variety of land use patterns in a generally rural environment. The route runs along State Highway 73, continuing along Hingley Road, County Rd 965 (CSAH 86), Duluth Street, Vincent Road (CSAH 8), Hill Rd, Benson Road (CR 171), CSAH 29, Stremel Road (CR 192) and Parantala Road (CR 732).

The route is dominated by forest, with areas of grassland, cropland, wetlands and waters, and residential land uses scattered throughout; land use maps provided by the Applicants are contained in **Appendix D**.

Appendix E contains zoning maps of the project area provided by the Applicants.

A portion of the proposed project is located in southwestern St. Louis County where it crosses Cedar Valley, Van Buren, Floodwood and Fine Lakes townships. The St. Louis County current Zoning Map shows that the majority of the route crosses areas with zoning classifications of Forest Agricultural Management and Mixed Use (Multiple Use Non-Shoreland), with some Residential areas associated with lakes near the St. Louis County/Carlton County border.

In the vicinity of the proposed route, the St. Louis River is defined as a Shoreland Mixed Use zoning district in St. Louis County. The proposed crossing of the St. Louis River is in an existing corridor and complies with the zoning district use restrictions.

The proposed route crosses northwestern Carlton County in Eagle and Kalevala townships. According to the Carlton County Zoning Map, the majority of the route crosses areas with zoning classifications of Agricultural/Forest Management (A-1) and Agriculture/Rural Residential (A-2). There is also a Municipality (City of Cromwell) and a small portion of Recreation Residential (R-1) at the south end of the project.

Red Clover Township is unincorporated and has no zoning ordinance; therefore, Carlton County zoning applies.

Potential Impacts

The Applicant's preferred alignment minimizes new impacts to existing land uses by following existing transmission line ROW for much of its length.

As discussed previously, the Applicant will need to acquire new or up-date existing easements for the HVTL right-of-way if a route permit is granted. An easement is an interest in land purchased by a utility, which permits the use of that land for a specific purpose. In this case, GRE's easement would permit construction, operation and maintenance of an overhead transmission power line. The easement also permits the trimming and removal of trees within the easement to prevent them from touching the line.

The existence of a transmission line easement restricts some possible uses for the property. Acceptable uses within the easement areas include planting crops, pasture, roadways, curbs and gutters. The two most common restrictions would include prohibiting construction of permanent structures or buildings within the easement area and restrictions on planting trees that may grow into the lines; properties with existing structures very close to or within the current ROW may have further restrictions placed on them.

The project would be design to meet or exceed the clearance standards provided in NESC Section 232 for a 115 kV transmission line, which require a 9' 1'' horizontal distance between the conductor and a building; a 15' 1'' vertical distance between the conductor and a roof/balcony accessible by people; and a 20' 1'' vertical distance between the conductor and a roadway or parking lot

An additional potential adverse effect of transmission lines on adjacent properties is on the ability of homeowners and developers to obtain Federal Housing Administration (FHA) and/or Housing and Urban Development (HUD) loans. Section 2.2(J) of the current HUD guidebook 4150.2 addresses this issue in the following FAQ:

FAQ : Is a property eligible for FHA if there are overhead or high voltage power lines nearby?

The appraiser must indicate whether the dwelling or related property improvements is located within the easement serving a high-voltage transmission line, radio/TV transmission tower, cell phone tower, microwave relay dish or tower, or satellite dish (radio, TV cable, etc).

1. If the dwelling or related property improvement is located within such an easement, the lender must obtain a letter from the owner or operator of the tower indicating that the dwelling and its related property improvements are not located within the tower's (engineered) fall distance in order to waive this requirement.

2. If the dwelling and related property improvements are located outside the easement, the property is considered eligible and no further action is necessary. The appraiser, however, is instructed to note and comment on the effect on marketability resulting from the proximity to such site hazards and nuisances.

Impacts of the new HVTL ROW are expected to be minimal because the line is adjacent to roadways through these areas.

Mitigative Measures

In general, the rebuild portions of the line would not create new impacts on existing or proposed land use; therefore, no mitigation would be necessary for the majority of the proposed rebuild; however, potential impacts to those properties with existing structures very close to or within the current ROW may be mitigated through final design efforts such as placing the conductors on a single side of the support towers, adjustments in final alignment within the proposed route, and selection of span width and tower placement.

The Applicants stated in the application that they would work with St. Louis and Carlton counties, city staff and business owners to ensure that impacts to land use from the construction of the line are minimized and addressed.

6.11 Public Services and Transportation

The project generally runs through rural areas with typical public services (police, fire protection, waste collection, natural gas, wells, septic systems, cable television, electricity, telephone, etc.). Because the route follows existing transmission line ROW, no impacts to public services are anticipated and therefore no mitigation is necessary.

The transportation network that may be used to develop and operate this project is comprised of various county, trunk and U.S. highways. Few urban areas exist within the project area. Two active BNSF Railway Company railroad lines are present within the project area.

MnDOT has adopted a formal policy and procedures for accommodation of utilities on the highway rights-of-way (Utility Accommodation Policy). A copy of MnDOT's policy can be found at:

http://www.dot.state.mn.us/utiIity/files/pdflappendix·b.pdf

Potential Impacts

No impacts are anticipated to public services due to construction or operation of the proposed project.

In general, the proposed route is located in rural areas served by highways and county roads with relatively low traffic volume. Therefore, congestion is not a primary factor on any of the roadways along the route. Temporary and permanent licenses for both construction and utility line operation would be required from the BNSF. Construction activities would be regulated by the carrier and any disruptions to rail service would require approval by the carrier.

Temporary access for the rebuild of transmission lines along the route would be along the existing transmission line ROW or by short spur trails from the existing road network to the ROW. Temporary guard structures would be used to string conductor over existing roads and railroads. The structures typically consist of directly-imbedded poles with a horizontal cross piece to support the conductor at sufficient height above traffic. Temporary traffic impacts associated with equipment are material delivery and worker transportation.

Mitigative Measures

The Applicant has stated that access to modify the existing substations and the newly constructed substation would be from existing roads and would only cause minor and temporary disruption to traffic. Given the small number of workers and construction vehicles, traffic disruptions would be minimal and localized.

The Applicant has reviewed county highway capital improvement plans for the project area; no major road work along the route is planned. It is expected that general upkeep of the roads along the route will take place.

Short-term localized traffic delays are anticipated. The impacts resulting from construction and operation of the proposed transmission lines and modifications to substations would be minimal for transportation.

During transmission line and substation modification/construction activities, delays to railroad operations due to construction vehicles or equipment crossing tracks is not anticipated; the Applicant has stated that construction activities will be coordinated with local railroad operators.

When appropriate, pilot vehicles will accompany the movement of heavy equipment. Traffic control barriers and warning devices will be used when appropriate. All necessary provisions will be made to conform to safety requirements for maintaining the flow of public traffic. Construction operations will be conducted to offer the least possible obstruction and inconvenience to the traveling public. The construction contractor would be required to plan and execute delivery of heavy equipment in such a

manner that would avoid traffic congestion and reduce likelihood of dangerous situations along local roadways.

6.12 Archaeological and Historic Resources

As part of the project's pre-planning phase, the Minnesota State Historic Preservation Office (SHPO) and the Office of the State Archaeologist were contacted by the Applicants during their cultural resource literature review. The focus of the review included the proposed transmission line route and proposed substation, including a one-mile buffer. Historic property location maps, site forms, and survey reports were among the sources consulted. Sources examined included the historic Trygg maps, the Andreas' Illustrated Atlas of Minnesota, 1874 and archaeological site files.

The Applicants examined archaeological site files to obtain a list of all previously recorded archaeological sites in the vicinity of the project (**Table 13**). Multiple historic structures were found within the one-mile buffer; most of which have been determined as not eligible for listing on the National Register of Historic Places (NRHP) or have not been evaluated for listing.

One archaeological site, an artifact scatter with associated structural ruins, is located in Floodwood Township in St. Louis County. The historic Trygg maps identify several historic trails and roads in the general project area.

Table 13. Previously Identified Historic Properties

SHPO Number	Archaeology/Historic	Township	Range	Section	Quarter Sections
CL-CRO-007	Historic	49	20	33	SE-SE-SW
CL-CRO-002	Historic	49	20	33	NW-SW-SE
CL-CRO-001	Historic	49	20	33	SW-SW-SE
CL-CRO-020	Historic	48	20	4	NW-SE
CL-CRO-019	Historic	48	20	4	SW-NE
CL-CRO-016	Historic	48	20	4	NW-NE
CL-CRO-017	Historic	48	20	4	NW-NE
CL-CRO-015	Historic	48	20	4	NW-NE
CL-CRO-012	Historic	48	20	4	SE-SW
CL-CRO-013	Historic	48	20	4	SE-NW
CL-CRO-014	Historic	48	20	4	NW-NE
CL-CRO-018	Historic	48	20	4	NW-NE
CL-CRO-009	Historic	48	20	4	NE-NE-NW
CL-CRO-010	Historic	48	20	4	NW-NE-NE
CL-CRO-003	Historic	48	20	4	SW-NE
CL-CRO-008	Historic	48	20	4	NW-NW-NE
CL-EAG-008	Historic	48	20	8	NE-SE
CL-EAG-009	Historic	48	20	8	SE-NE
CL-EAG-010	Historic	48	20	16	NW-NW
CL-EAG-007	Historic	48	20	17	SE-SE
CL-EAG-006	Historic	48	20	20	NE-NE

CL-EAG-005	Historic	48	20	20	SE-SE
CL-EAG-013	Historic	48	20	21	NW-SW
CL-EAG-012	Historic	48	20	21	NW-SW
CL-EAG-011	Historic	48	20	21	NW-NW
CL-EAG-014	Historic	48	20	28	NW-NW
CL-EAG-015	Historic	48	20	28	SW-NW
CL-EAG-016	Historic	48	20	28	NW
CL-EAG-001	Historic	48	20	28	SW-SW-SW
CL-EAG-004	Historic	48	20	29	SE-NE
CL-EAG-004	Historic	48	20	29	SE-NE
CL-EAG-003	Historic	48	20	32	SE-SE
CL-CRO-011	Historic	48	20	33	SE-SW-SE
CL-EAG-002	Historic	48	20	33	NW-NW-NW
CL-CRO-005	Historic	48	20	33	SW-SW-SE
CL-CRO-004	Historic	48	20	33	SE-SW-SE
CL-CRO-006	Historic	48	20	33	SE-SW-SE
CL-KAL-008	Historic	47	20	5	NW-NW
CL-KAL-005	Historic	47	20	8	SW-NW
21SL0874	Archaeology	51	20	27	SE

Potential Impacts

Because the proposed project is the rebuild of an existing line and is adjacent to roads for approximately 76 percent of the length, the corridor has already been disturbed and the likelihood of affecting archaeological resources is relatively low. Archaeological sites may be disturbed during construction of transmission structures, substations and substation expansions, maintenance structures, staging areas or access roads. Historic buildings or other sites may be impacted as well in that construction of modern transmission structures may compromise the integrity of a historic viewshed from or to above ground archaeological and historic resources.

Since there is a line already in place, significant visual change is not anticipated.

Mitigative Measures

Avoidance of archaeological and historic architectural properties in designing and locating HVTLs is the Applicants' preferred policy, as stated in their application.

The Applicants contacted the Minnesota Historical Society (MHS) and requested information on the possible effects of the proposed project on historic properties in the project area. MHS indicated that the proposed project was reviewed pursuant to the responsibilities given the State Historic Preservation Officer by the National Historic Preservation Act of 1966 and the Procedures of the Advisory Council on Historic Preservation (36 Code of Federal Regulations 800), and to the responsibilities given the MHS by the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act.

The MHS recommended that an archaeological survey be completed if it cannot be documented that the area was previously disturbed; a common condition included in HVTL Route Permits would require the Applicants to work with the SHPO during the design and pre-constrcution process to determine what areas may require surveys for the project. Once line design is complete and pole locations are known, the route will be visually inspected to assess cultural resource potential. Segments of the route considered to be of high potential for the existence of archaeological deposits will be physically inspected. If surface visibility is sufficient, pedestrian survey will be conducted within the project ROW. If surface visibility is not sufficient to allow pedestrian survey, subsurface investigations will be initiated.

If any archaeological sites are identified during placement of the poles along the permitted route, construction work will be stopped and MHS staff consulted as to how to proceed. The Applicants will make every effort to avoid impacts to identified archaeological and historic resources. In the event that an impact would occur, the Applicants will consult with SHPO and invited consulting parties (particularly Native American Tribes and other State and Federal permitting or land management agencies) on whether or not the resource is eligible for listing in the NRHP. While avoidance of the resource would be a preferred action, mitigation for project-related impacts on NRHP-eligible archaeological and historic resources may include an effort to minimize project impacts on the resource and/or additional documentation through data recovery.

The Applicants submitted a project review request letter to the Fond du Lac Band of Lake Superior Chippewa; no response was received.

6.13 Natural Environment

Air Quality

There are minimal air quality impacts associated with transmission line construction and operation. The only potential air emissions from a transmission line result from corona. Corona can produce ozone and oxides of nitrogen in the air surrounding the conductor. Corona consists of the breakdown or ionization of air in a few centimeters or less immediately surrounding conductors. For 115/115 kV double-circuit, 115 kV single-circuit and 161 kV single-circuit transmission lines, the conductor gradient surface is usually below the air breakdown level.

Calculations done for a 345 kV project showed that the maximum one hour concentration during foul weather (worst case) would be 0.0007 ppm ozone. This is well below both the federal (0.075 ppm 8 hour) and state standards (0.08 ppm 8 hour) for ozone.

The Henshaw Effect is a theory that fine particulates already present in the air surrounding HVTLs may become ionized from HVTL corona. Ionization of the particulates is believed by Dr. Denis Henshaw, HH Wills Physics Laboratory, University of Bristol, United Kingdom, to increase the deposition of the fine particulates within the lungs. Fine particulates may be comprised of polycyclic aromatic hydrocarbons. The increased deposition may lead to increased lung disease and cancer rates.

Temporary fugitive dust emissions from construction activities may occur. Along the proposed route, clearing vegetation and driving the utility poles may create exposed areas susceptible to wind erosion. In addition, tailpipe emissions may generate exhaust from the construction vehicles.

Fugitive dust is considered particulate matter under air quality regulations. The concentrations of fugitive dust that is fine particulate matter (PM less than 2.5 microns or PM2.5) is generally small or approximately three percent to ten percent of total particulate matter (USEPA's AP-42, Sections 13.2 and 11.9). Since fine particulate matter has the potential to travel further into the lungs, it is of greater concern than larger particle size ranges.

Potential Impacts

Currently, both state and federal governments have regulations regarding permissible concentrations of ozone and oxides of nitrogen. The national standard is 0.08 ppm on an eight-hour averaging period. The state standard is 0.08 ppm based upon the fourth-highest eight-hour daily maximum average in one year. Calculations using the Bonneville Power Administration (BPA) Corona and Field Effects Program Version 3 (USDOE, BPA Undated) for a standard single-circuit 161 kV project, predicted the maximum concentration of 0.007 ppm near the conductor and 0.0003 ppm at one meter above ground during foul weather or worst-case conditions (rain at 4 inches per hour). During a mist rain (rain at 0.01 inch per hour), the maximum concentrations decreased to 0.0003 ppm near the conductor and 0.0001 ppm at one meter above ground level. For both cases, these calculations of ozone levels are well below the federal and state standards. Studies designed to monitor the production of ozone under transmission lines have generally been unable to detect any increase due to the transmission line facility. Given this, there would be no impacts relating to ozone for the project.

There would be limited emissions from vehicles and other construction equipment and fugitive dust from ROW clearing during construction of the transmission line and substation. Temporary air quality impacts caused by the construction-related emissions are expected to occur during this phase of activity. The magnitude of the construction emissions is influenced heavily by weather conditions and the specific construction activity occurring. Exhaust emissions from primarily diesel equipment would vary according to the phase of construction but would be minimal and temporary. Adverse impacts to the surrounding environment would be minimal because of the short and intermittent nature of the emission and dust-producing construction phases.

Mitigative Measures

As a common HVTL Permit condition, construction activities must follow best management practices (BMPs) to control air emissions (fugitive dust). Petroleum based dust suppressants may not be used. Construction vehicles with excess tailpipe emissions would not be operated until repairs to the vehicle could be made. The disturbed area for each route would be minimized.

There would be no significant impacts to air quality; therefore, no mitigation beyond BMPs would be necessary.

Water Quality

Hydrologic features in the project area and along the proposed route are shown on mpas provided by the Applicants and contained in **Appendix F**. Hydrologic features, such as wetlands, lakes, rivers and floodplains perform several important functions within a landscape, including flood attenuation, groundwater recharge, water quality protection and wildlife habitat production.

The project lies within the St. Louis watershed of the Lake Superior Basin

Lakes in the project area include Prairie Lake (848 acres), Mud Lake, Blackwood Lake (34 acres), Cross Lake (104 acres), Springer Lake (8 acres), North Island Lake (113 acres), South Island Lake (319 acres), Flower Lake (12 acres) and Eagle Lake (389 acres). The route comes the closest to Cross Lake, approximately 140 feet from the riparian area and 300 feet from open water

There are a number of rivers and streams in the project area, including the St. Louis River, Floodwood River, East Savanna River, McCarty River, Prairie River, Tamarack River, Kettle River and Heikkila Creek. The proposed transmission line will cross tributaries to the Floodwood River, the St. Louis River and tributary, McCarty River, Prairie River, Tamarack River and two drainages between lakes.

Riparian areas are ecosystems that occur along watercourses or at the fringe of water bodies. Riparian areas, herein, are defined as the land within 300 feet of streams and within 1,000 feet of lakes. These distances are consistent with the definition of shoreland in the DNR Statewide Standards. These statewide standards set guidelines for the use and development of shoreland (riparian) property around all lakes greater than 25 acres (10 acres in municipalities) and rivers with a drainage area of two miles or greater. The proposed route crosses riparian areas associated with the rivers and streams as listed above.

Public Waters are wetlands, water basins and watercourses of significant recreational or natural resource value in Minnesota as defined in Minnesota Statutes Section 103G.005. The DNR has regulatory jurisdiction over these waters, which are identified on the hydrologic features maps (Appendix F) and listed in **Table 14**. The transmission line would cross 10 Public Waters and associated floodplains.

Wetlands are important resources for flood abatement, wildlife habitat, and water quality. Wetlands that are hydrologically connected to the nation's navigable rivers are protected federally under Section 404 of the Clean Water Act. In Minnesota, wetlands are also protected under the Wetland Conservation Act. The USFWS produced maps of wetlands based on aerial photographs and NRCS soil surveys starting in the 1970s; these wetlands are known as the National Wetland Inventory (NWI). The transmission line would cross approximately 5.9 miles of NWI wetlands. Scrub-shrub and forested wetlands are the dominant wetland types.

Table 14. Public Waters

County	Name	Type	Location
St. Louis	Tributary of Floodwood River	Stream	T52N, R20W, Section 7
	Tributary of Floodwood River	Stream	T52N, R20W, Section 20
	St. Louis River	River	T52N, R20W, Section 33
	McCarty River	River	T51N, R20W, Section 15
	St. Louis River	River	T51N, R20W, Section 27
	Tributary of St. Louis River	Stream	T51N, R20W, Section 34
	Drainage between Prairie Lake and Mud Lake	Stream	T50N, R20W, Section 28
Carlton	Prairie River	River	T49N, R20W, Section 4
	Tamarack River	River	T49N, R20W, Section 32
	Drainage between Eagle Lake and Island Lake	Stream	T49N, R20W, Section 9

The wetland types and lengths within the proposed route are provided in **Table 15** and shown in Appendix F. Wetlands classified as Palustrine Emergent (PEM) make up approximately 18% of the wetland types. Those classified as Palustrine Scrub-Shrub (PSS) make up approximately 60.5% and Palustrine Forested (PFO) wetlands make up approximately 21.5 percent.

Table 15. Wetlands Identified in the Vicinity of the Project

Cowardin Type[1]	No. of Basins	Length of Crossing (miles)	Percent of Wetland Type within Proposed Route
PEMB	9	0.9	15
PEME	1	0.2	3
PFOB	7	0.3	5
PFO4B	4	0.5	8.5
PF0/SSB	5	0.3	5
PF01/SSB	1	0.2	3
PSSB	11	0.6	10
PSS1B	2	0.4	7
PSS1C	1	0.1	2

Cowardin Type[1]	No. of Basins	Length of Crossing (miles)	Percent of Wetland Type within Proposed Route
PSS1/EMC	1	0.1	2
PSS/EMB	9	1.6	27
PSS/EM5B	1	0.1	2
PSS3BG	1	0.5	8.5
PSSE	1	0.1	2
Total	**54**	**5.9**	**100**

The proposed transmission line rebuild will have minor, mostly short term effects on surface water resources. Most potential effects on surface waters will be related to construction of the transmission line across wetlands proximal to the existing transmission corridor. The project could require wetland and water resource approvals from the U.S. Army Corps of Engineers (USCOE), MnDNR, St. Louis and Carlton County. These agencies administer regulatory programs of the federal Clean Water Act and Rivers and Harbors Act, the Minnesota Public Water Resources Act and Utility Crossing Licenses, and the Minnesota Wetland Conservation Act (WCA).

The DNR divides Minnesota into six groundwater provinces. St. Louis and Carlton counties fall into the Central Province, which is described as sand aquifers in generally thick sandy and clayey glacial drift overlaying Precambrian and Cretaceous bedrock. Fractured and weathered Precambrian bedrock is used locally as a water source.

Potential Impacts

The majority of the project proposes to replace an existing line with structures that have a similar footprint; therefore, the project would not result in any substantial, permanent wetland impacts or changes. Minimal temporary impacts to wetlands may occur from construction activities and access to the line. Minimal temporary impacts to wetlands may occur if these areas need to be crossed during construction of the transmission ROW. However, the crossing wetlands during construction will be avoided to the greatest extent feasible.

During construction, there is the possibility of sediment reaching surface waters as the ground is disturbed by excavation, grading and construction traffic. As a standard HVTL Permit condition, the Applicant would be required to employ erosion control BMPs; as well as, adherence to the terms and conditions of the National Pollution Discharge Elimination System (NPDES) permits and Stormwater Pollution Prevention Plan (SWPPP).

After construction, maintenance and operation activities for substation or transmission line facilities are not expected to have an adverse impact on surface water quality. The small increase in impermeable surface area, resulting from construction and expansion of the project substations, could increase the

likelihood of sediment in runoff reaching surface water features. However, the majority of the substation areas would remain as permeable surfaces. BMPs would be employed and erosion potential is not expected to be higher than under the existing land use at the sites.

No impacts to groundwater in the project area are anticipated.

Mitigative Measures

BMPs include maintaining sound water and soil conservation practices during construction and operation of the project to protect topsoil and adjacent water resources and minimize soil erosion. Practices can include containing excavated material, protecting exposed soil and stabilizing restored soil. Major disturbance of individual wetlands and drainage systems can be avoided during construction by spanning wetlands and drainage systems where possible. When it is not possible to span the wetland, the Applicants have stated that they would draw on several options during construction to minimize impacts:

- When possible, construction would be scheduled during frozen ground conditions.
- Crews would attempt to access the wetland with the least amount of physical impact to the wetland (e.g., shortest route).
- The structures would be assembled on upland areas before they are brought to the site for installation.
- When construction during winter is not possible, plastic/wood/composite mats would be used where wetlands would be impacted.

The transmission line rebuild may require waters and wetlands permits, letters of no jurisdiction, or exemptions from the USCOE, MnDNR Division of Waters, and St. Louis or Carlton counties. Wetland and surface water impacts will be avoided and minimized to the extent practicable. After coordination and application submission, authorization from the USACE would likely fall under a Letter of Permission (LOP-05-MN) or the utility line discharge provision of a Regional General Permit (RGP-3-MN). The MnDNR Division of Waters requires a Public Waters Work Permit for any alteration of the course, current, or cross-section below the ordinary high water level of a Public Water or Watercourse. No such alterations are anticipated. St. Louis and Carlton counties administer the WCA in the project area. It is likely that wetland impact minimization will allow the project to be eligible for a WCA de minimis or utilities exemption. If that is not the case, WCA permits will be required.

Minnesota Statutes Section 84.415 requires a utility to obtain a license from the MnDNR Division of Lands and Minerals for the passage of any utility over, under, or across any state land or public waters. Therefore, the Applicants will either confirm the applicability of existing licenses for these crossings or obtain new utility crossing licenses prior to construction.

The MPCA regulates construction activities that may impact storm water under the Clean Water Act. It is anticipated that a National Pollution Discharge Elimination System (NPDES) construction storm

water permit and Stormwater Pollution Prevention Plan (SWPPP) will be required for the project; as a standard HVTL Permit condition the Applicants will obtain the permit and develop a SWPPP as needed. An NPDES permit is required for owners or operators for any construction activity disturbing: 1) one acre or more of soil; 2) less than one acre of soil if that activity is part of a "larger common plan of development or sale" that is greater than one acre; or 3) less than one acre of soil, but the MPCA determines that the activity poses a risk to water resources.

Flora

Pre-settlement vegetation consisted of lowland conifers (black spruce, tamarack, and white cedar), lowland hardwoods (black ash), sedge meadows, aspen-birch, northern hardwoods, upland conifers, white pine-red pine forests, and mixed hardwood-pine forests.

Transmission line construction impacts to trees and woodlands will be minimized because the transmission line rebuild will follow existing right-of-way.

Potential Impacts

Permanent impacts would be minor since the transmission line would be constructed on an existing utility ROW. Temporary impacts may occur due to activities associated with pole construction, including minor vegetative clearing for excavation, leveling and heavy equipment traffic. Vegetative clearing would include felling trees along the existing transmission line route and temporarily trimming or removing any shrubs or tall grass. Similar to existing maintenance practices, trees that would grow to taller than 15 feet would be removed beneath the overhead lines.

The ROW clearing for the project may result in the spread or introduction of noxious weeds or invasive plant species. Minnesota Statutes, section 18.78 requires property owners to eradicate or control noxious weeds. The Applicants have stated that they will institute measures to control the spread of noxious weeds during construction. Additionally, the Applicants will comply with all noxious weed laws in Minnesota and will control noxious weeds that are found in the ROW during vegetation maintenance activities.

Mitigative Measures

During construction of the transmission line, impacts to forestry and vegetative resources would be avoided whenever possible. The Applicants intend to utilize the existing ROW where clearance requirements have been followed for many years. Additionally, the Applicants would maintain sound water and soil conservation practices during construction and operation of the project to protect topsoil and adjacent water resources, and minimize soil erosion. Areas disturbed due to construction activities would be restored to pre-construction contours. In non-cultivated areas, reseeding would occur in a timely manner using a seed mix certified to be free of noxious weeds, if acceptable to the affected landowner.

Fauna

While not crossed by the proposed route, there are several areas in the project area where natural environment is being managed, including:

- Savanna State Forest
- Fond Du Lac State Forest
- Wawina Peatland SNA
- Floodwood WMA
- Ricehaven WMA
- Carl Sandell WMA
- Mervin WMA
- Kettle Lake WMA

These resources provide potential habitat for native vegetation, wildlife and rare and unique resources.

The agricultural lands, grasslands, wetlands, and woodlands in the area provide habitat for a variety of wildlife. Wildlife and other organisms that inhabit the project Area include small mammals such as mice, voles, and ground squirrels; large mammals such as white-tailed deer; waterfowl and other water birds like pelicans and egrets, songbirds, raptors, upland game birds; and reptiles/amphibians such as frogs, salamanders, snakes, and turtles.

Wildlife that resides within the construction zone will be temporarily displaced to adjacent habitats during the construction process. It is anticipated that fish and mollusks that inhabit the local watercourses will not be affected by transmission line rebuild.

The reconstructed transmission line may affect raptors, waterfowl and other bird species. Birds have the potential to collide with all elevated structures, including power lines. Avian collisions with transmission lines can occur in proximity to agricultural fields that serve as feeding areas, wetlands and water features, and along riparian corridors that may be used during migration.

The electrocution of large birds, such as raptors, is more commonly associated with small distribution lines than large transmission lines. Electrocution occurs when birds with large wingspans come in contact with two conductors or a conductor and a grounding device. Utility transmission and distribution line design standards provide adequate spacing to eliminate the risk of raptor electrocution and will minimize potential avian impacts of the proposed project.

Potential Impacts

Wildlife that inhabits natural areas such as meadows, rivers and lakes could be impacted in the short-term within the immediate area of construction. The distance that animals would be displaced would depend on the species. Impacts to wildlife are anticipated to be short-term since the route primarily would be constructed along an existing transmission line ROW, and the amount of grading and clearing required is minimal. Additionally, the animals in the areas where new construction would occur would be typical of those found in agricultural and rural settings. The new construction should not affect these

animals because rural agricultural habitat would remain in the immediate vicinity. Impacts to the wooded areas along the project route would be avoided when possible.

Raptors, waterfowl and other bird species may also be affected by the construction and placement of the transmission lines. Avian collisions are a possibility after the completion of the transmission line. Waterfowl are typically more susceptible to transmission line collision, especially if the line is placed between agricultural fields that serve as feeding areas, or between wetlands and open water which serve as resting areas.

Mitigative Measures

There is minimal potential for the displacement of wildlife and loss of habitat from construction of the project.

As a common HVTL Permit condition, the Applicant would be required to consult with the DNR to discuss the appropriate placement and design for counter measures (diverter technologies) to reduce the potential for avian collision with the transmission lines.

6.14 Rare and Unique Natural Resources

There are nine known occurrences of rare or unique resources identified within two miles of the project area; they are listed in **Table 16** and shown on the maps provided by the Applicants in **Appendix G**. These resources were identified using the MnDNR Natural Heritage Databaseand the native plant community was mapped by the Minnesota DNR County Biological Survey (Minnesota DNR, 2008b).

Table 16. Rare and Unique Resources in the Vicinity of the Project

Common Name	Scientific Name	Number of Occurrences	Federal Status	MN Status*	State Rank**	Habitat
Colonial Waterbird Nesting Site	Various	1	N/A	N/A	SNR	Marshes, lakes.
American Bittern	Botaurus lentiginosus	3	None	NON	S4B	Thick vegetation of freshwater marshes.
Sandhill Crane	Grus canadensis	1	None	NON	S4B, SNRM	Wet meadows, open landscapes.
Bog Copper	Lycaena epixanthe michiganensis	1	None	NON	S4	Butterfly found in acid bogs and boggy marshes.
Cuckoo Flower	Cardamine pratensis var. palustris	1	None	NON	SNR	Lake, marsh, fen and streamside sites.

Common Name	Scientific Name	Number of Occurrences	Federal Status	MN Status*	State Rank**	Habitat
Eastern Hemlock	Tsuga canadensis	1	None	SPC	S3	Scattered in mixed hardwood-conifer forests; typically on moist, well-drained soils in cool, sheltered valleys and ravines.
White Adder's -Mouth	Malaxis monophyloss var.brahypoda	1	None	SPC	S3	Bog orchid found in conifer swamps within forested rich peatlands; usually occur near the upland margin of the swamp.
Spiny Hornwort	Ceratophylumm echinatum	1	None	NON	SNR	
Vasey's Pondweed	Potamogeton vaseyi	1	None	SPC	S3	Rooted, aquatic macrophyte; inhabits small, softwater lakes.

All of the occurrences of rare features, except for one botanical feature, were recorded outside of the proposed route. The proposed route passes just to the west of a DNR Site of Moderate Biodiversity Significance south of Gowan.

Potential Impacts

In general, impacts to rare and unique natural resources would be avoided because the project is a rebuild of an existing line ROW.

Mitigative Measures

Rebuilding along existing transmission ROW will avoid impacting undisturbed habitat along the route. As a common HVTL Permit condition, the Applicant would be required to consult with the DNR as to the need for additional assessment relative to the identified rare botanical found within the proposed route at T49N R21W Section 21.

The Applicants have stated that measures will be used to help avoid or minimize impacts to area wildlife and rare natural resources during and after the completion of the proposed transmission line; these measure include:

- Minimize tree felling and shrub removal that are important to area wildlife.
- Utilize BMPs to prevent erosion of the soils in the areas of impact.

- Implement sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent water resources and minimize soil erosion. Practices may include containing excavated material, protecting exposed soil, and stabilizing restored soil.
- Re-vegetate disturbed areas with native species and wildlife conservation species where applicable.
- Implement raptor protection measures, including placement of bird flight diverters on the line at water crossings after consultation with local wildlife management staff.

7.0 Potential Impacts Comparison of Alternate Routes

In the Alternative Routing Process, applicants are not required to provide any routes for review other than their proposed, preferred route. However, alternatives are often brought forward during the scoping process by concerned citizens or local governments. In this case, three alternatives were developed through the scoping process and carried forward into the *Scoping Decision* for further consideration.

Descriptions of these alternatives are presented in Section 5; potential impacts are discussed below.

7.1 Goodell Alternatives

This alternative route segment would impact five new parcels; four corporate owned (Potlatch Corporation and Northwest Paper Company) parcels and one private, undeveloped parcel (Hokala). The relocation of the ROW would move the line off of four privately owned parcels, two of which are developed (**Appendix C Key Map Book, Goodell Alternative Route Segment Maps 1 and 2**).

Table 17 contains comparative data for the Goodell Alternative compared to Xcel Energy's proposed HVTL route/alignment.

Lake Country Power – Distribution Line

Lake County Power's (LCP) existing distribution line is located on the south side of CSAH 86, near the edge of the southern road ROW. Great River Energy's existing 69 kV line is located approximately 50 feet south of the LCP distribution line, further into private property.

Lake Country Power does not have a need to modify their existing line as a result of the Savanna Project and no change to the Lake County Power line has been considered.

Great River Energy has stated that in an effort to minimize the necessary ROW for the proposed double-circuit 115/69 kV transmission line, GRE would be willing to shift the new line approximately 20 to 25 feet to the north (i.e., closer to the Lake County Power distribution line). This would result in a narrowing of the distance between the LCP distribution line and the proposed GRE HVTL to 25 or 30 feet instead of the existing 50 feet.

If the Commission adopts the Goodell Alternative, thus requiring the 115/69 kV transmission line to be constructed along the north side of CSAH 86, GRE proposes that the new HVTL be located 3-5 feet outside of road right-of-way; this would necessitate a new fifty-five foot wide ROW (easement) and the associated vegetation clearing.

Table 17. Comparison of Impacts, Goodell Alternative Route Segment

Proximity to Structures from Alignment (w/in 150ft)			
Route	**Type**	**PID**	**Distance (feet)**
Goodell Alternative	Residence	NA	0
GRE/MP Proposed	Residence	355-0010-01590	110
Land Use Occupied by Route (300ft)			
Route	**Classification**	**Area (sq ft)**	**Acres**
Goodell Alternative	NLCD Deciduous Forest	1176324.3	27.0
	NLCD Developed/low intensity	0	0
	NLCD Developed/open space	381369.8	8.8
	NLCD Herbaceous Wetlands	85069.0	2.0
	Grassland/Herbaceous	49754.1	1.1
	Pasture/Hay	18057.2	0.4
GRE/MP Proposed	NLCD Deciduous Forest	372174.7	8.5
	NLCD Developed/low intensity	428988.8	9.8
	NLCD Developed/open space	0	0
	NLCD Herbaceous Wetlands	112329.3	2.6
	Evergreen Forest	10361.8	0.2
	Grassland/Herbaceous	541394.8	12.4
	Pasture/Hay	286975.0	6.6
	NLCD Deciduous Forest	4980.9	0.1
	Shrub/Scrub	372174.7	8.5
Wetlands Occupied by Route (300ft)			

Route	Type	Area (sq ft)	Acres
Goodell Alternative	PSSB	180896.7	4.2
GRE/MP Proposed	PFO4B	9229.3	.2
	PSS/EME	20440.3	.5
	PSSB	40494.5	.9
Line Length			
Route	**Length (feet)**	**New ROW (sq ft)**	**New ROW (acres)**
Goodell Alternative	5469.0	300795	6.9
GRE/MP Proposed	5642.7	0	0
Cost			
Route	**Estimate ($)**		
Goodell Alternative	$658,000		
GRE/MP Proposed	$591,000		

7.2 Lund Alternative Route Segment

As noted previously, the Lund family has established a memorial site in a stand of tamaracks to honor a deceased sibling. The memorial and tamarack stand are to the west of the existing 69 kV ROW; this area lies close to the proposed new 115 kV ROW off-set. The off-set, as stated by the Applicants, is required to avoid taking that portion of the existing 69 kV line "out of service" during the construction of the new 115 kV line. The stated purpose of this alternative route segment or alternative construction methodology is to eliminate the impact to the tamarack stand and memorial therein.

This alternative would impact nine new parcels; two State of Minnesota owned and seven privately owned parcels, four of the parcels are developed. The current 69 kV line crosses 10 privately owned parcels along the subject portion of the route, two of which are developed (**Appendix C Key Map Book, Lund Alternative Route Segment Maps 1, 2 and 3**).

Proposed route with off-set, relative to Lund Memorial site, is illustrated in **Figure 9**. The memorial site would be approximately 157 feet from the centerline of the new 115 kV transmission if the line were to

be constructed as proposed; this would leave a distance of approximately 107 feet between the memorial and the edge of the cleared ROW.

Table 18 contains comparative data for the Lund Alternative compared to Xcel Energy's proposed HVTL route/alignment.

Table 18. Comparison of Impacts, Lund Alternative Route Segment

Proximity to Structures from Alignment (150ft)			
Route	**Type**	**PID**	**Distance (feet)**
Lund Alternative	Residence	555-0010-03410	73
	Residence	555-0010-04580	110
GRE/MP Proposed	Residence	NA	0
Land Use Occupied by Route (300ft)			
Route	**Classification**	**Area (sq ft)**	**Acres**
Lund Alternative	Cultivated Crops	54579.9	1.3
	Deciduous Forest	695285.1	16.0
	Developed, Open Space	1006910.3	23.1
	Emergent Herbaceous Wetlands	576755.0	13.2
	Evergreen Forest	109059.1	2.5
	Grassland/Herbaceous	382612.9	8.8
	Pasture/Hay	113627.8	2.6
	Shrub/Scrub	133253.0	3.1
	Woody Wetlands	361046.4	8.3
GRE/MP Proposed	Cultivated Crops	21233.0	0.5
	Deciduous Forest	735551.5	16.9
	Developed, Open Space	818161.3	18.8
	Emergent Herbaceous	644397.1	14.8

	Wetlands		
	Evergreen Forest	136344.6	3.1
	Grassland/Herbaceous	510490.7	11.7
	Pasture/Hay	95291.6	2.2
	Shrub/Scrub	153345.6	3.5
	Woody Wetlands	282558.7	6.5
Wetlands Occupied by Route (300ft)			
Route	**Type**	**Area (sq ft)**	**Acres**
Lund Alternative	PEMB	39730.2	.9
	PFO/SSB	210401.4	4.8
	PFO/SSBG	145256.8	3.3
	PFO/SSE	7371.8	.2
	PFO4B	140753.1	3.2
GRE/MP Proposed	PEMB	13909.0	.3
	PFO/SSB	254800.2	5.8
	PFO/SSBG	32939.8	.8
	PFO/SSE	36240.5	.8
	PFO4B	77902.5	1.8
Distance			
Route	**Length (feet)**	**New ROW (sq ft)**	**New ROW (acres)**
Lund Alternative	11217.0	570350	13.09
GRE/MP Proposed	11093.7	0	0
Cost			
Route	**Estimate ($)**		
Lund Alternative	$798,000		
Lund Alternative	$1,335,000		

Constructed w/ Hot Work	
GRE/MP Proposed	$772,000

Hot work Option

The Applicants feel that to maintain reliable electric service to customers being served from the Cedar Valley Substation it will be necessary to keep the existing 69 kV transmission line energized during construction. On the Savanna to Cedar Valley segment, the existing 69 kV line is the only source of electricity to the area ("radial feed").

There are certain construction practices that GRE has used to construct segments of new lines on top of an existing energized transmission line; however, these practices have not been used on transmission lines of similar length to the Savanna Project. Some of these construction practices include leaning poles, using hot sticks, hot hand, hot glove, and building temporary lines. Though this sounds simple in theory, in practice live line work is potentially very hazardous, and must be undertaken in a very methodical manner with highly trained workers in a carefully planned and controlled work environment. Regulations for live working are strict, and rigid adherence to protocols is essential.

None of these options are GRE's standard method of constructing adjacent to an energized transmission line. These methods can be very time consuming, costly, and most importantly, increase concerns over safety of the construction personnel building the transmission line. The OSHA 1910-269 guidelines list a minimum approach distance of 4 feet-3 inches that field personnel must maintain at all times while working around an energized transmission line. This minimum approach distance must be maintained to themselves, as well as to any tools or equipment they are operating during construction. GRE feels it would be very difficult to maintain these safe approach distances at all times while constructing within the same ROW containing the existing energized transmission line.

Several specifics in the design of the existing 69 kV line make these "hot-work" methods problematic, they include:

1. The pole framing on the existing GRE line includes a 10 foot cross-arm with a vertical post at the top of the pole. The GRE line is un-shielded with lightning arresters attached to the top (center) phase. The lightning arresters do create a hazard when leaning poles since they swing toward and potentially into one of the outer phases. The arresters would need to be removed before leaning the poles, which will increase construction costs.

2. Where the soils are predominately sandy (i.e., the Xcel portion of the Air Lake project) the inherit stability of these soils is conducive to leaning transmission line poles. In the area of the Lund Alternative there are many swamps and boggy areas which the existing transmission line goes through. Leaning poles in swamps and bogs is much more risky since the compaction qualities and density of soils in these areas is not as high as sand or sand/clay soil types. The risk is higher since the poles could potentially fall over, taking the existing 69kV transmission line

out of service. Poles that are leaned may need to be braced if soil conditions allow, which will cause greater disturbance of the right-of-way and increase construction costs.

3. On rebuild projects that are constructed as double circuit lines (i.e., Xcel Energy's Air Lake project) the transmission lines have all the phases of one circuit on the same side of the pole and all the phases of the second circuit on the opposite side of the pole. The double circuit construction provides much more separation from the existing transmission line than the Savanna rebuild will be able to achieve. In a double circuit configuration, a utility is able to string the conductor for the phases of the circuit furthest away from the existing transmission line first, energize the circuit, and then remove the existing structures. Once the existing structures are removed, the utility is then able to string the conductor of the circuit which would have been closest to the existing structures had they still been standing. GRE does not have the benefit of a double circuit. The Savanna transmission line will be a single circuit that will have phase conductors on each side of the pole. In the case of the Savanna rebuild, if GRE were to construct on top of the existing centerline, there would be a phase of the new transmission line very close to the existing energized transmission line at all times when stringing the new conductor.

7.3 Cedar Valley – Savanna Alternative Route Segment

This alternative would impact 23 new parcels; eight State of Minnesota owned and 15 private parcels, five of the parcels are developed. This route parallels existing HVTLs along its entire length (**Appendix C Key Map Book, Cedar Valley-Savanna Alternative Route Segment Maps 1 through 10**).

Table 19 contains comparative data for the Cedar Valley – Savanna Alternative compared to Xcel Energy's proposed HVTL route/alignment.

Table 19. Comparison of Impacts, CV-SSS Alternative Route Segment

Proximity to Structures from Alignment (w/in 150ft)			
Route	**Type**	**Count**	**Distance (feet)**
CV-SSS Alternative	Residence	none	0
GRE/MP Proposed	Residence	555-0010-02720	148
	Residence	555-0010-02705	128
Land Use Occupied by Route (300ft)			
Route	**Classification**	**Area (sq ft)**	**Acres**

CV-SSS Alternative	Cultivated Crops	102724.7	2.4
	Deciduous Forest	3518885.9	80.8
	Developed, Open Space	126647.1	2.9
	Emergent Herbaceous Wetlands	4112271.8	94.4
	Evergreen Forest	382093.9	8.8
	Grassland/Herbaceous	1017120.4	23.3
	Pasture/Hay	628071.0	14.4
	Shrub/Scrub	116068.7	2.7
	Woody Wetlands	1845935.2	42.4
GRE/MP Proposed	Cultivated Crops	21233.0	0.5
	Deciduous Forest	2184320.0	50.1
	Developed, Low Intensity	239938.7	5.5
	Developed, Open Space	4023449.6	92.4
	Emergent Herbaceous Wetlands	1034014.1	23.7
	Evergreen Forest	573319.8	13.2
	Grassland/Herbaceous	592573.7	13.6
	Mixed Forest	53554.1	1.2
	Pasture/Hay	707151.1	16.2
	Shrub/Scrub	349778.9	8.0
	Woody Wetlands	1000819.6	23.0
Wetlands Occupied by Route (300ft)			
Route	**Type**	**Area (sq ft)**	**Acres**
CV-SSS Alternative	PEMB	2937185.9	67.4
	PFO/SSB	1417141.7	32.5
	PFO/SSBG	388116.2	8.9

	PFO2/4B	195.5	0.0
	PFO4/SSB	333063.2	7.6
	PFO4B	463905.9	10.6
	PFOB	134227.7	3.1
	PSS/EM5B	244055.1	5.6
	PSS/EMB	84233.7	1.9
	PSS/EMBG	12331.3	0.3
	PSS1C	139893.0	3.2
	PSSBG	1889731.0	43.4
GRE/MP Proposed	PEMB	59174.7	1.4
	PFO/SSB	691719.8	15.9
	PFO/SSBG	32939.8	0.8
	PFO/SSE	36240.5	0.8
	PFO4/SSB	3540.4	0.1
	PFO4B	568862.2	13.1
	PFOB	108491.6	2.5
	PSS/EM5B	87847.5	2.0
	PSS/EMB	69747.7	1.6
	PSS1C	63631.6	1.5
	PSSB	38931.2	0.9
Distance			
Route	**Length (feet)**	**New ROW (feet)**	**New ROW (acres)**
CV-SSS Alternative	39283.3	3928330	90.2
GRE/MP Proposed	35746.1	0	0
Cost			

Route	Estimate ($)		
CV-SSS Alternative	$4,763,000*		
GRE/MP Proposed	$2,586,000		

- * Significant additional costs for wetland mitigation would also be incurred with the CV-SSS Alternative

8.0 Unavoidable Impacts

The Savanna Transmission line rebuild project would have no significant unavoidable adverse impacts. It would not have the same level of impacts that are usually associated with the construction of new transmission line due to the fact that it is a rebuild of an existing line. As the project is mostly a rebuild, the bulk of the new impacts would be related to those short term impacts that are associated with the construction of the transmission line project. The long term impacts of the transmission line, those related to land and visual impacts have already been realized with the existing line. As the majority of the proposed line would be located in essentially the same place as the existing line, the incremental long term impacts of changing out the structures would not result in significant changes. Operating the transmission line at the higher voltage level of 115 kV would also not result in a significant environmental impact. In addition, the new transmission line will parallel road ROWs for the majority of the route, further mitigating the direct impacts associated with the construction of the new line.

In addition, there are few commitments of resources associated with this project that are irreversible and irretrievable, but those that do exist are primarily related to construction. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action. Construction resources that would be used include aggregate resources, concrete, steel, and hydrocarbon fuel. These resources would be used to construct the project. During construction, vehicles would be traveling to and from the site utilizing hydrocarbon fuels.

Figures

Appendix A – Scoping Decision

Appendix B – Sample Route Permit

Appendix C – Map Book Aerials

Appendix D – Land Use Maps

Appendix E – Zoning Maps

Appendix F – Hydrologic Maps

Appendix G – Rare Features Maps