GREAT RIVER ENERGY

and

MINNESOTA POWER

APPLICATION TO THE
MINNESOTA PUBLIC UTILITIES COMMISSION
FOR A
CERTIFICATE OF NEED and ROUTE PERMIT

MENAHGA AREA 115 KV PROJECT

DOCKET NOS.
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GREAT RIVER ENERGY℠
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January 15, 2015

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APPENDICES

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Appendix C Certificate of Need Application Requirements Completeness Checklist

Appendix D Letter from Carole Schmidt of Great River Energy to Dr. Burl Haar, Executive Secretary of the Minnesota Public Utilities Commission, informing the Commission of Applicants' intent to file a route permit application under the alternative review procedures, dated December 11, 2014

Appendix E Route Permit Application Requirements Completeness Checklist

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Appendix I Great River Energy Demand Side Management Programs

Appendix J List of Landowners within Proposed Route

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LIST OF ACRONYMS

ACRONYMS	
AC	Alternating Current
ACSR	Aluminum Conductor Steel Reinforced
ACSS	Aluminum Conductor Steel Supported
ALJ	Administrative Law Judge
Applicants	Great River Energy and Minnesota Power
BMPs	Best Management Practices
BPA	Bonneville Power Administration
CIP	Conservation Improvement Program
Commission	Minnesota Public Utilities Commission
CON	Certificate of Need
Corps	United States Army Corps of Engineers
CR	County Road
CSAH	County State Aid Highway
dBA	Decibel – A weighted
DC	Direct Current
DNR	Minnesota Department of Natural Resources
DSM	Demand Side Management
EA	Environmental Assessment
EERA	Energy Environmental Review and Analysis
EF	Electric Fields
ELF	Extremely Low Frequency
EMF	Electric and Magnetic Fields
EPA	United States Environmental Protection Agency
EQB	Minnesota Environmental Quality Board
G	Gauss
HVDC	High Voltage Direct Current
HVTL	High Voltage Transmission Line
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronic Engineers
IMDs	Implantable Medical Devices
kV	Kilovolt
kV/m	Kilovolts Per Meter
LGUs	Local Governmental Units
LHVTL	Large High Voltage Transmission Line
mA rms	MilliAmperes Root Mean Square
MBS	Moderate Biodiversity Significance
MF	Magnetic Fields
mG	Milligauss
MHS	Minnesota Historical Society
MISO	Midcontinent Independent System Operator
MnDOT	Minnesota Department of Transportation
MPL	Minnesota Pipe Line Company

ACRONYMS	
MPCA	Minnesota Pollution Control Agency
MRO	Midwest Reliability Organization
MTEP	MISO Transmission Expansion Plan
MVAR	Mega Volt Ampere Reactive
MW	Megawatt
MWh	Megawatt hours
NAC	Noise Area Classifications
NERC	North American Electric Reliability Council
NESC	National Electrical Safety Code
NIEHS	National Institute of Environmental Health Sciences
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
Project	Menahga Area 115 kV Project
PWI	Public Waters Inventory
ROW	Right-of-Way
SHPO	State Historic Preservation Office
SNA	Scientific and Natural Area
SWPPP	Stormwater Pollution Prevention Plan
TH	Trunk Highway
Todd-Wadena	Todd-Wadena Electric Cooperative
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WHO	World Health Organization
WMA	Wildlife Management Area

1 SUMMARY OF THE APPLICATION

1.1 Introduction

Great River Energy and Minnesota Power (Applicants) are applying to the Minnesota Public Utilities Commission (Commission) for a Certificate of Need (CON) and a Route Permit to construct approximately 22.5 miles of new overhead 115 kilovolt (kV) transmission line in Hubbard, Wadena and Becker counties, Minnesota (Project).

Applicants propose to construct a new 115 kV transmission line between the existing Great River Energy Hubbard Substation and the proposed Todd-Wadena Electric Cooperative (Todd-Wadena) "Red Eye" distribution substation; construct the proposed Minnesota Power "Straight River" Substation, Great River Energy "Blueberry" Substation, and Todd-Wadena Red Eye Substation (to serve the proposed Minnesota Pipe Line Company (MPL) "Sebeka" pump station); relocate the existing Todd-Wadena Menahga Substation to the Blueberry Substation site and convert the voltage from 34.5 kV to 115 kV; and modify the existing Great River Energy Hubbard Substation and Minnesota Power Pipeline Substation.

Approximately 4.5 of the 22.5 miles of transmission line will be double circuit 115 kV/115 kV transmission line to accommodate a future project to the north, and approximately 18 miles will be single circuit 115 kV transmission line. Some segments of the transmission line will carry distribution line underbuild.

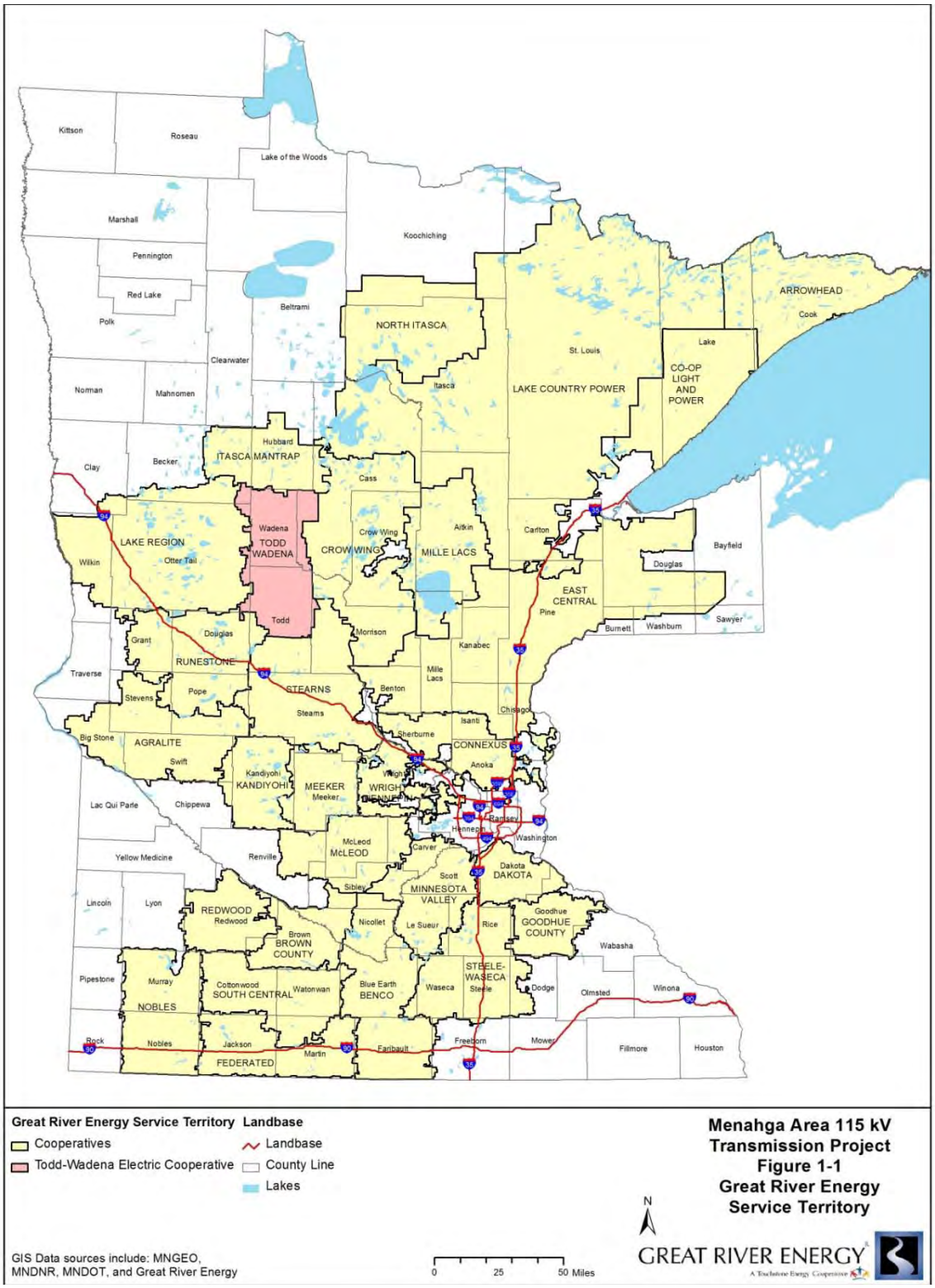
Applicants anticipate start of construction in 2016 and energization of the line in spring 2017.

1.2 Great River Energy

Great River Energy is a not-for-profit generation and transmission cooperative based in Maple Grove, Minnesota. Great River Energy provides electrical energy and related services to 28 member cooperatives, including Todd-Wadena, the distribution cooperative serving the area proposed to be supplied by the proposed transmission line (**Figure 1-1**). Great River Energy's distribution cooperatives, in turn, supply electricity and related services to more than 650,000 residential, commercial, and industrial customers in Minnesota and Wisconsin.

Todd-Wadena provides electricity and related services to approximately 8,000 residential, commercial and industrial customers in Minnesota. Approximately 800 residential, commercial and industrial members of this cooperative would benefit from the proposed high voltage transmission line during normal system operation and up to 1400 would benefit during contingency conditions.

Figure 1-1. Great River Energy Service Territory



Great River Energy's generation system includes a mix of baseload and peaking plants, including coal-fired, refuse-derived fuel, natural gas and oil plants as well as wind generators (a total of approximately 3,500 megawatts (MW)). Great River Energy owns approximately 4,600 miles of transmission line in Minnesota, North Dakota, South Dakota, and Wisconsin.

Great River Energy's transmission network is interconnected with the regional transmission grid to promote reliability and Great River Energy is a member of the Midwest Reliability Organization (MRO) and the Midcontinent Independent System Operator (MISO).

1.3 Minnesota Power

Minnesota Power is an investor-owned public utility headquartered in Duluth, Minnesota. Minnesota Power supplies retail electric service to 143,000 retail customers and wholesale electric service to 16 municipalities in a 26,000-square-mile electric service territory located in northeastern Minnesota (**Figure 1-2)**. Minnesota Power generates and delivers electric energy through a network of transmission and distribution lines and substations throughout northeastern Minnesota. Minnesota Power's transmission network is interconnected with the regional transmission grid to promote reliability and Minnesota Power is a member of the MRO and MISO.

1.4 Project Contact

The contact for the Menahga Area 115 kV Project is:

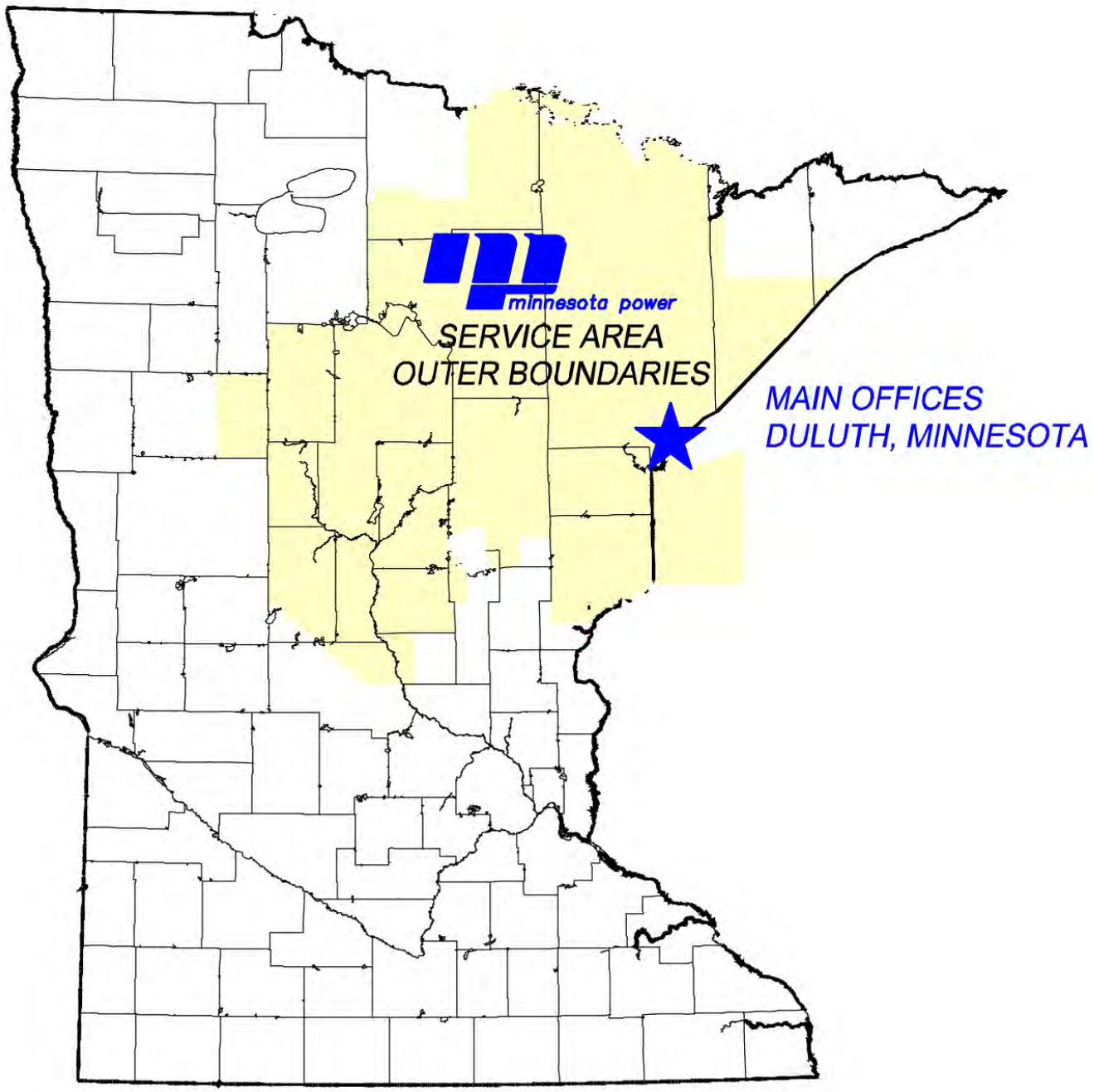
Carole L. Schmidt
Great River Energy
Supervisor, Transmission Permitting and Compliance
12300 Elm Creek Blvd.
Maple Grove, MN 55369
763-445-5214
cschmidt@grenergy.com

1.5 Proposed Project

Applicants have studied the power service to the region and have determined that new 115 kV electrical facilities are needed to meet existing electric load and future electric load requirements. Great River Energy has an additional need to provide electric service to a proposed Todd-Wadena distribution substation that will serve the proposed MPL Sebeka pump station. MPL submitted a Certificate of Need application for the Minnesota Pipe Line Reliability Project on July 25, 2014 (MPUC Docket No. PL-5/CN-14-320).

The proposed plan to address the power system overloads in the area and to serve the proposed Todd-Wadena distribution substation includes:

Figure 1-2. Minnesota Power Service Territory



- Construction of approximately 7 miles of east-west transmission line between the existing Great River Energy Hubbard Substation and proposed new Minnesota Power Straight River Substation, which will replace the existing Minnesota Power 34.5 kV "522" feeder line. The first 4.5 miles between the Hubbard Substation and County Road (CR) 115 will be double-circuit 115 kV line to accommodate a future Great River Energy project to the north. The approximate 2.5 miles between CR 115 and the proposed Minnesota Power Straight River Substation will be single-circuit 115 kV line.

- Construction of a generally north to south, single-circuit transmission line (approximately 15.5 miles) between the proposed Minnesota Power Straight River Substation and the proposed new Todd-Wadena Red Eye distribution substation.

- Construction of the proposed new Minnesota Power Straight River Substation, Great River Energy Blueberry Substation, and Todd-Wadena Red Eye Substation (that will serve the proposed new MPL pump station); relocation of the existing Todd-Wadena Menahga Substation to the proposed new Blueberry Substation site and conversion of the voltage from 34.5 kV to 115 kV; and modifications to the existing Great River Energy Hubbard Substation and the Minnesota Power Pipeline Substation.

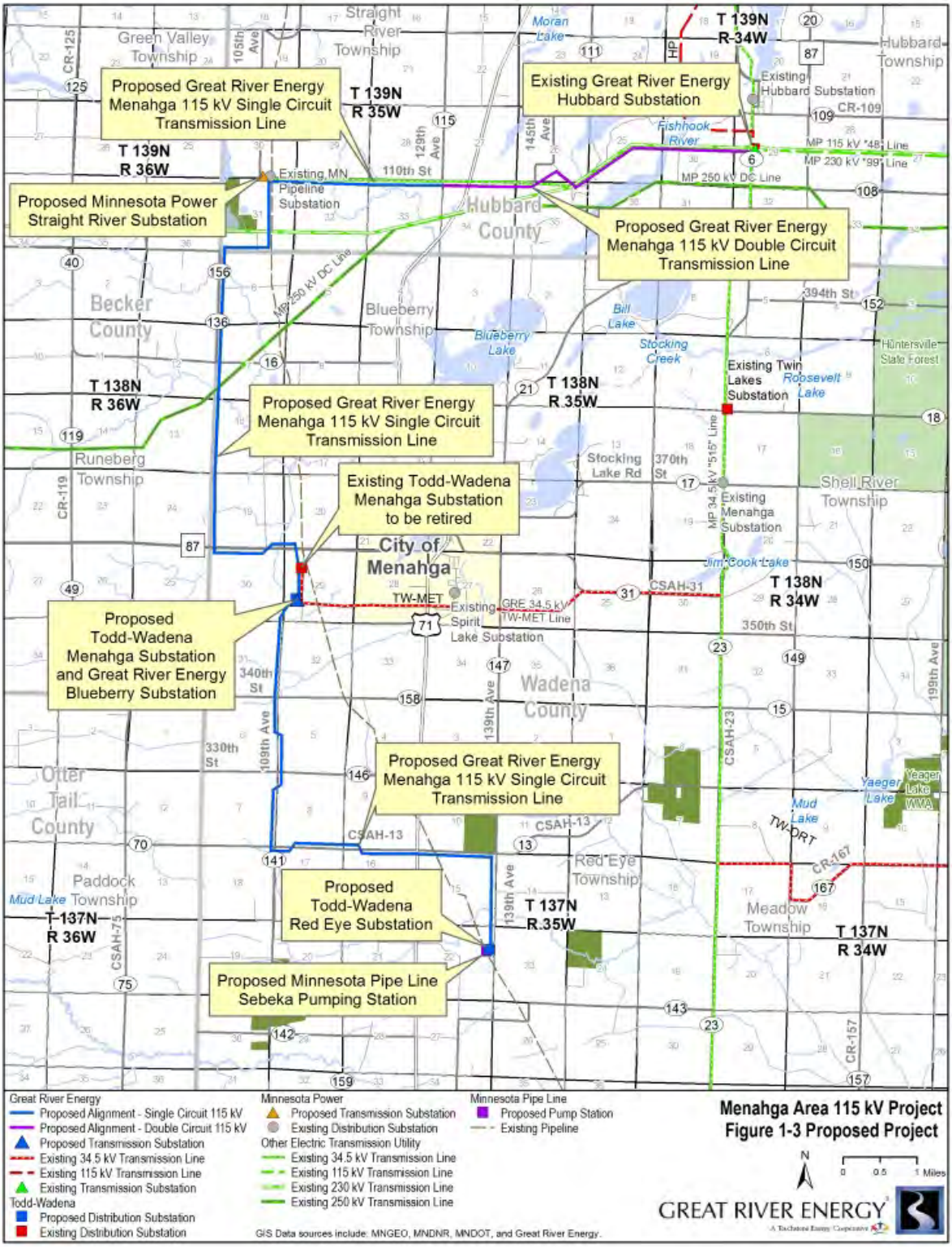
The proposed route is shown on **Figure 1-3**. Applicants are generally requesting approval of a 500-foot route width (250 feet either side of the transmission line in areas where the transmission line will be cross-country, or 250 feet either side of the centerline of road right-of-ways (ROW) in areas where the transmission line follows a road). In a few areas (particularly around proposed substations), Applicants are requesting a route width wider than 500 feet to accommodate facility designs as described in **Section 4.1.1**.

The proposed transmission line is located in Hubbard, Wadena and Becker counties, Minnesota. Single-pole wood structures with horizontal post insulators will be used for most of the transmission line. H-frame, laminated wood poles or steel poles may be required in some locations (to cross under an existing line, for angles poles, or in areas where soil conditions are poor and guying is not practical). Typical pole heights will range from 60 to 90 feet above ground and spans between poles will range from 275 to 450 feet. Some segments of the transmission line will carry distribution line underbuild.

Great River Energy will acquire easements for the new 115 kV transmission line.

The Project will cost approximately $23 million dollars.

Figure 1-3. Proposed Project



1.6 Project Need and Purpose

The Menahga Area 115 kV Project will serve two needs as described below. A detailed discussion of Project need is provided in **Chapter 5**.

1.6.1 Load-Serving Need

The 34.5 kV sub-transmission system (**Figure 1-4**) sourced from the Great River Energy Hubbard 230/115/34.5 kV Substation and the Minnesota Power Verndale 115/34.5 kV Substation is at risk of experiencing transmission system overloads. These system issues were first detected in 2007. As a temporary measure, Minnesota Power installed a 2.4 mega volt ampere reactive (MVAR) capacitor at the Sebeka Regulator Station in 2008 to relieve these voltage issues. However, the capacitor bank was viewed as a short-term solution, because at the time the transmission line and transformers were close to the thermal limits.

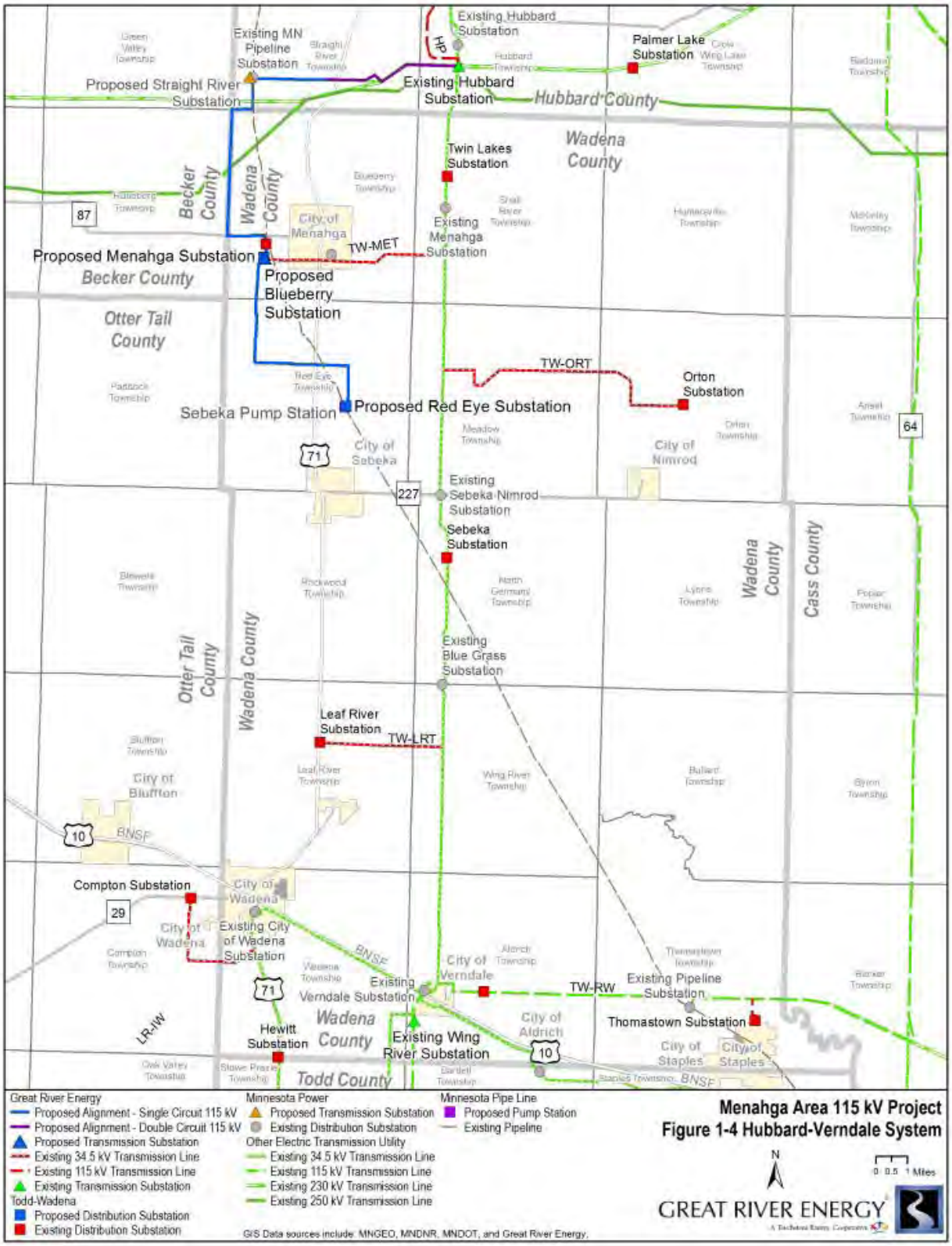
With continuing risk of sub-transmission system overloads and a proposed new pump station load, it is now necessary to remove a large load (Menahga) from the 34.5 kV system and place it on a new 115 kV system. This will require construction of a new 115 kV transmission line between the existing Great River Energy Hubbard Substation and the proposed new Great River Energy Blueberry Substation, and then south to the proposed new Todd-Wadena Red Eye distribution substation to serve the proposed new MPL pump station.

The North American Electric Reliability Council (NERC), which develops standards for implementing secure and safe electrical delivery, mandates that certain levels of service be maintained to ensure that the transmission grid operates efficiently and reliably. In addition, electric utilities like Great River Energy and Minnesota Power are responsible for maintaining power quality at a level that prevents damage to all consumers' electrical equipment. Based on these mandates, transmission improvements are necessary to maintain the reliability and quality of electric service for this region.

1.6.2 MPL Need

MPL is proposing to construct six new pump stations along its newest pipeline (Line 4) to ensure that Minnesota refineries continue to have access to reliable and sufficient crude oil supplies to meet demand for transportation fuels. MPL plans to use available capacity on Line 4 to ensure reliability of its pipeline system, which is the primary crude oil pipeline system supplying Minnesota's two refineries. In addition to the local load-serving need discussed above, the Project is needed to provide electrical service to the proposed new Todd-Wadena Red Eye distribution substation, which will serve one of these six proposed pump stations (the Sebeka Pump Station), which will be located at the southern terminus of the Project.

Figure 1-4. Hubbard-Verndale System



1.7 Proposed Route

A general description of the proposed route is provided below. See **Section 4.1.1** for a more detailed description of the route.

The proposed transmission line (**Figure 1-3)** begins at Great River Energy's Hubbard Substation and heads westerly for about 7 miles to Minnesota Power's proposed new Straight River Substation. In this section of the Project, the new 115 kV line would replace Minnesota Power's 34.5 kV 522 feeder line. The line then turns south paralleling the west side of MPL's pipelines for approximately one mile; it then turns westerly on the north side of Hubbard Line Road for a short distance; then turns southerly several miles to Trunk Highway (TH) 87. The line follows east along TH 87 for about 1.25 miles, then turns in a south-southeasterly direction and angles to Great River Energy's existing "TW-MET" 34.5 kV line, where it will angle over to 111th Avenue, turn southerly, and into the proposed location of the proposed new Blueberry Substation. The TW-MET 34.5 kV line in this area will be removed once construction of the 115 kV line is complete.

The line will exit the Blueberry Substation and turn westerly for approximately 550 feet, then turn southwesterly along the west side of the Minnesota Energy natural gas pipeline to a crossing of 350th Street, where it continues south about 3 miles on 109th Avenue to County State Aid Highway (CSAH) 13. There the line turns east for 3 miles along CSAH 13, then turns south on 139th Avenue and into the proposed Red Eye Substation.

1.8 Alternatives

Applicants considered several alternatives to the proposed Project, including: 1) a new local generation alternative; 2) various transmission solutions, including upgrading other existing facilities, different conductors, different voltage levels and different endpoints; and 3) a no-build alternative focusing on reactive power supply improvements and demand side management. Alternatives to the proposed Project are discussed further in **Chapter 6**.

1.9 Potential Environmental Effects

Applicants analyzed the potential environmental effects from the proposed Project. No significant unavoidable impacts will result from construction of the new 115 kV transmission line and associated facilities.

No homeowners will be displaced by construction of the proposed transmission line. All agricultural land impacted during construction will be returned to its natural condition as nearly as possible and landowners will be compensated for any losses from construction. All water bodies will be protected during construction. The electric fields associated with the new line will be significantly less than the maximum levels permitted by state regulators. No stray voltage issues are anticipated to affect farm animals along the routes.

The Department of Commerce, Energy Environmental Review and Analysis (EERA) is responsible for environmental review of the Project. The Certificate of Need rules require preparation of an Environmental Report, whereas the Route Permit rules require preparation of

an Environmental Assessment (EA). The Department of Commerce may elect to prepare an EA for the Project that analyzes potential environmental impacts from the Project and meets all statutory and rule requirements of both the Environmental Report and the EA.

1.10 Public Involvement

Great River Energy held a public open house informational meeting on September 30, 2014, at the Menahga Senior Center in Menahga, Minnesota to provide information about the Project to the public. Great River Energy sent post card open house invitations to 141 landowners within the 1000-foot notice corridor. Great River Energy also mailed notice (an example letter is provided in **Appendix A)** of the Project and open house to 93 agencies, elected officials, and local governmental units (LGUs), including tribal representatives (White Earth Band of Ojibwe and Leech Lake Band of Ojibwe). Newspaper notices announcing the open house were also placed in four local newspapers approximately a week before the open house.

Approximately 30 members of the public attended the open house. Inquiries/concerns from the public included whether the transmission line will go through their property, proximity of the proposed line to houses, tree removal, Project schedule, compensation for easements, electric and magnetic fields (EMF) and stray voltage, and possible impacts to center pivot irrigation systems. A Minnesota Department of Natural Resources (DNR) representative attended and pointed out state lands in the Project area and other resource issues (a designated trout stream, a high wildlife area, swan activity) to be considered in the area.

Subsequent to the open house, Applicants received: one written statement on the Project (a letter regarding the proximity of the proposed line to the Alajoki Cemetery), three telephone calls and one email requesting information on the Project and the proposed line location.

The need for the Project has been discussed in the Minnesota Biennial Transmission Projects Report since 2007 (Tracking number 2007-NE-N3).

The public will have an opportunity to review this application and submit comments to the Commission about the Project. A copy of the application will be available on the Commission eDockets website (www.mn.gov/puc), on the Department of Commerce Project website (http://mn.gov/commerce/energyfacilities) and on the Great River Energy webpage at www.greatriverenergy.com. Additionally, a copy of this application will be available at the Park Rapids Public Library, Menahga City Hall, Sebeka City Hall, and Wadena Public Library for the public to review.

A scoping meeting will be held in the area by EERA within 60 days of acceptance of this application as complete to answer questions about the Project and to solicit public comments and suggestions for matters to examine during its environmental review. In a few months, assuming the Department of Commerce chooses to prepare an EA that includes all requirements of an Environmental Report, a public hearing will be held in the Project area after the EA is complete. At this hearing, members of the public will be given an opportunity to ask questions and submit comments. Applicants will also present further evidence to support their need and route for the Project. Applicants anticipate that the Commission will hold a joint public hearing on both the

Certificate of Need and the Route Permit pursuant to Minnesota Statutes Section 216B.243, subdivision 4.

There are two options for citizens, landowners, and interested persons to receive project information:

1. **Sign up for the Project Mailing List.** To sign up to receive notices about project milestones and opportunities to participate (meetings, comment periods, etc.) email docketing.puc@state.mn.us or call 651-201-2234 with the docket number (14-787 or 797), your name, mailing address and email address.

   You may request to receive notices by email or U.S. Mail. For projects with more than one docket (e.g., a project requiring a Certificate of Need and a Route Permit), you will be added to both mailing lists.

2. **Subscribe to the Docket.** To receive email notifications when new documents are filed in the Certificate of Need or Route Permit dockets:

   1. Go to: mn.gov/puc
   2. Select the green box *Subscribe to a Docket*
   3. Type your e-mail address
   4. For *Type of Subscription*, select *Docket Number*
   5. For *Docket Number*, select *14* in the first box, type *787* (for the Certificate of Need docket) or *797* (for the Route Permit docket) in the second box
   6. Select *Add to List*
   7. Select *Save*

   Note - subscribing may result in a large number of emails

Staff contact information is provided below.

Minnesota Public Utilities Commission
Cezar Panait, Staff Analyst
121 7th Place East, Suite 350
St. Paul, MN 55101
651.201.2207
800.657.3782
cezar.panait@state.mn.us
www.mn.gov/puc

Department of Commerce, EERA
Ray Kirsch, Environmental Review Manager
85 7th Place East, Suite 500
St. Paul, MN 55101
651.539.1841
800.657.3794
raymond.kirsch@state.mn.us
mn.gov/commerce/energyfacilities

1.11 Conclusion

The Commission has established criteria in Minnesota Rule 7849.0120 to apply in determining whether a proposed high voltage transmission line is needed. An applicant for a Certificate of Need must show that the probable result of denying the request would be an adverse effect on the future adequacy and reliability of the system, there is not a more reasonable and prudent alternative, the proposed facility will provide benefits to society compatible with protecting the

environment, and the project will comply with all applicable standards and regulations. Applicants have demonstrated in the Application that the proposed Project meets all the requirements to obtain a Certificate of Need. The Project will address transmission system overloads in the area and provide electric service to a new pump station proposed by MPL.

With regard to route selection for high voltage transmission lines, the applicable rules are found in Minnesota Rules Chapter 7850. This Project satisfies the criteria for a route permit: the transmission line conserves resources, minimizes environmental impacts, and minimizes effects on human settlement and land-based economies by the use of existing transmission line corridors and road corridors.

2 GENERAL PROJECT INFORMATION

2.1 Certificate of Need Requirement

Minnesota Statutes Section 216B.243, subdivision 2, provides that "No large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the [public utilities] commission pursuant to sections 216C.05 to 216C.30 and this section and consistent with the criteria for assessment of need." A large energy facility is defined in Minnesota Statutes Section 216B.2421 subdivision 2(3) as, among other things, "any high-voltage transmission line with a capacity of 100 kilovolts or more with more than ten miles of its length in Minnesota."

The proposed 115 kV transmission line will be located in Minnesota and will, in total, be approximately 22.5 miles long. Because the Project consists of a transmission line in excess of 100 kV and is more than ten miles in length, a CON is required.

The Commission has adopted rules for the consideration of applications for certificates of need. Minn. R. Ch. 7849. On September 23, 2014, Great River Energy, on behalf of Applicants, filed a Petition for Exemption under Minnesota Rule 7849.0200, subpart 6, requesting that the Applicants be exempt from certain filing requirements under Chapter 7849. The Commission approved the Exemption Petition on November 24, 2014, and issued its written Order on December 3, 2014 (Exemption Order). This Application contains the information required under Minnesota Rules Chapter 7849, as modified by the Commission in its Exemption Order. A copy of the Commission's Exemption Order is provided in **Appendix B**.

The CON application content requirements are provided in **Appendix C** with cross references indicating where information can be found in this Application.

2.2 Route Permit

Minnesota Statutes Section 216E.03, subdivision 2, provides that "[n]o person may construct a high voltage transmission line without a route permit from the commission." A high voltage transmission line (HVTL) is defined by Minnesota Statutes Section 216E.01, subdivision 4, as "a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kilovolts or more and is greater than 1,500 feet in length." Because the Project includes a 115 kV transmission line that is greater than 1,500 feet, a Route Permit is required.

The rules that apply to the review of Route Permit applications are found in Minnesota Rules Chapter 7850. Minnesota Rule 7850.1900, subparts 2 and 3, set forth the information that must be included in a Route Permit application.

Minnesota Statutes Section 216E.04, subdivision 2(3) provides for an Alternative Review Process for transmission lines between 100 and 200 kilovolts; therefore, this Project qualifies for alternative review. The permitting timeline for the Alternative Review Process is shorter than the

timeline required for transmission lines over 200 kV. On behalf of Applicants, Great River Energy notified the Commission on December 11, 2014, pursuant to Minnesota Rule 7850.2800, subpart 2 of its intent to utilize the Alternative Review Process and file its Route Permit Application under Minnesota Rules 7850.2800 to 7850.3900. A copy of the notification letter is provided in **Appendix D**.

Under the Alternative Review Process, an applicant is not required to propose any alternative routes, but must disclose any other routes that were rejected by the applicant (Minn. Stat. § 216E.04, subd. 3.). Further, an Environmental Impact Statement is not required under the Alternative Review Process. Instead, the Department of Commerce is required to prepare an EA. Minn. Stat. § 216E.04, subd. 5. Unlike the full route permit process for higher voltage lines, which requires a formal contested case hearing, the Commission has discretion to determine what kind of public hearing to conduct. Minn. Stat. § 216E.04, subd. 6. In **Section 2.3** below, the procedures described are those required for the lower voltage lines under the Alternative Review Process.

The Route Permit application content requirements are provided in **Appendix E** with cross references indicating where information can be found in this Application.

2.3 Regulatory Process

As a result of legislation passed in 2005, the Commission has jurisdiction over both Certificates of Need and Route Permits. 2005 Minn. Laws ch. 97, art. 3, § 17. Minnesota Statutes. Section 216E.02, subdivision 2, states that "[t]he commission is hereby given the authority to provide for site and route selection for large electric power facilities." The legislature transferred these siting and routing responsibilities to the Commission to "ensure greater public participation in energy infrastructure approval proceedings and to better integrate and align state energy and environmental policy goals with economic decisions involving large energy infrastructure." 2005 Minn. Laws ch. 97, art. 3, § 17.

Applicants chose to file for a CON and a Route Permit at the same time and in a single document, as it was efficient to compile the necessary information to request a Route Permit concurrently with the CON.

Combining the CON and the Route Permit proceedings into one proceeding is consistent with the goal of the Legislature to simplify public participation and to expedite agency review and decision-making. The Legislature provided in the 2005 Act transferring siting and routing authority to the Commission that "Unless the commission determines that a joint hearing on siting and need under this subdivision and section 216E.03, subdivision 6, is not feasible or more efficient or otherwise not in the public interest, a joint hearing under those subdivisions shall be held." Minn. Stat. § 216B.243, subd. 4 and Minn. R. 7849.1900, subp. 4. A joint hearing in this case is certainly feasible, it is definitely efficient, and it will promote the public interest.

The regulatory process described in this section, then, is the process that is followed to satisfy all the requirements under the CON rules (Chapter 7849) and all the requirements under the Route Permit rules (Chapter 7850). In the end, the Commission can make a decision on the need and authorize construction along a designated route in one proceeding.

The Commission's rules establish requirements that apply prior to the submission of a CON application. Minn. R. 7829.2550, subp. 1, requires the applicant for a high voltage transmission line CON to submit a proposed plan for providing notice three months prior to the filing of the application. In this matter, Great River Energy, on behalf of Applicants, filed a proposed Notice Plan Petition with the Commission on September 18, 2014. The proposed Notice Plan incorporated the notice requirements of the Commission's Certificate of Need rules (Minn. R. 7829.2550). The Commission approved the Notice Plan Petition on November 24, 2014, and issued its written Order on December 8, 2014. A copy of the Commission's Order is provided in **Appendix F.**

In accordance with Minnesota Statute Section 216E.04, subdivision 4, upon filing this CON and Route Permit Application, Applicants will mail a notice of the filing to potentially affected landowners, to those persons who have registered their names with the Commission and expressed an interest in large energy projects, and to the area tribal government and local units of government whose jurisdictions are reasonably likely to be affected by the proposed Project. Minn. Stat. § 216E.04, subd. 4; Minn. R. 7850.2100. In addition, Applicants will publish notice in four local newspapers announcing the filing of this Application.

An electronic version of the Application will be available on eDockets in docket numbers 14-787 and 14-797. The Application will also be available on Great River Energy's transmission projects webpage (http://www.greatriverenergy.com/deliveringelectricity/currentprojects/) with a link to the Menahga Area 115 kV Project by clicking on either Hubbard, Wadena or Becker counties on the map.

Upon submission of an application for a CON or a Route Permit, the Department of Commerce, EERA has the obligation to conduct environmental review of the Project. Minn. R. 7849.1200 and 7850.3700. In this matter, because Applicants are applying for both a CON and a Route Permit, the environmental review will consider issues relating both to the need for the Project, including size, type, timing, voltage, and system configurations, and also to the proposed route, such as construction impacts, environmental features, and impacts on homeowners. EERA has the option to elect to combine the environmental review and prepare one document, an EA. Minn. R. 7849.1900. Applicants believe that combining the environmental review into one document is appropriate and preferable in this matter – it is more expeditious, it will be easier for the public to follow, and it is consistent with legislative intent to combine the need and routing processes.

The process EERA must follow in preparing the EA is set forth in Minnesota Rule 7850.3700. This process requires EERA to schedule at least one scoping meeting in the area of the proposed Project. The purpose of the meeting is to advise the public of the Project and to solicit public input into the scope of the environmental review. Applicants and EERA will both have representatives at the public meeting to answer questions and provide information for the public. The public meeting will be held within 60 days after the Application is accepted and deemed complete.

Once the public meeting has been held, EERA will issue a scoping decision describing the issues and alternatives that will be evaluated in the EA. EERA will prepare the EA based on the scoping decision. Upon completion of the EA, EERA will publish notice in the *EQB Monitor*, a

bi-weekly publication of the Environmental Quality Board (EQB) that can be accessed on the EQB webpage, www.eqb.state.mn.us/monitor.html, and will send notice to persons who have placed their names on the project mailing list (see **Section 1.10)**. A copy of the EA will be available electronically through eDockets and the EERA webpage, and in print at local libraries.

After the EA is completed, the Commission will schedule a public hearing to again solicit public input and to create an administrative record. The Commission will select a person to preside at the hearing; it may be an administrative law judge (ALJ) from the Office of Administrative Hearings or another person acceptable to the Commission. The Commission will establish the procedures to be followed at the hearing. Minn. R. 7850.3800. The EA will become part of the record for consideration by the Commission. Interested persons will be notified of the date of the public hearing and will have an opportunity to participate in the proceeding. The hearing will likely be a joint hearing to consider both the CON and the Route Permit. Minn. R. 7849.1900 and 7850.3800.

Once the hearing is concluded, the ALJ will prepare a report based on the record and briefs filed by parties to the proceeding. After the ALJ issues the report, the matter will come to the Commission for a decision. At that time, the Commission may afford interested persons an opportunity to provide additional comments.

The Commission has one year from the time a CON Application is submitted to reach a final decision. Minn. Stat. § 216B.243, subd. 5. A route permit under the Alternative Permitting Process can be issued in six months after the Commission's determination that the Application is complete (Minn. Stat. § 216E.04, subd. 7); however, Minnesota Rule 7850.2700, Subpart 3 prohibits the Commission from making a final decision on a route permit until the CON is approved. Minn. Stat. § 216E.02, subd. 2.

Applicants anticipate that a final decision on the Certificate of Need and the Route Permit for this Project can be made by February 2016.

2.4 Public Participation

Great River Energy held a public open house informational meeting on the Project on September 30, 2014, at the Menahga Senior Center in Menahga, Minnesota. Approximately 30 members of the public attended the open house.

The meeting was publicized in several local papers approximately one week prior to the open house, and landowners potentially impacted received a post card invitation. Tribal and local government officials and resource agencies were also invited by letter. Minn. Stat. § 216E.03, subd. 3a. Large aerial maps of the proposed Project, photos of proposed transmission structures, fact sheets, information on the permitting process and need for the Project, ROW information, and a post card for questions or comments were available at the open house.

Inquiries/concerns from the public included whether the transmission line will go through their property, proximity of the proposed line to houses, tree removal, Project schedule, compensation for easements, EMF and stray voltage, and possible impacts to center pivot irrigation systems. A DNR representative attended and pointed out state lands in the Project area and other resource issues (a designated trout stream, a high wildlife area, swan activity) to be considered in the area.

Subsequent to the open house, Applicants received: one written statement (a letter regarding the proximity of the proposed line to the Alajoki Cemetery, see **Sheet 17**, **Appendix G** for location of the cemetery), three telephone calls and one email requesting information on the Project and the proposed line location.

The need for the Project has also been discussed in the Minnesota Biennial Transmission Projects Report since 2007. The public participation process associated with the Biennial Transmission Projects Report provided the public and LGUs opportunities to offer comments and suggestions.

In accordance with the Notice Plan, on December 8, 2014, Great River Energy mailed 146 letters to landowners and residents within the expanded 1500-foot notice corridor, and mailed 124 letters to LGU officials, elected officials, and state and federal agencies. Great River Energy also published notice of the Project, in accordance with the Notice Plan, in the Northwoods Press, Detroit Lakes Tribune, Verndale Sun and The Review Messenger between December 10, 2014, and December 11, 2014.

2.5 Other Permits/Approvals

In addition to the CON and Route Permit sought in this Application, several other permits may be required for the Project depending on the actual routes selected and the conditions encountered during construction. A list of local, state and federal permits that might be required for this Project is provided in **Table 2-1**.

2.5.1 Local Approvals

Great River Energy will work with local units of government to address any concerns related to the following possible approvals.

Road Crossing/Right-of-Way Permits
These permits may be required to cross or occupy county, township, and city road ROW.

Over width/Loads Permits
These permits may be required to move over width or heavy loads on county, township, or city roads.

Driveway/Access Permits
These permits may be required to construct access roads or driveways from county, township, or city roadways.

Table 2-1. List of Possible 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 – Ecological Services
Licenses to Cross Public Waters and Lands	Minnesota Department of Natural Resources – Lands and Minerals
Utility Permit	Minnesota Department of Transportation
Wetland Conservation Act	Board of Water and Soil Resources
National Pollutant Discharge Elimination System Permit	Minnesota Pollution Control Agency
Federal Approvals	
Section 10 Permit	US Army Corps of Engineers
Section 404 Permit	US Army Corps of Engineers
Permit to Cross Federal Aid Highway	Federal Highway Administration
United States Fish and Wildlife Service	Endangered Species Consultation
Other Approvals	
Crossing Permit	Other Utilities such as Pipelines

2.5.2 State of Minnesota Approvals

Endangered Species Consultation

The DNR Natural Heritage and Nongame Research Program collects, manages, and interprets information about nongame species. Consultation was requested from the DNR for the Project regarding rare and unique species. Great River Energy will work with the DNR to identify any areas that may require marking transmission line shield wires and/or to use alternate structures to reduce the likelihood of avian collisions.

License to Cross Public Lands and Waters

The DNR Division of Lands and Minerals regulates utility crossings over, under, or across any State land or public water identified on the Public Waters and Wetlands Maps. A license to cross

Public Waters is required under Minnesota Statutes Section 84.415 and Minnesota Rules Chapter 6135. The proposed Project will require a license for the seven Public Waters crossed by the new transmission line. Great River Energy will file the license application with the DNR once the design of the transmission line is complete and will acquire the license prior to construction.

Utility Permit

A permit from the Minnesota Department of Transportation (MnDOT) is required for construction, placement, or maintenance of utility lines that occur adjacent or across the highway ROW. Great River Energy will file for this permit once the design of the transmission line is complete and will acquire the permit prior to construction.

Wetland Conservation Act

The Minnesota Board of Water and Soil Resources administers the state Wetland Conservation Act, under Minnesota Rules Chapter 8420. The proposed Project may require a permit under these rules if permanent impacts to wetlands are anticipated to result from construction. Great River Energy will apply for this permit (which is a joint application with the Section 404 permit) or for an exemption if applicable once the design of the transmission line is complete.

NPDES Permit

A National Pollutant Discharge Elimination System (NPDES) permit from the Minnesota Pollution Control Agency (MPCA) is required for stormwater discharges associated with construction activities disturbing equal to or greater than one acre. A requirement of the permit is to develop and implement a stormwater pollution prevention plan (SWPPP), which includes Best Management Practices (BMPs) to minimize discharge of pollutants from the site. This permit will be acquired if construction of the transmission line will cause a disturbance of greater than one acre.

2.5.3 Federal Approvals

Section 10 Permit

The US Army Corps of Engineers (Corps) regulates impacts to navigable waters of the United States. There are no rivers in the Project area that are classified by the Corps as navigable.

Section 404 Permit

A Section 404 permit is required from the Corps for discharges of dredged or fill material into waters of the United States. If impacts exceed the permitting threshold, Great River Energy will apply for this permit once the design of the transmission line is complete.

United States Fish and Wildlife Service (USFWS)

Review of the Project was requested from the USFWS regarding federally-listed species or critical habitat. Great River Energy will work with the USFWS to identify any areas that may require marking transmission line shield wires and/or to use alternate structures to reduce the

likelihood of avian collisions. Any eagle or other migratory bird nests discovered during survey of the line or in the land acquisition process will be reported to the USFWS and Great River Energy will adhere to guidance provided.

2.5.4 Other Approvals

In the vicinity of the proposed transmission line, Minnesota Energy has a small regulator station in the southeast quadrant of 110th Street and 119th Avenue in the NW ¼ of the NW ¼ of Section 33 in Straight River Township; and an 8-inch steel natural gas pipeline located in Sections 20, 29, 31, 32 in Blueberry Township and Sections 6, 7, and 19 in Red Eye Township.

Great River Energy will work with Minnesota Energy to obtain any required crossing permits or engineering analysis of the pipeline. In areas that Great River Energy proposes to place the transmission line parallel and adjacent to the pipeline, no poles will be proposed to be placed in Minnesota Energy's easement.

3 APPLICANT INFORMATION

3.1 Proposed Ownership

It is anticipated that Minnesota Power will own the Straight River Substation, the switch and the approximately 700-foot tap line into the substation. Great River Energy will own the proposed Blueberry Substation and the approximately 22.5 miles of new 115 kV transmission line between the Hubbard Substation and the Red Eye Substation. Todd-Wadena will own the Red Eye Substation and the relocated Menahga Substation at the Blueberry site.

3.2 Organization and System Background

3.2.1 Great River Energy

Great River Energy is a not-for-profit generation and transmission cooperative based in Maple Grove, Minnesota. Great River Energy provides electrical energy and related services to 28 member cooperatives, including Todd-Wadena, the distribution cooperative serving the areas that will benefit from the proposed Project. Great River Energy's distribution cooperatives, in turn, supply electricity and related services to more than 650,000 residential, commercial and industrial customers in Minnesota and Wisconsin.

Great River Energy and its cooperatives' mission is to provide safe, reliable, competitively priced energy to those they serve.

Great River Energy's generation system includes a mix of baseload and peaking plants, including coal-fired, refuse-derived fuel, natural gas and oil plants as well as wind generators (a total of approximately 3,500 MW). Great River Energy owns approximately 4,600 miles of transmission line in Minnesota, North Dakota, South Dakota, and Wisconsin.

Todd-Wadena provides electricity and related services to approximately 8,000 residential, commercial and industrial customers in Minnesota. Approximately 800 residential, commercial and industrial members of this cooperative would benefit from the proposed high voltage transmission line during normal system operation and up to 1400 would benefit during contingency conditions.

Figure 1-1 shows Great River Energy's service territory and highlights the service area of Todd-Wadena. Great River Energy's electric system is interconnected directly with neighboring suppliers. Great River Energy is a member of the MRO and MISO.

3.2.2 Minnesota Power

Minnesota Power is an investor-owned public utility headquartered in Duluth, Minnesota. Minnesota Power supplies retail electric service to 143,000 retail customers and wholesale electric service to 16 municipalities in a 26,000-square-mile electric service territory located in

northeastern Minnesota (**Figure 1-2**). Minnesota Power generates and delivers electric energy through a network of transmission and distribution lines and substations throughout northeastern Minnesota. Minnesota Power's transmission network is interconnected with the regional transmission grid to promote reliability and Minnesota Power is a member of the MRO and MISO.

3.3 Existing System

3.3.1 Hubbard–Verndale 34.5 kV System

The 34.5 kV sub-transmission system (**Figure 3-1**) is sourced by the Great River Energy 230/115/34.5 kV Hubbard Substation located near Park Rapids and the Minnesota Power 115/34.5 kV Verndale Substation located near Verndale. Between these substations there are nearly 51 miles of 34.5 kV sub-transmission lines (31 miles owned by Minnesota Power and 20 miles owned by Great River Energy).

Along the Hubbard-Verndale 34.5 kV system, there are switches that are used to serve substations and to sectionalize the line for outages, maintenance or system performance. With a 34.5 kV sub-transmission system such as Hubbard-Verndale, it is typical to have one switch designated as a normally open switch between the sources, meaning power cannot flow from one source to the other. The normally open switch maximizes operational flexibility and reduces outage times. The Hubbard-Verndale system is operated with a normally open switch between the Great River Energy Sebeka Substation and the Minnesota Power Regulator Station.

The 34.5 kV sub-transmission system serves a mix of loads including agricultural, residential, commercial, and light industrial loads in the cities and towns in the affected load area through various distribution substations: MN Pipeline, Twin Lakes, Menahga (Minnesota Power), Menahga (Great River Energy), Spirit Lake, Orton, Sebeka-Nimrod, Sebeka, Blue Grass, Leaf River, and Verndale.

In addition to many miles (51 miles) of 34.5 kV sub-transmission lines serving the loads in the Hubbard-Verndale System, the conductors on some segments of the system are of high impedance and low current carrying capacity. The 34.5 kV sub-transmission lines in the affected load area of the Hubbard-Verndale System are a mix of 336 aluminum conductor steel reinforced (ACSR) and smaller 3/0 conductors. Where it has not been replaced with a larger conductor, the smaller 3/0 conductor contributes to increased power loss and voltage drop, and potential overload concerns in the distribution system. During contingencies when the normally open switch near Sebeka is closed, for example the loss of the Verndale 115/34.5 kV source, increased power flows from the Hubbard source could cause segments of 34.5 kV sub-transmission line to overload. The Project proposes to place a new 115/34.5 kV source in the midsection of the Hubbard-Verndale system to mitigate the potential overload while removing load from the 34.5 kV system.

Figure 3-1. Hubbard-Verndale 34.5 kV Sub-transmission System

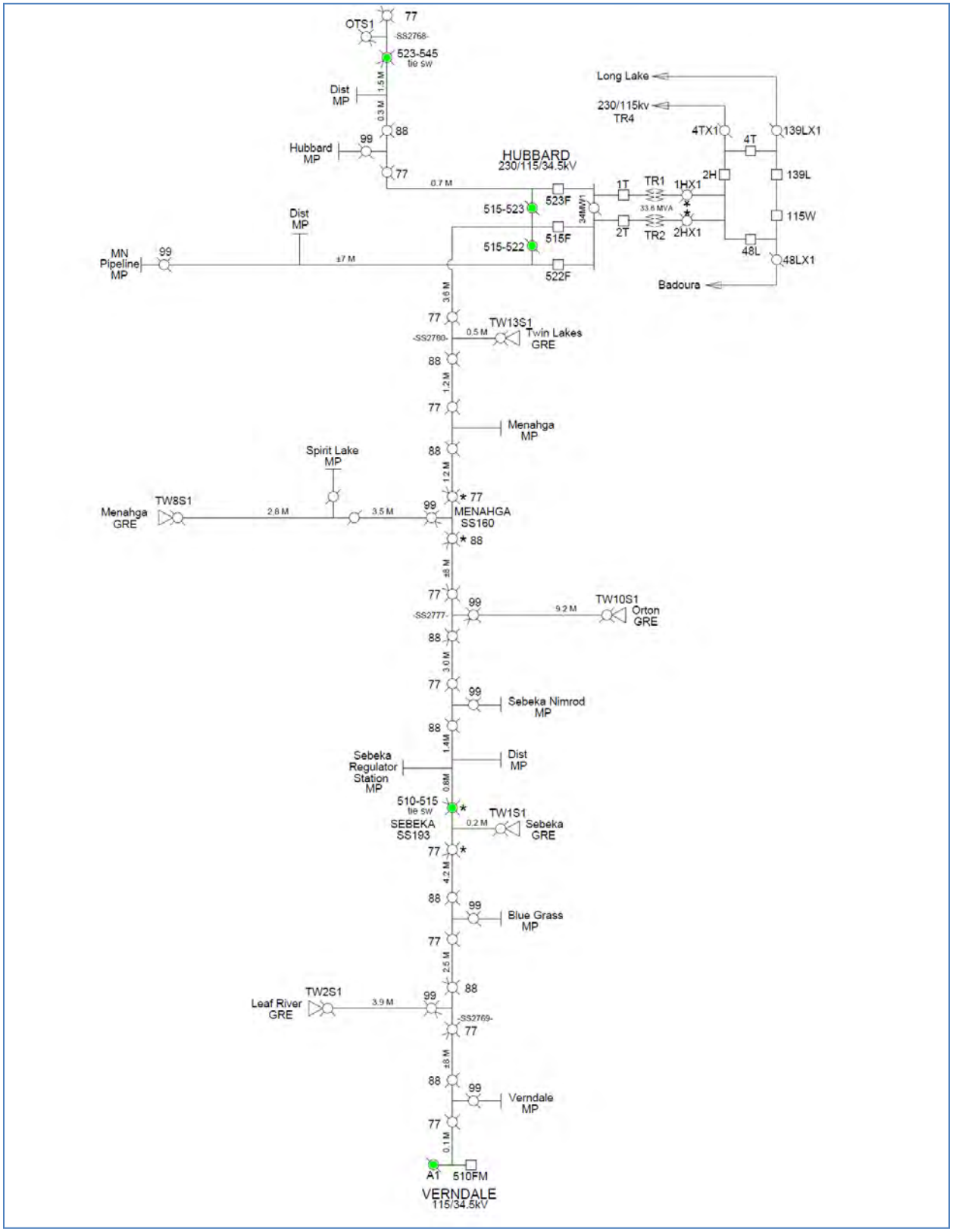


Table 3-1 summarizes the conductor type, length, and rating of the existing 34.5 kV sub-transmission lines in the affected load area.

Table 3-1. Affected Load Area and Project Area Conductors

	Hubbard–Verndale System	
Conductor Type	**Length (in miles)**	**Rating (in MVA)**
1/0A	4.6	15.8
3/0A	18.4	16.7
4/0A	6.3	22.7
336 A	21.5	29.6
Total Length	**50.8**	**N/A**

4 PROPOSED PROJECT

4.1 Project Description

The proposed Project is located entirely in Minnesota, in Hubbard, Becker and Wadena counties and is shown in **Figures 4-1A through 4-1C.**

Applicants propose to construct approximately 22.5 miles of new 115 kV transmission line between the existing Great River Energy Hubbard Substation and the proposed new Todd-Wadena Red Eye distribution substation; construct the proposed new Minnesota Power Straight River Substation and the proposed new Great River Energy Blueberry Substation; construct the proposed new Todd-Wadena Red Eye Substation to serve the proposed new MPL pump station; relocate the existing Todd-Wadena Menahga Substation to the new Blueberry Substation site and convert the voltage from 34.5 kV to 115 kV; and modify the existing Great River Energy Hubbard Substation and the Minnesota Power Pipeline Substation.

4.1.1 Transmission Line

Applicants are generally requesting approval of a 500-foot route width (250 feet either side of the transmission line in areas where the transmission line will be cross-country, or 250 feet either side of the centerline of road right-of-ways in areas where the transmission line follows a road), with the following exceptions (see detailed route maps in **Appendix G**):

- At the existing Hubbard Substation, an additional 150 by 650 feet north of the route width that encompasses the substation.

- In Section 26 of Straight River Township, a wider triangular route width is proposed to allow flexibility for the crossing of Minnesota Power's 230 kV "909" Line, although only a single alignment with an easement that is 50' on each side of the transmission line will be required in this area.

- Around the Straight River Substation, an area that accommodates the proposed location, plus an additional 650 feet to the west of the north-south alignment; and 500 feet north and 250 south of the road centerline is necessary to accommodate the transmission line.

- Around the Blueberry Substation, an additional route width of 100 feet to the north, 150 feet to the south, and 450 feet to the west of the substation is necessary to accommodate the transmission lines that will go in and out of the substation.

- Around the Red Eye Substation, an additional area of 400 feet by 750 north of the east-west alignment that extends into the substation (property owned by MPL) to allow flexibility in design and to minimize conflict with MPL and Todd-Wadena's facilities.

Figure 4-1A. Proposed Project-North

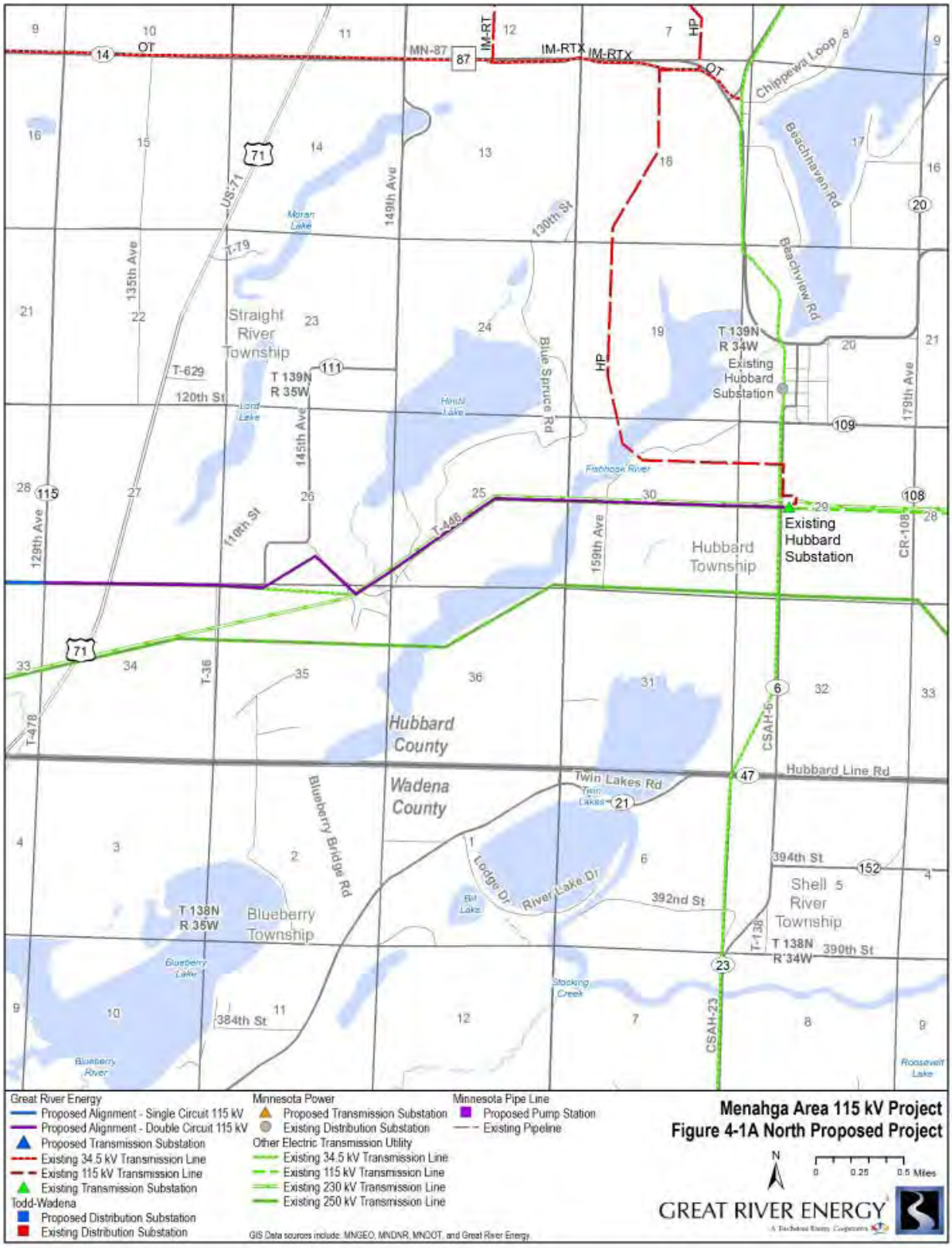


Figure 4-1B. Proposed Project-Central

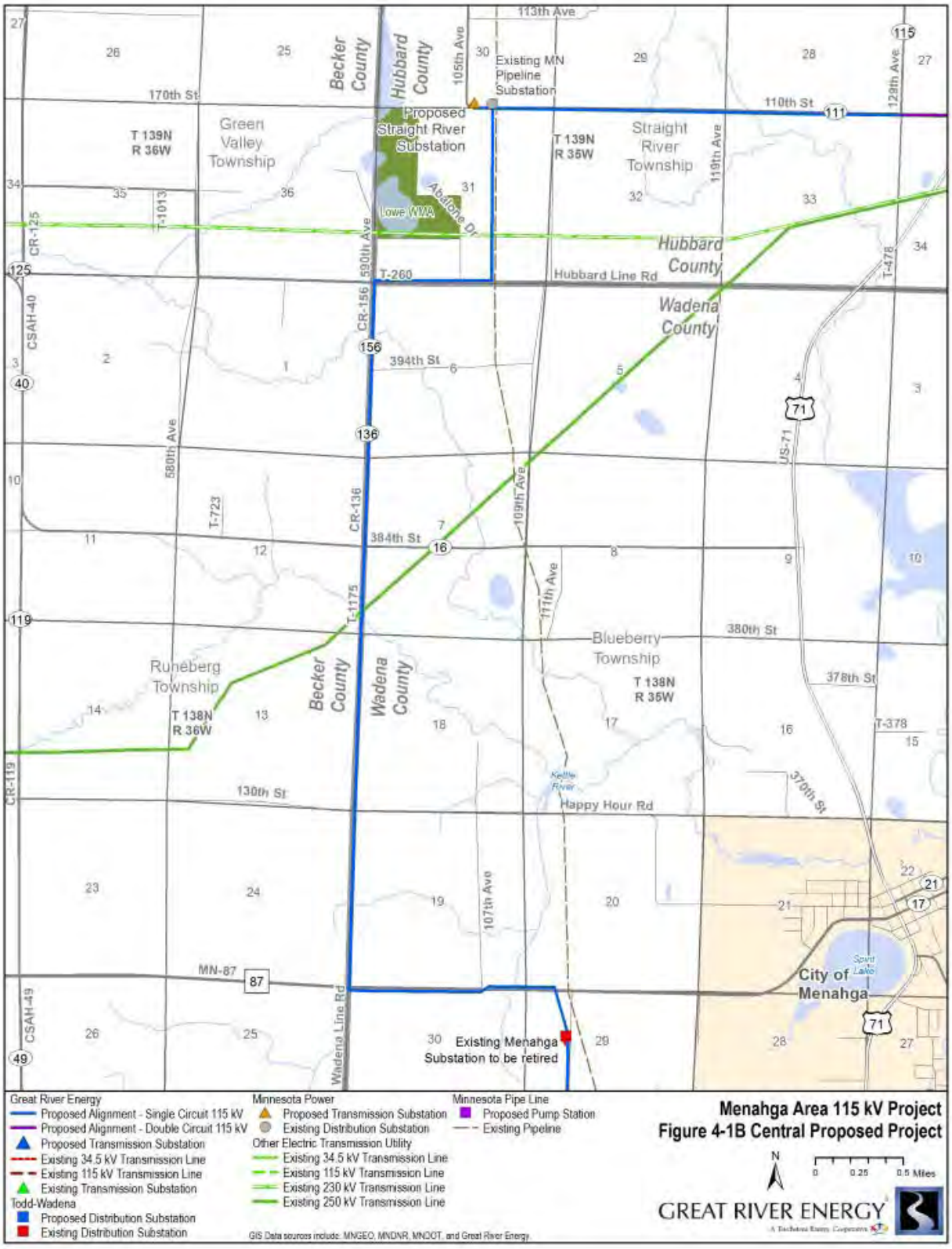


Figure 4-1C. Proposed Project-South

The Minnesota Power DC Line will need to be raised where the proposed 115 kV transmission line would cross under it in Section 7, T148, R35W. However, no additional right-of-way is anticipated to be needed to raise the line.

The proposed route is described below and detailed route maps (on aerial photo background) are included in **Appendix G.**

Proposed Route

The proposed route begins at Great River Energy's Hubbard Substation and heads westerly for approximately 7.0 miles to Minnesota Power's proposed new Straight River Substation. In this section of the Project the new 115 kV transmission line would replace Minnesota Power's 34.5 kV 522 feeder line. Because the 522 feeder line needs to remain energized during construction of the new 115 kV line, the 522 feeder line would not be removed until construction of the 115 kV line is complete. The first 4.5 miles of this section of the Project (from the existing Great River Energy Hubbard Substation west to CR 115) is proposed to be a double circuit 115 kV/115 kV line, as the second 115 kV circuit would be used for a future Great River Energy project to the north to address load-serving needs in the Osage area. Great River Energy is requesting that the second circuit be permitted as part of the Menahga Project so that the second circuit can be strung during construction of the Project, as it would be safer, more cost-effective, and would result in fewer environmental impacts (see additional discussion in **Sections 6.7 and 8.1.2**). A wider route is proposed in Section 26 of Hubbard Township to allow flexibility for the crossing of Minnesota Power's 230 kV "909" Line.

From the Straight River Substation, the line then turns southerly and will parallel the west side of MPL's pipelines for approximately 1.1 mile; it then turns westerly on the north side of Hubbard Line Road and continues for approximately 0.75 mile; it then turns southerly and runs along the west side of Wadena Line Road/County Road 156 for 4.0 miles to a crossing to the south side of TH 87; it then runs easterly along the south side of TH 87 for 0.75 mile, where it crosses to the north side of TH 87 and continues for 0.40 mile; it then turns in a south-southeasterly direction and angles to Great River Energy's existing TW-MET 34.5 kV line, where it will overtake the existing alignment for 0.5 mile to the proposed location of the new Blueberry Substation.

The line will exit the Blueberry Substation, turn west for 550 feet and cross to the westerly side of the Minnesota Energy natural gas pipeline, then turn southwesterly and continue along the west side of the Minnesota Energy pipeline for 0.25 mile; it then crosses 350th Street to the west side of 109th Avenue, where it continues for 1.5 miles to a proposed crossing of 109th Avenue to the southwest corner of the SW ¼ of the NW ¼ of Section 5 in Red Eye Township; the proposed line continues along the east side of 109th Avenue for approximately 0.75 mile to a crossing back to the west side near the southwest corner of the NW ¼ of the NW ¼ of Section 8, Red Eye Township; the proposed line continues along the west side of 109th Avenue for 0.75 mile to a crossing to the south side of CSAH 13, where it turns easterly and runs along the south side of CSAH 13 for 0.25 miles to a crossing to the north side of CSAH 13, where it continues easterly for 1.0 mile to a proposed crossing from the southeast corner of the SW ¼ of the SW ¼ of Section 9 to the northeast corner of the NW ¼ of the NW ¼ of Section 16; the proposed line then continues easterly for 0.75 mile along the south side CSAH 13, crosses TH 71, and continues easterly for 1.0 mile to the west side of 139th Avenue, where it turns south and continues along

the west side of 139th Avenue for about 1.5 miles to the Red Eye Substation in the SE ¼ of the NE ¼ in Section 22 of Red Eye Township.

Right-of-Way

Great River Energy has worked closely with the local, state and federal agencies and landowners regarding the Project. A 100-foot wide permanent ROW for the new transmission line (50 feet on each side of the transmission line centerline) will be acquired by Great River Energy. The easement may be slightly wider than 100 feet in some areas to accommodate guy wires and anchors. A portion of the easement may overtake/overlap with existing transmission or distribution line easements and/or road ROW where the line parallels a road.

A 100-foot wide ROW is Great River Energy's standard for a 115 kV transmission line to maintain proper clearances to objects within the ROW, and to ensure that the conductor will not blowout past the ROW during high wind events and that vegetation is sufficiently cleared to safely operate and maintain the line.

Structures

The majority of the new 115 kV line will consist of single circuit, single pole wood structures spaced approximately 275 to 400 feet apart. Spans for the double circuit portion of the Project will range from 350 to 450 feet. Transmission structures will typically range in height from 60 to 90 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. Some sections of the new line will have distribution underbuild, which would be attached to new 115 kV transmission line structures spaced 250 to 300 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 90 feet above ground 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.

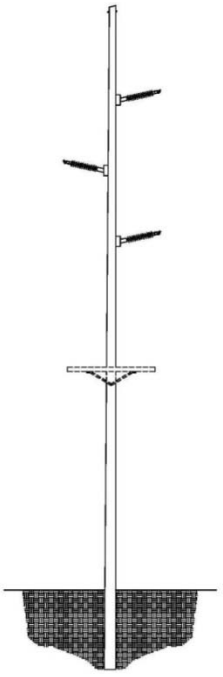
Typical 115 kV structure types (single circuit, single circuit with distribution underbuild, double circuit and H-Frame) are shown in **Figure 4-2** and **Figure 4-3**.

Conductors

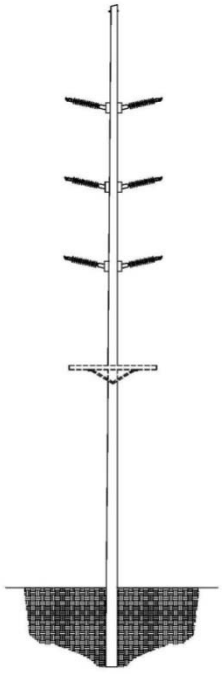
The single circuit structures will have three single conductor phase wires and one shield wire. It is anticipated that the phase wires will be 477 thousand circular mil ACSR with seven steel core strands and 26 outer aluminum strands.

The shield wire will be 0.528 optical ground wire.

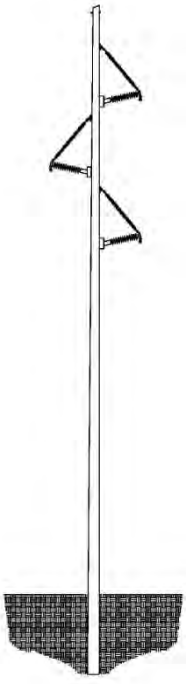
Figure 4-2. Typical Transmission Structure Types



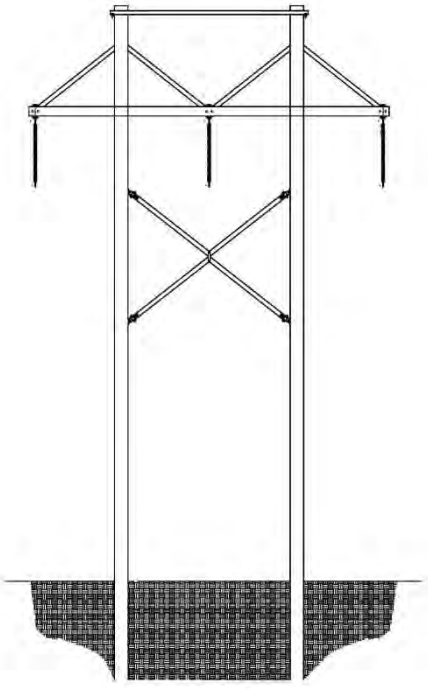
SINGLE CIRCUIT
HORIZONTAL POST
(UNDERBUILD AS REQURED)



DOUBLE CIRCUIT
HORIZONTAL POST
(UNDERBUILD AS REQURED)



SINGLE CIRCUIT
BRACED POST



SINGLE CIRCUIT
H-FRAME

Figure 4-3. Photos of Typical 115 kV Transmission Structures

Typical Single Circuit Structure with Distribution Underbuild

Typical Double Circuit Structure

Typical Braced Post Structure

Typical H-Frame Structure

Service Life

The service life of a transmission line is approximately 40 years, although based on experience, it is quite possible that the line and structures will last longer than 40 years.

Annual Availability

An average new 115 kV transmission line is expected to be available approximately 99.9 percent of the year. Applicants expect that these lines should not be out of service for any extended period of time other than the rare times when scheduled maintenance is required or when a natural event, such as a tornado, thunderstorm, or ice storm causes an outage.

4.1.2 Associated Facilities

The proposed Project associated facilities include:

- The new Minnesota Power Straight River Substation in the vicinity of the existing Minnesota Power Pipeline Substation;
- The new Great River Energy Blueberry Substation;
- Relocation of the existing Todd-Wadena Menahga Substation to the new Blueberry Substation site and conversion of the voltage from 34.5 kV to 115 kV;
- The new Todd-Wadena Red Eye Substation to serve the proposed MPL pump station;
- Modifications to the existing Great River Energy Hubbard Substation and Minnesota Power Pipeline Substation.

Preliminary plot plans for the proposed new substations are provided in **Appendix H**.

Minnesota Power Straight River Substation

Minnesota Power proposes to construct the Straight River 115/34.5 kV Substation near the existing MPL Park Rapids Pump Station to re-establish 34.5 kV service to the Minnesota Power Pipeline Substation after removal of the 34.5 kV source from Hubbard. The 34.5 kV 522 feeder line from the Hubbard Substation to the Pipeline Substation will be removed to accommodate the interconnection and routing of the new 115 kV transmission line.

It is anticipated that the fenced area of the 115 kV substation will be approximately 115’ by 180’.

Facilities at the Straight River Substation will include:

- 115/34.5 kV transformer
- A 115 kV “transrupter” and a 34.5 kV recloser
- A 3-way 115 kV motor operated switch and tap line (approximately 700 feet)
- Structural steel, grounding
- 115 kV and 34.5 kV substation switches
- Communications and metering equipment

Great River Energy Blueberry Substation

Great River Energy proposes to construct the Blueberry115/34.5 kV Substation south of the existing Menahga distribution substation near Menahga, Minnesota. Great River Energy has an option to purchase 10 acres in the NW ¼ of the SW ¼ of Section 29 of Blueberry Township. It is anticipated that the fenced area of the 115 kV substation will be approximately 240' by 415'.

Facilities at the Blueberry Substation will include:

- Relocated 115/34.5 kV transformer from the Hubbard Substation
- A 115 kV breaker and a 34.5 kV breaker
- 115 kV switches
- Electrical Equipment Enclosure
- Structural steel
- Bus work and fittings
- SCADA/Relay/Control Equipment
- Conduit
- Grounding
- Fiber optic communication
- 115/12.47 kV distribution transformer
- Low side sectionalizing equipment

Todd-Wadena Menahga Substation

Todd-Wadena proposes to relocate the existing Menahga Substation to the new Blueberry Substation site and convert the voltage from 34.5 kV to 115 kV. The existing Menahga Substation will be completely retired, including all equipment, structures and fence. The Menahga Substation will occupy approximately 100' by 100' at the Blueberry site.

Facilities at the relocated Menahga Substation will include:

- 115/12.47 kV transformer
- Structural steel
- Meter building
- Bus work
- Low side sectionalizing equipment

Todd-Wadena Red Eye Substation

Todd-Wadena proposes to construct the Red Eye 115/4.16 kV Substation to support the motor loads for the MPL Sebeka pump station. Todd-Wadena plans to construct the proposed new substation on MPL's property in Section 22, T137N, R35W in Red Eye Township. It is anticipated that the fenced area of the 115 kV substation will be approximately 125' by 125'.

Facilities at the Red Eye Substation will include:

- 115/4.16 kV transformer
- Electrical Equipment Enclosure

- Structural steel
- Bus work and fittings
- Low side sectionalizing equipment
- Meter equipment
- Conduit, Grounding
- Fiber optic communication

Great River Energy Hubbard Substation

Great River Energy will modify the existing Hubbard Substation to accommodate the new 115 kV transmission line. One 115/34.5 kV transformer will be relocated to the proposed Blueberry Substation. The existing 34.5 kV breakers and foundations associated with the transformer will be retired. New equipment to be installed at the Hubbard Substation includes:

- A 115 kV breaker in the ring bus
- 115 kV switches
- Structural steel, bus work and fittings
- SCADA/Relay/Control Equipment
- Conduit, grounding
- Grounding
- Fiber optic communication

Minnesota Power Pipeline Substation

The existing Minnesota Power Pipeline 34.5/4.16 kV Substation, which provides a dedicated source to the MPL Park Rapids pump station, may need to be modified to accommodate the connection of a 34.5 kV feeder from the proposed new Straight River Substation. The extent of these modifications, if they are needed, will not be known until further engineering is completed on the Straight River Substation.

4.2 Estimated Costs

Total Project costs are estimated to be approximately $23 million dollars.

4.2.1 Great River Energy

Estimated costs for Great River Energy's portion of the proposed Project are divided into five phases. The tasks associated with each phase are outlined below and estimated costs for each phase are summarized in **Table 4-1**.

Planning
Siting and routing preliminary activities
Project presentation to the public
Certificate of Need and Route Permit development/state permitting process
Establishing centerline for survey

Land Acquisition/Miscellaneous Permits
Easements, ROW and environmental permits

Design
Line and structure design, survey and probes/soil borings

Procurement
Cost of all construction materials, i.e. poles, conductor and hardware

Construction
Staking for clearing and construction
ROW clearing and restoration
All construction labor and heavy equipment

Close Out
Remaining ROW restoration activities
Field verification surveys
Financial, engineering, and environmental close out activities

Table 4-1. Estimated Great River Energy Project Costs (2014 Dollars)

Project	Planning/ State Permitting	Land Acquisition/ Permits	Design	Procurement	Construction	Close Out	Total
Transmission Line	$553,682	$1,254,841	$587,317	$4,644,204	$5,701,116	$195,340	**$12,936,500**
Switches	$ 12,200	$ 10,200	$ 46,000	$ 146,000	$ 176,600	$ 9,000	**$ 400,000**
Meters	0	0	$ 39,200	$ 62,400	$ 53,600	$ 4,800	**$ 160,000**
Hubbard Substation	$ 11,160	$ 22,940	$ 86,800	$ 660,300	$ 441,440	$ 17,360	**$1,240,000**
Blueberry Substation	$ 27,000	$ 55,500	$210,000	$1,597,500	$1,068,000	$ 42,000	**$3,000,000**
Red Eye Substation	$ 13,500	$ 27,750	$105,000	$ 798,750	$534,000	$ 21,000	**$1,500,000**
Menahga Substation	$ 9,000	$ 18,500	$ 70,000	$ 532,500	$356,000	$ 14,000	**$1,000,000**
Total	**$626,542**	**$1,389,731**	**$1,144,317**	**$8,441,654**	**$8,330,756**	**$303,500**	**$20,236,500**

All capital costs for the proposed Blueberry Substation, modifications at the Hubbard Substation, and the approximately 22.5 miles of new 115 kV transmission line between the Hubbard Substation and the Red Eye Substation will be borne by Great River Energy. All capital costs for the Red Eye Substation and the relocated Menahga Substation will be borne by Todd-Wadena.

4.2.2 Minnesota Power

Estimated costs for Minnesota Power's portion of the proposed Project are summarized in **Table 4-2**.

Table 4-2. Estimated Minnesota Power Project Costs (2014 Dollars)

Component	Cost
Straight River Tap – Straight River 115 kV Line	$ 620,000
Straight River 115/34.5 kV Substation	$ 2,140,000
Straight River – Pipeline 34.5 kV Line	$ 50,000
Total	**$ 2,810,000**

All capital costs for the Straight River Substation (and associated facilities in the immediate area) and any modifications required at the Minnesota Power Pipeline Substation will be borne by Minnesota Power.

4.2.3 Transmission Line Construction Costs

Single pole construction costs are approximately $498,000 per mile. H-Frame construction costs are approximately $550,000 per mile and the double circuit construction costs are approximately $747,000 per mile.

There may be areas where construction is more difficult (e.g. where there are access issues or where greater span lengths must be employed to avoid sensitive features). In these areas the use of wooden mats, the Dura-Base Composite Mat System, or specialized construction vehicles to minimize environmental impacts during line construction may be required and could increase costs by $50,000 or more per mile.

4.2.4 Operation and Maintenance Costs

The estimated annual cost of ROW maintenance and operation and maintenance of Great River Energy's transmission lines (69 kV to 500 kV) in Minnesota currently average about $2,000 per mile. Storm restoration, annual inspections and ordinary replacement costs are included in these annual operating and maintenance costs.

4.3 Effect on Rates

The Commission's rules require an applicant to provide the annual revenue requirements to recover the costs of a proposed project. The Commission's Order of December 3, 2014, granting exemptions allowed the effect on rates to be described in the format set forth below.

Great River Energy has submitted the Hubbard to Blueberry area project for consideration as part of the 2014 MISO Transmission Expansion Plan (MTEP 14) and the Sebeka pump station area project for consideration as part of the 2015 MISO Transmission Expansion Plan (MTEP 15); Minnesota Power has submitted the Straight River Substation project for consideration as part of the MTEP 15 as well. The initial annual revenue requirement for both area projects is estimated

to be in the range of $2.7 million to $3.1 million. This is based off of a combined investment $14 to $16 million from both Minnesota Power and Great River Energy that may be included in MISO rates. Assuming a 10 MW increase in load associated with the Project, the effect on the zonal rate for the Minnesota Power pricing zone is estimated to be an increase in the range of a $0.11 to 0.13 per kW-month.

4.4 Project Schedule

Provided Applicants obtain a CON and a Route Permit by early 2016, Applicants plan to commence construction of the Project in late spring 2016 and complete it by spring 2017. Applicants anticipate that construction will take approximately 11 months and that the entire Project will be energized in April 2017.

4.5 Estimated Line Losses

When electrical energy is sent over a transmission line, some of it is lost through conversion into heat from the resistance in the conductor. The losses that occur are directly related to the square of the current flowing through the transmission line, the conductor size, and the length of the line. Additionally, transmission lines operated at higher voltages need less current to transfer the same amount of power than lower voltage lines. Therefore, the higher the operating voltage of a transmission network, the lower the amount of losses encountered for the same amount of power transferred, wire size, and line length. Also, because the current across a transmission line usually varies over time, losses are seldom constant from hour to hour, or from month to month.

Losses are a measure of the energy flow across the system that is converted into heat due to the resistance within the elements of the transmission system. It is necessary for utilities to provide enough generation to serve their respective system demands (plus reserves), taking into account the loss of the energy before it can be usefully consumed. By reducing and minimizing the amount of system losses, more efficient delivery of the electrical energy to the end user is achieved, which can help to defer the need to add more generation resources to a utility's portfolio. Therefore, system loss reduction results in monetary savings in the form of less fuel required to meet the system demand plus delayed capital investment in generating plant construction.

In determining the amount of losses associated with a particular project, it is not reasonable to consider only the project's transmission and calculate the losses directly from operation of that transmission. It is necessary to look at the total losses of the system that result with and without the proposed project. In its Exemption Order, the Commission authorized Applicants to provide line loss data for the system as a whole, rather than line loss data specific to the individual transmission lines. In this case Applicants considered a significantly larger area served by a number of utilities to determine the resulting effect of the Project's transmission upgrades.

Applicants calculated losses at peak demand based on the 2014 winter peak loadings. The results are summarized in **Table 4-3**.

Table 4-3. Summary of Line Losses

Scenario	System Losses (MW)
Existing System	154.3
System with Project Transmission	154.0
Difference	-0.3

Table 4-3 shows that the Project's proposed transmission infrastructure reduces the losses on the electrical system. Under winter peak demand conditions, the losses incurred are 0.3 MW less when the Project is energized as compared to the existing system configuration.

Because demand for electric power is not constant and losses are related to the square of current flowing through the transmission lines in the electric system, the losses will change over time, increasing as demand increases and decreasing as demand decreases. Because losses change over time, there is no precise method to calculate average annual loss reductions. One common method is to use the loss savings at peak demand to estimate the average annual loss savings in megawatt hours (MWh) based on the following formulas[1]:

$$\text{Loss Factor} = (0.3 \times \text{Load Factor}) + (0.7 \times \text{Load Factor}^2)$$

$$\text{Annual Loss Savings (MWh)} = (\text{Loss Factor} \times \text{Peak Loss Savings}) \times 8760 \text{ hours/year}$$

The average load factor for the Project area is 50.96 percent. Using the method described above and the calculated loss savings at peak demand (given in **Table 4-3**), the Project will reduce average transmission losses by an estimated 977.7 MWh annually.

4.6 Construction Practices

Applicants intend to employ normal practices in construction of the new substations and transmission line. No unusual or difficult features are expected along the route. Construction practices to be followed are described in more detail in **Section 8.4**.

4.7 Operation and Maintenance Practices

Great River Energy will periodically use its transmission line ROW to perform inspections, maintain equipment, and repair damage. Regular maintenance and inspections will be performed over the life of the facility to ensure a reliable system. Annual inspections will be done by foot, snowmobile, All-Terrain Vehicle, pickup truck, or by aerial means. These inspections will be limited to the acquired ROW and areas where obstructions or terrain require access off the easement. If problems are found during inspection, repairs will be performed and the landowners will be compensated for any losses incurred.

[1] Gönen, Turan. *Electric Power Distribution System Engineering.* McGraw Hill, 1986. 55, 58-59.

Great River Energy's Transmission Construction & Maintenance Department will conduct vegetation surveys and remove undesired vegetation that will interfere with the safe operation of the transmission line. A three to seven year cycle of vegetation maintenance is desirable. ROW practices include a combination of mechanical and hand clearing, along with an application of herbicides where allowed.

4.8 Work Force Required

During construction, there will be positive impacts to community services, hotels and restaurants to support the utility personnel and contractors. It is estimated that 15 to 20 workers at a time will be employed during construction of the Project.

It is not expected that additional permanent jobs would be created by this Project. The construction activities would provide seasonal influx of additional revenue into the communities during the construction phase, and some materials may be purchased locally.

5 PROJECT NEED AND PURPOSE

5.1 Summary of Need

The proposed Project is needed by 2017 to:

- Meet the in-service date for the proposed MPL Sebeka pump station that will be served by the proposed new Todd-Wadena Red Eye distribution substation.
- Address circuit overloads that currently exist on the Hubbard-Verndale 34.5 kV system and alleviate capacity issues identified on the lines between Hubbard and Verndale.

These needs are discussed in the sections below.

5.1.1 MPL Pump Station Need

MPL Reliability Project

The Minnesota Pipe Line Reliability Project will increase the pumping capacity on the MPL System's newest pipeline (MPL Line 4) to maintain reliable crude oil supplies to Minnesota refineries.

MPL is currently the only pipeline system supplying crude oil directly to Minnesota's two refineries: the Northern Tier Energy, LLC's Refinery in St. Paul Park, Minnesota and the Flint Hills Resources, LP's Refinery in Rosemount, Minnesota. These refineries are responsible for producing the vast majority of transportation fuels on which Minnesotans rely, and other essential products such as asphalt and home heating fuels. The refineries also help meet regional demand for these products, supplying significant percentages of the fuels used in surrounding states.

The MPL System is comprised of four pipelines that originate at a crude oil station in Clearbrook, Minnesota. The first pipeline in the system was installed in 1954. A second pipeline was built in the 1970s, and the third in the 1980s. The system was most recently expanded in 2008 with the addition of MPL Line 4 – formerly known as the MinnCan Project.

Today the MPL System has insufficient pumping capacity to maintain reliable crude oil supplies to the Minnesota refineries.

Since MPL Line 4 was built in 2008, both refineries have improved their utilizations and increased their operating capacity which, in turn, has increased demand on the MPL System. Wood River Pipeline, which had been capable of supplying Minnesota refineries with 90,000 barrels per day of crude oil, also has since been idled, shifting additional demand from the two Minnesota refineries to the MPL System.

As pipelines age, they also require more frequent inspections and maintenance, and occasionally must be taken out of service for extended periods of time to remain in good working condition. The MPL System currently lacks the pumping capacity needed to perform preventative maintenance on segments of the pipeline without disrupting crude oil supplies to Minnesota refineries. The MPL System also currently has insufficient sprint capacity, which is the ability to transport surplus barrels to refineries when needed to satisfy a sudden increase in demand or to make up for prior production or pipeline outages.

Supply disruptions caused by system outages, production constraints, or a lack of adequate pipeline capacity can have serious implications for local economies and people's daily lives. For example, in early 2014 a failure of a primary pipeline that supplies natural gas to Minnesota resulted in a sharp increase in prices, product rationing, and a prolonged shortage of home heating fuels. Similarly, in the summer of 2013, a series of regional refinery outages and system constraints caused record high gasoline prices in Minnesota and much of the Upper Midwest.

The continued reliability of the MPL System is critical to maintaining adequate supplies of the fuels Minnesotans and other Midwesterners depend on for transportation, home heating, powering motorized equipment, and numerous other applications.

MPL Line 4 was originally designed with a capacity of approximately 350,000 barrels of crude oil per day, but it currently transports approximately 165,000 barrels per day. The MPL Reliability Project will add six pump stations to MPL Line 4 and upgrade two existing stations to allow the pipeline to operate at its original design capacity. The total volume of crude oil reaching the market is not expected to change significantly as a result of this Project, but it will give MPL the flexibility to shift volumes to MPL Line 4 as needed to maintain reliable crude oil supplies and meet demand.

The expected maximum operating pressure of MPL Line 4 will not change as a result of the MPL Reliability Project. Rather, the pump stations will allow the pipeline to maintain a more consistent pressure across the entire 305 mile pipeline expanse.

The new pump stations will be located in rural areas along the MPL Line 4 route in Hubbard, Wadena, Morrison, Meeker, McLeod and Scott counties. No new pipeline will be constructed and no new ROW will be acquired for the MPL Reliability Project.

The proposed pump station related to the Menahga Area 115 kV Project is the "Sebeka" pump station in Wadena County.

The MPL System is operated and maintained by Koch Pipeline Company, L.P., which has a best-in-class program to inspect and repair pipelines through proactive reliability strategies. This includes an in-line integrity program and pump station equipment maintenance reliability programs.

The MPL Reliability Project is an estimated $125 million private investment that will bring increased property tax benefits to the counties where construction will occur. Additionally, 40 to 50 new construction jobs will be created as a result of the MPL Reliability Project. MPL anticipates using local contractors, as it does with most projects.

Gasoline, diesel, jet fuel, and other petroleum-based products remain essential to the economy. The MPL Reliability Project is critical to maintaining adequate supplies of these products while maintaining the long-term safety and reliability of the MPL System.

Sebeka Pump Station Electrical Needs

The electrical facility nearest the proposed Sebeka pump station is the Hubbard-Verndale 34.5 kV system. The Hubbard-Verndale 34.5 kV system is not robust enough to serve the pump station, which will include three 4500 horsepower electric motors that would create an electric demand of 10 MW at full output, as explained below.

When a motor is started, it typically draws a current 6-7 times its full load current for a short duration (commonly called the locked rotor current). During a motor start, there is a large increase in current that will result in a larger voltage drop across the system. This means that there can be large momentary voltage drops system-wide. If the system does not have a strong enough voltage source, the motor itself may not start. Meanwhile, the rest of the customers served from the same 34.5 kV system will see suppressed voltages.

Additionally, the Hubbard-Verndale 34.5 kV system does not have the capacity to serve 10 MW of electrical demand. The transition of Great River Energy's Menahga load from the 34.5 kV system to a new 115 kV system at the Blueberry Substation creates capacity on the Hubbard-Verndale 34.5 kV system, but not nearly enough capacity to serve the proposed 10 MW Sebeka pump station load.

Because it has been determined that the Hubbard-Verndale 34.5 kV system is not a feasible load-serving option for the proposed pump station, a new, larger voltage source at the Red Eye Substation is needed to provide reliable electric service to the pump station.

5.1.2 Load-Serving Need

Operational Contingencies

The Menahga Area 115 kV Project is required to address system overloads in the affected load area (**Figure 5-1**). System overload concerns are due to the growth of the peak electrical demand that has surpassed the level that can be served, and the age of the 34.5 kV sub-transmission lines combined with the overall length of the 34.5 kV network. The Project will also improve an aged sub-transmission infrastructure prone to operational concerns.

Maintaining the voltage of the power system is essential for the normal operation of electrical equipment connected to the power system. Electric appliances, for example, draw a large amount of current (above rated current) during low voltage conditions. This condition creates heat within the electric appliance that can damage the appliance. **Table 5-1** identifies the voltage criteria applied by substation owners and operators in the affected load area under both system intact and contingency conditions. Great River Energy and Minnesota Power both operate substations in the affected load area.

Figure 5-1. Affected Load Area

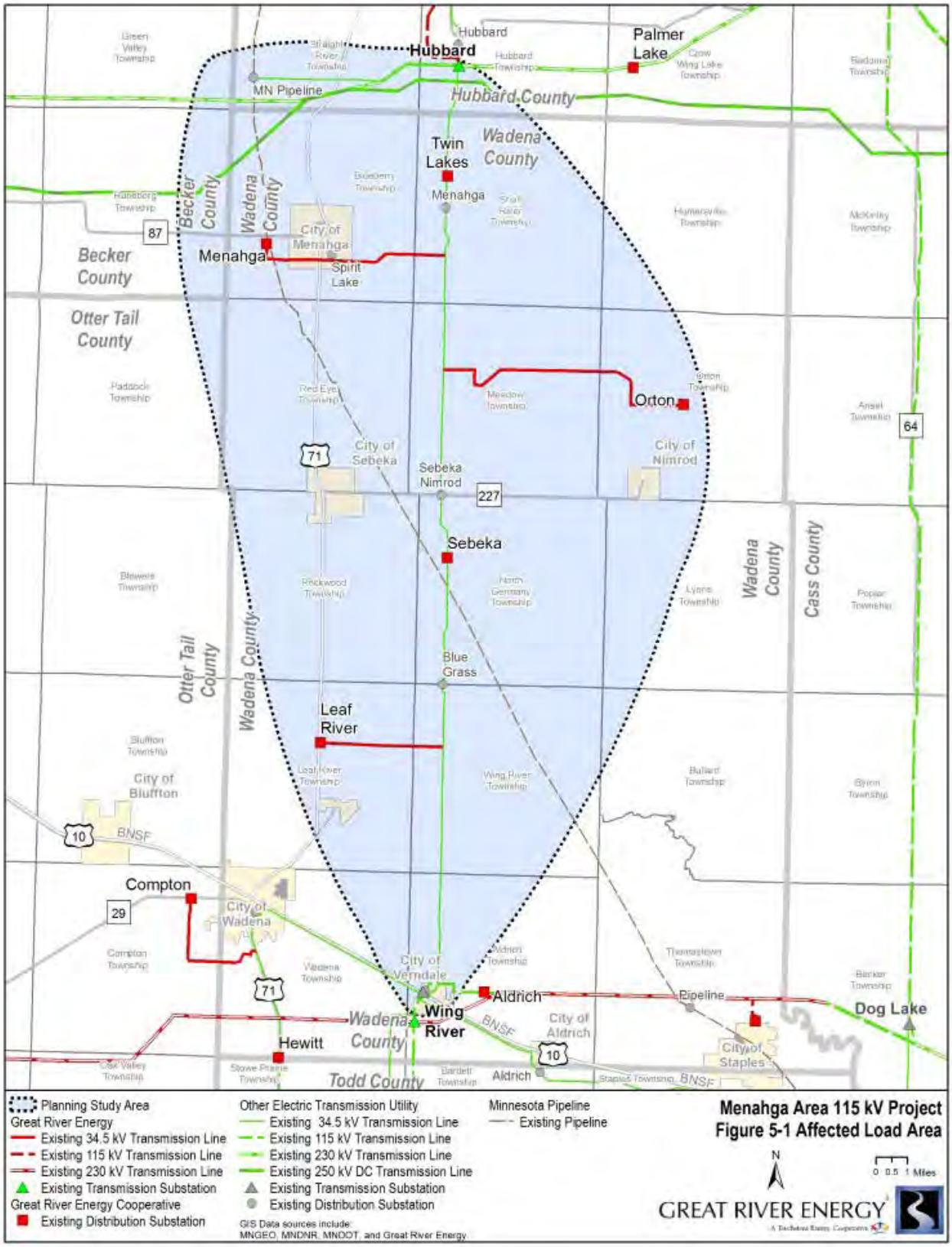


Table 5-1. Substation Voltage Criteria

Transmission System	System Intact		Contingency	
	Minimum Voltage (per unit)	Maximum Voltage (per unit)	Minimum Voltage (per unit)	Maximum Voltage (per unit)
Great River Energy	0.95	1.05	0.92	1.10
Minnesota Power	0.97	1.05	0.92	1.10

Transmission line and transformer overloads concerns relate to the amount of current operating through the conductor. Electrical equipment requires sufficient current to function properly. Conductors are rated to allow a certain amount of current to be carried. As electrical demand grows or when additional equipment is connected to the system, the conductor continues to supply the required current until the conductor reaches its maximum rating. An overload situation occurs when the conductor transfers current above its rating. In an overload situation, a conductor can heat up and begin to sag. Similarly, a transformer can overload and cause loss of life and/or fail catastrophically. If the overload condition is great enough or prolonged enough, the conductor can break. A break in a conductor can cause service interruption, equipment damage, or other system concerns. **Table 5-2** identifies the thermal loading criteria applied by transmission line owners and operators in the affected load area under both system intact and contingency conditions.

Table 5-2. Transmission Line Thermal Loading Criteria

Transmission System	Normal (percent)	Emergency (30 minutes) (percent)
Great River Energy	100	100
Minnesota Power	100	110

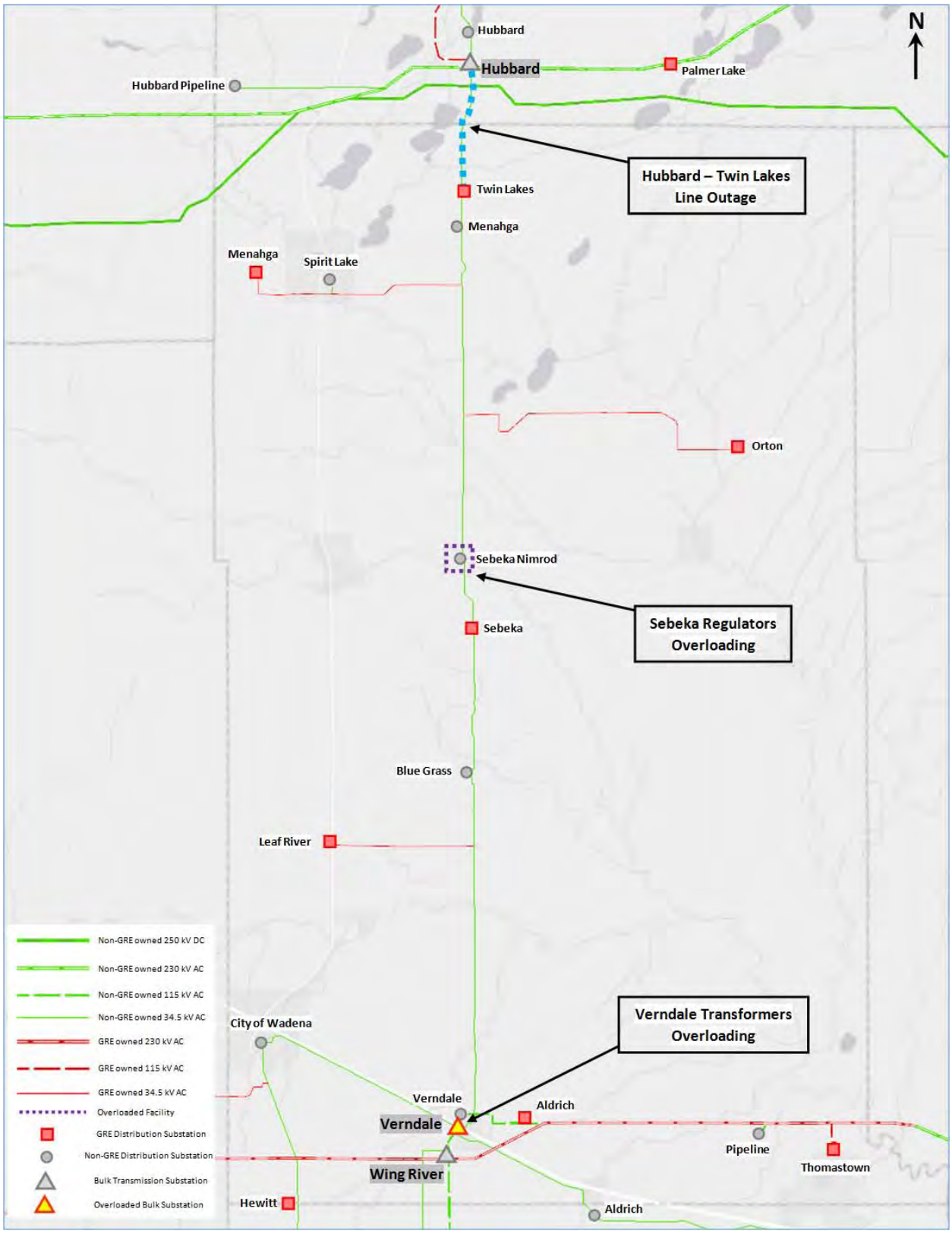
There are several single-system outages, when they occur, that lead to overloaded equipment in the study area, either a line or a transformer. Outages on the Hubbard-Twin Lakes or Verndale-Verndale distribution can lead to conditions that result in overloading lines and transformers, as described in next section.

System Contingencies

Hubbard-Twin Lakes 34.5 kV Outage

An outage of the Hubbard-Twin Lakes 34.5 kV sub-transmission line results in overloading of the Verndale transformers and the Sebeka Regulator Station. The outage of this particular line causes thermal overloads. These overload concerns are under existing system conditions. **Figure 5-2** identifies the substations and lines that experience these operational concerns during this contingency.

Figure 5-2. Hubbard-Twin Lakes 34.5 kV Outage with Existing System Conditions



Verndale-Verndale Distribution 34.5 kV Outage

An outage of the Verndale-Verndale 34.5 kV sub-transmission line results in an overload of the Hubbard-Twin Lakes 34.5 kV sub-transmission line. The outage of this particular line causes thermal overloads. These overload concerns are under existing system conditions. **Figure 5-3** identifies the substations and lines that experience these operational concerns during this contingency.

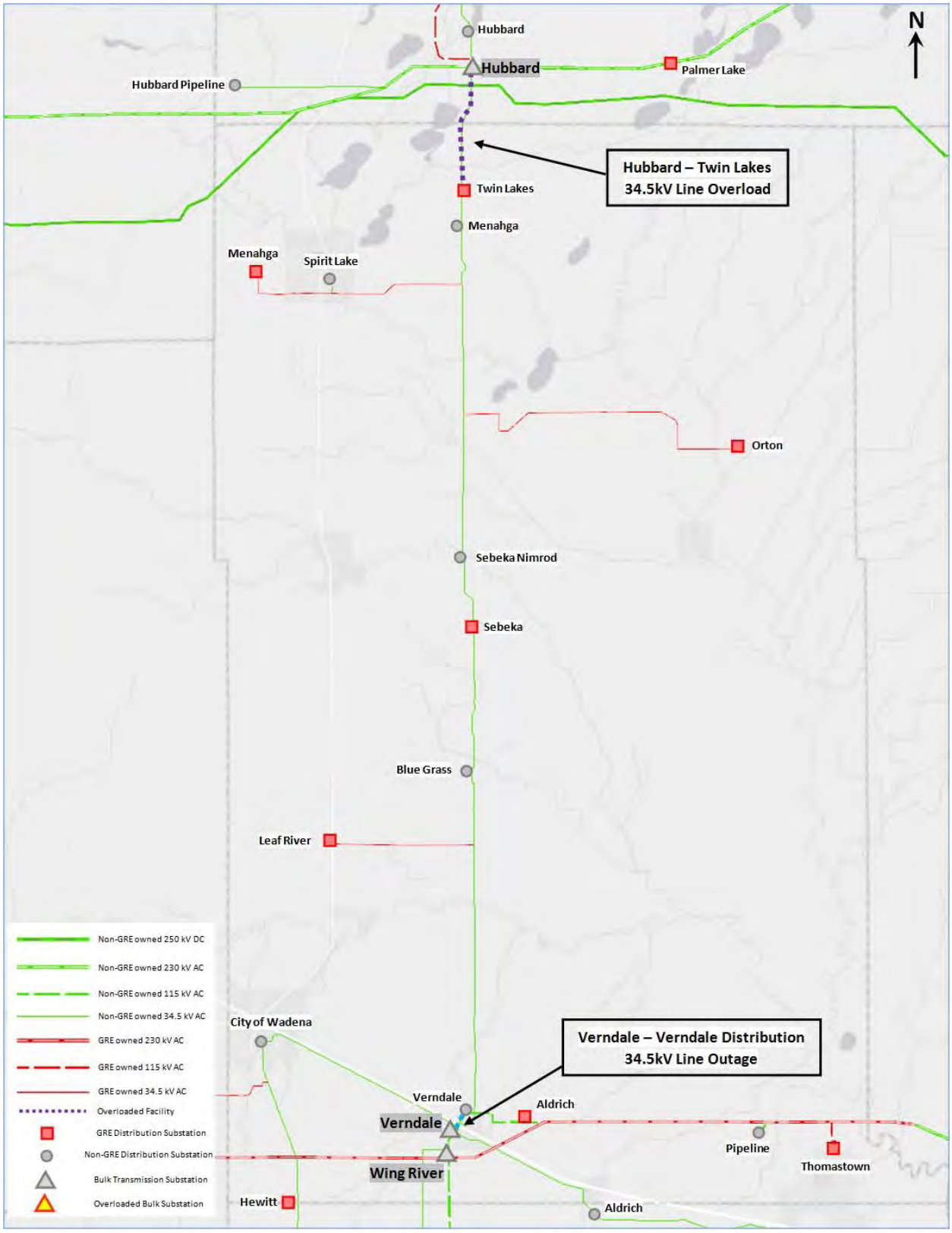
5.2 Relationship Between Proposed Project and Overall State Energy Needs

The need for this Project has been discussed in the Minnesota Biennial Transmission Projects Report since 2007 (Tracking Number 2007-NE-N3).

The proposed Project is a baseline reliability project that will insure a continuous supply of secure and reliable electric energy. The affected load area will benefit from the proposed Project. The benefit will be experienced in areas along CR 23 between Hubbard and Verndale including Menahga, Nimrod, Sebeka, Verndale and areas in between. This Project is consistent with the goals of the Minnesota Energy Security and Reliability Act that addressed a wide range of energy issues, including building the infrastructure necessary to deliver electric energy in a timely, efficient, secure, and reliable manner while at the same time minimizing cost and impact on the environment.

If the proposed Project or one of its alternatives is not constructed, the electrical needs of the proposed MPL Sebeka pump station could not be met. In addition, studies indicate that without the Project, electric security in the Project area would decrease, which could lead to reduced reliability. An insecure unreliable electric supply is not in the best interest of the area's residents or the State's; therefore, doing nothing would not be consistent with the energy policies of the State.

Figure 5-3. Verndale-Verndale Distribution 34.5 kV Outage with Existing System Conditions



5.3 Data Exemptions

On September 24, 2014, Great River Energy, on behalf of Applicants, submitted a Petition for Exemption to the Commission requesting that Applicants be exempted from certain filing requirements of the Minnesota Rules relating to information that must be included in a Certificate of Need application. The Commission, after soliciting and considering comments from interested persons, granted the exemption request on November 24, 2014, and issued its written Order on December 3, 2014. A copy of the Order is attached as **Appendix B**. In its Order, the Commission relieved Applicants from submitting certain information required under Minnesota Rules Chapter 7849 and specified other type of information that should be included in the CON application instead.

Applicants have included in this Application the information relating to the need for this Project required by the Minnesota Rules, as modified by the Commission in its Order granting the exemption request. The following summarizes the exemptions that were granted.

Minn. R. 7849.0260, Subps. A(3) and C(6). The Commission granted the request for an exemption from certain portions of Minnesota Rules 7849.0260, Subparts A(3) and C(6) requiring information on estimated line losses. The Commission authorized Applicants to provide line loss data for the system as a whole, rather than line loss data specific to the individual transmission lines.

Minn. R. 7849.0270, Subps. 1 and 2 (B-F). The Commission granted the request for an exemption from certain portions of Minnesota Rule 7849.0270 requiring information on predicted energy consumption for the utility's entire service area. Because the transmission upgrades proposed here are intended to serve the Hubbard-Verndale system, the Commission authorized Applicants to provide the requested data only for the affected load area. Historic demand data are provided for customers served from the Minnesota Power distribution substations and Great River Energy member cooperative substations in the affected load area that are relevant to the Project. Peak demand forecast was based on historical loading by substation, and growth rates of the affected load area that are part of the Minnesota Power and Todd-Wadena systems.

The Commission also exempted Applicants from providing data on forecasted consumption and peak demand by customer class (Minn. R. 7849.0270, Subps. 2(B) and 2(C)) for the northern portion of the Project. Instead, Applicants provided aggregate data on an annual coincident peak basis for the Minnesota Power and Todd-Wadena load in the Hubbard-Verndale system.

Because the southern half of the Project is needed to serve the proposed new MPL pump station, Great River Energy has provided information on the pump station to satisfy this rule.

The Commission exempted Applicants from providing information on the system peak demand by month as required in Minnesota Rule 7849.0270, Subpart 2(D). Instead of this information, Applicants have provided historical winter peak power demand data and forecast of power demand at each Minnesota Power substation and Todd-Wadena substation in the Hubbard-Verndale system that will benefit from the Project.

In lieu of providing the estimated annual revenue requirement per kilowatt hour for the system in current dollars (Minn. R. 7849.0270, Subp. 2(E)), the Commission granted Applicants' request to provide: 1) a description of how MISO spreads wholesale electricity costs among users of the transmission grid, and 2) the general financial effect of the Project on Great River Energy's member cooperatives and on Minnesota Power.

Minnesota Rule 7849.0270, Subpart 2(F) requires average system weekday load factors for each month. The Commission granted the exemption from this requirement because load factor is not relevant when evaluating the need for a transmission facility.

Minn. R. 7849.0270, Subps. 3-5 requires information on the forecast methodology employed, identification of databases, and details on the assumptions made in preparing the forecasts provided under Minnesota Rule 7849.0270, Subpart 2. Instead of this information, Applicants proposed providing substation load forecasts and line operation data. The Commission granted this exemption and Applicants have provided Minnesota Power and Todd-Wadena substation load data for those relevant substations within the Hubbard-Verndale system.

Minn. R. 7849.0280. The Commission exempted Applicants from the requirements of paragraphs B through G and I, as those sections apply to generation, not transmission proposals. The Commission also granted the request that the remaining requirements of Minnesota Rule 7849.0280, Subparts A and H, would be satisfied by providing information related to the affected load area for the Project.

Minn. R. 7849.0290. This rule requires an applicant to submit information about its conservation programs throughout its entire system. The Commission authorized Applicants to provide this information only for the applicable load area.

Minn. R. 7849.0300 and 7849.0340 requires detailed information regarding the consequences of delay on three specific statistically-based levels of demand and energy consumption. Applicants proposed to provide information regarding the consequences of delay in the context of the potential impacts on the local community's service reliability, and proposed to identify the threshold level of demand that places service at risk and the effect of incremental change in growth rather than evaluate system performance at three discrete demand levels. The Commission granted the requested exemption to these rules.

5.4 Affected Load Area

The customers that will benefit from the Project are primarily in Becker, Otter Tail, Wadena, and Hubbard counties.

Great River Energy has one member cooperative (Todd-Wadena) serving load in the affected load area from several substations. Todd-Wadena serves residential, commercial, agricultural and industrial customers in Becker, Otter Tail, Wadena, and Hubbard counties, including areas between Menahga, Sebeka, Nimrod, and Verndale. These areas will be benefit from the completion of the proposed Project.

Minnesota Power serves several areas in the affected load area. The load centers served by Minnesota Power in the affected load area include Menahga, Sebeka, Nimrod, and Verndale. These areas will directly benefit from the proposed Project.

5.5 Peak Demand and Annual Electrical Consumption

Minnesota Rule 7849.0270 requires an applicant for a CON to provide information about the peak demand and annual electrical consumption within the applicant's service area and system. Because the Project's transmission upgrades are designed to address localized system reliability issues, the Commission exempted Applicants from providing this information for their entire systems and authorized Applicants to provide the data only for the affected load area. Also, because there are small numbers of customers in the affected load area, the Commission agreed with Applicants that it was not necessary to provide the data for the various consumer classes served in the northern part of the Project and need only address customer class as it relates to the MPL pump station in the southern half of the Project. Finally, the Commission also agreed that the average system weekday load factor by month was not information that was required in this case.

5.5.1 Peak Demand

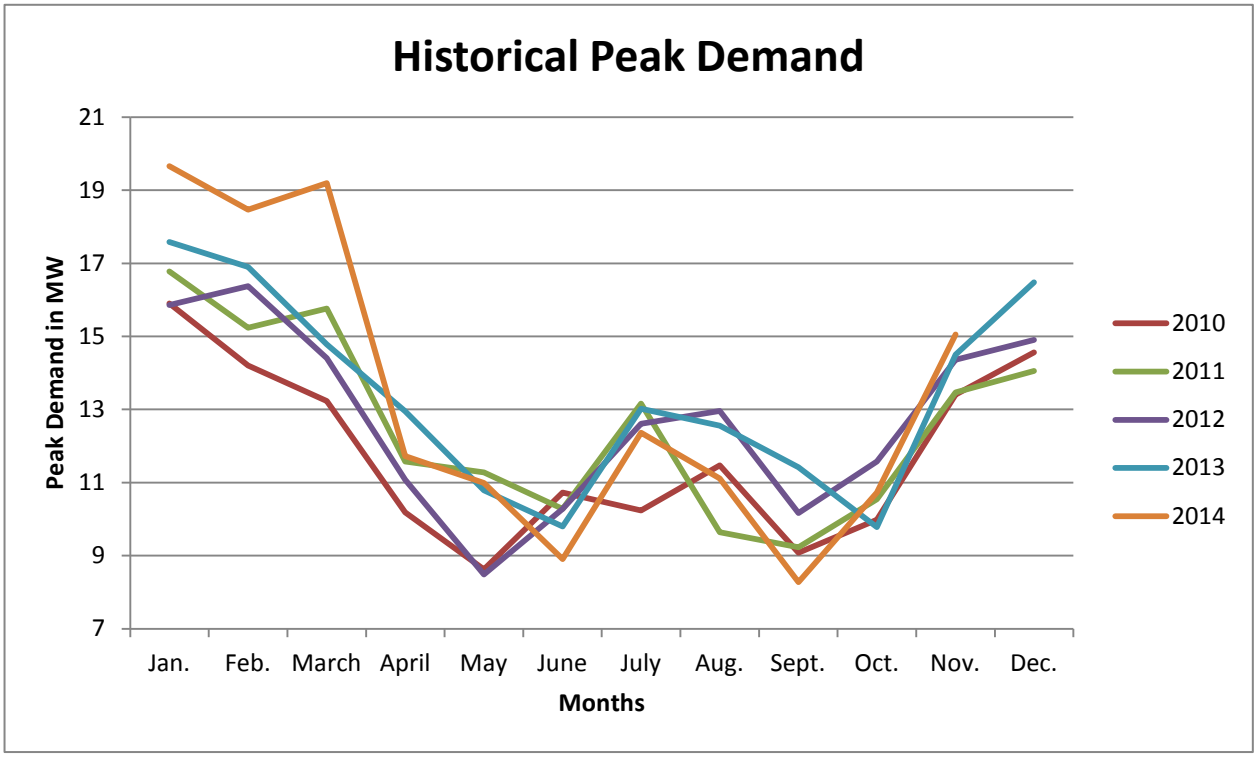
The peak demand for the affected load area for the previous five years is shown by month in **Table 5-3**. These peak demand values are based on the affected load area coincident peak demands.

Table 5-3. Historical Monthly Coincident Peak Demand for Affected Load Area (MW)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2010	15.90	14.20	13.23	10.18	8.63	10.73	10.24	11.47	9.08	9.98	13.41	14.56
2011	16.78	15.24	15.76	11.58	11.28	10.28	13.16	9.64	9.23	10.54	13.47	14.05
2012	15.86	16.37	14.40	11.08	8.49	10.28	12.61	12.96	10.17	11.58	14.36	14.90
2013	17.58	16.90	14.78	12.95	10.79	9.80	13.02	12.56	11.42	9.78	14.50	16.48
2014	19.66	18.47	19.19	11.73	10.99	8.90	12.37	11.11	8.27	10.73	15.05	N/A

Figure 5-4 shows the plots of the historical monthly peak demand shown in **Table 5-3**. The figure shows the affected load area highest electric demand occurs in the months between November and March. These are winter season months and the study models were based on addressing the winter peak demand of the affected load area. The load forecasts are mainly for expected winter season peak demands, as there is no value in creating a projection for summer season.

Figure 5-4. Historical Monthly Peak Demand of the Affected Load Area (MW)



5.5.2 Annual Electrical Consumption

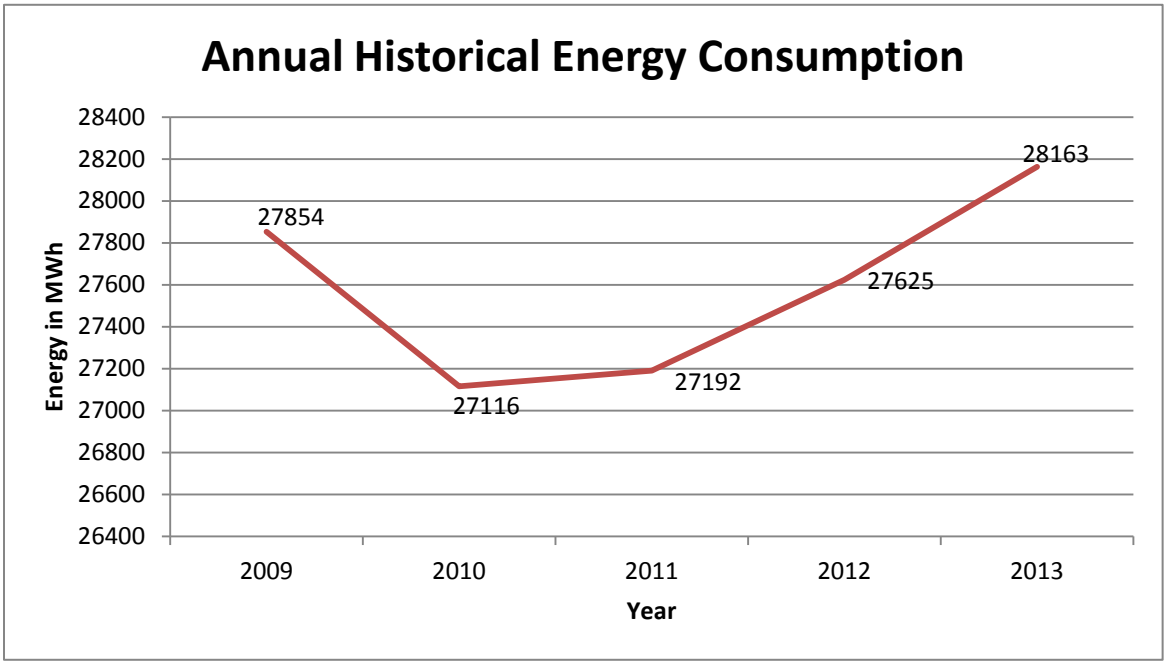
The total annual electrical consumption in MWh for Great River Energy and Minnesota Power loads in the affected load area for the previous five years is shown by month in **Table 5-4.**

Table 5-4. Historical Monthly Energy Consumption of Affected Load Area (MWh)

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
2009	3337	2659	2626	2112	1860	1784	1934	1931	1919	2322	2304	3065	**27,854**
2010	3118	2623	2357	1888	1964	1814	2106	2102	1778	1943	2444	2979	**27,116**
2011	3072	2609	2618	2101	1885	1785	2325	2050	1847	1942	2291	2669	**27,192**
2012	2917	2889	2493	1901	1797	1823	2372	2013	1859	2270	2488	2804	**27,625**
2013	2978	2608	2608	2276	1910	1836	2169	2192	1850	2107	2478	3151	**28,163**

Figure 5-5 shows the annual historical energy consumption from 2009 through 2013 of the affected load area. Over this 5-year period, the annual average growth rate in energy consumption was 0.3 percent.

Figure 5-5. Five-Year Historical Annual Energy Consumption of the Affected Load Area



5.6 Forecasts

Minnesota Rule 7849.0270 requires an applicant to explain the manner in which the applicant has conducted forecasting of its future energy needs. In the current filing, the Commission granted certain exemptions as summarized in **Section 5.3** and included in **Appendix B**, which is expected to result in a more streamlined filing focusing on the elements of the forecast that are more relevant to the need for the facilities. The affected load centers are mostly served by Great River Energy and Minnesota Power. The load forecasting methodology used by Applicants when determining the need for the proposed transmission Project is discussed in **Section 5.6.1**.

5.6.1 Methodology

When developing the long-range load forecast of the area for the affected load area, multiple load forecasts scenarios were compared. A more conservative load forecast, which has a high probability of occurring in the system, was chosen for the study. In fact, the existing and projected load profile and type of customers, such as residential, agricultural, commercial or industrial of the affected load area are different from one area to another. To be more predictive of the load growth trends at a specific load center in the affected load area, more emphasis was given to forecast loads based on growth rate by individual distribution substations.

Great River Energy (Todd-Wadena)

Great River Energy member cooperative Todd-Wadena serves the majority of the load centers in the affected load area. The following data were analyzed and compared when determining the growth rate percentage and projected peak load data for loads served by Todd-Wadena:

1. Past 10-year historical cooperative coincident peak load data and growth rate;

2. Recent 5-year historical cooperative peak load data and growth rate; and

3. Average annual growth rate per substation as forecasted by Great River Energy and Todd-Wadena.

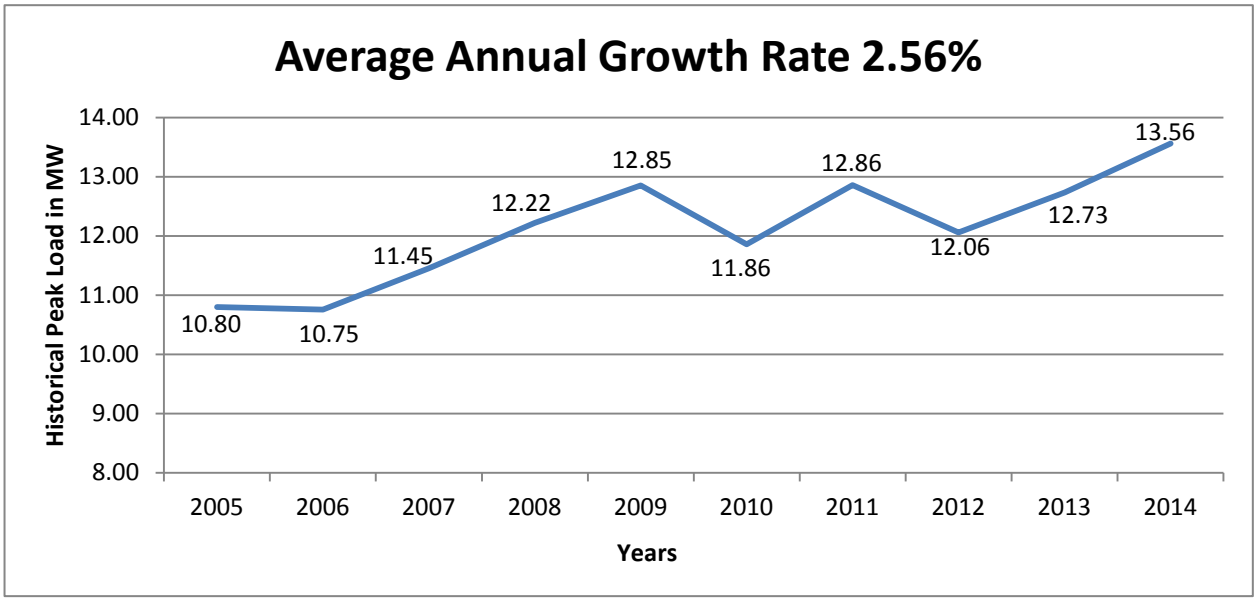
Great River Energy retrieved 10 years of historical coincident peak load data for the affected load centers served by Todd-Wadena. The historical coincident peaks are chosen so that switching peaks due to transferring loads between substations are removed when determining the peak demand at a substation. Note that switching peak is a peak demand at a substation when load is transferred to the substation from another substation by switching feeders. This mostly occurs during contingencies in the distribution system. **Table 5-5** shows the 10 years, from 2005 through 2014, recorded historical coincident peak demands in MW for the affected load area served by Todd-Wadena.

Table 5-5. Affected Load Area 10-Year Historical Coincident Peak Load Served by Todd-Wadena (MW)

Substation	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Sebeka	1.958	2.077	2.182	2.312	2.570	2.214	2.425	2.237	2.247	2.498
Menahga	3.389	3.412	3.855	3.907	4.210	3.396	3.654	3.495	3.662	3.974
Leaf River	2.786	2.605	2.690	3.058	3.189	3.190	3.426	3.001	3.287	3.433
Twin Lakes	1.008	0.978	0.985	1.015	0.944	1.324	1.507	1.493	1.526	1.550
Orton	1.659	1.682	1.741	1.927	1.941	1.737	1.844	1.833	2.010	2.106
Total	**10.80**	**10.75**	**11.45**	**12.22**	**12.85**	**11.86**	**12.86**	**12.06**	**12.73**	**13.56**

Figure 5-6 depicts the annual growth trend of the affected load area peak demand for the past ten years for loads served by Todd-Wadena. **Figure 5-6** illustrates that the peak load demand for the Todd-Wadena loads in the affected load area has shown consistent growth starting in 2005 and onward. The peak demand average annual growth rate of the affected load area served by Todd-Wadena for the prior 10 years is about 2.56 percent.

Figure 5-6. Affected Load Area Served by Todd-Wadena-10-Year Historical Coincident Peak Demand Growth Trend



Great River Energy also looked at historical peak demands of the affected load area for the past five years to get a more descriptive trend of the peak load growth rate of the affected load area for the near-term. The five-year historical load growth rate portrays the near-term peak load growth trend of the affected load area better than the growth rate based on the 10-year historical data. **Table 5-6** shows the five years, from 2010 through 2014, historical coincident peak loads recorded in the system.

Table 5-6. Affected Load Area Five-Year Historical Coincident Peak Load Served by Todd-Wadena (MW)

Substation	2010	2011	2012	2013	2014
Sebeka	2.214	2.425	2.237	2.247	2.498
Menahga	3.396	3.654	3.495	3.662	3.974
Leaf River	3.190	3.426	3.001	3.287	3.433
Twin Lakes	1.324	1.507	1.493	1.526	1.550
Orton	1.737	1.844	1.833	2.010	2.106
Total	**11.86**	**12.86**	**12.06**	**12.73**	**13.56**

The annual peak load demand of the affected load area in **Table 5-6** is plotted in **Figure 5-7** to graphically illustrate the peak load growth trend from 2010 through 2014.

Figure 5-7. Affected Load Area Five-Year Historical Coincident Peak Load Growth Trend – Todd-Wadena

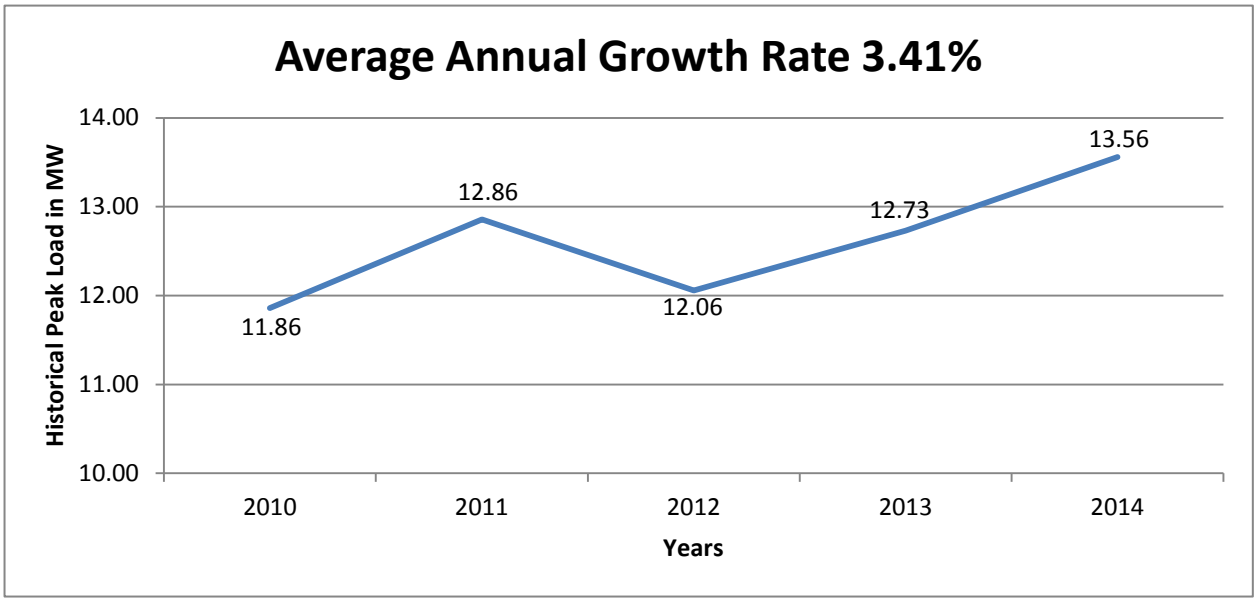


Figure 5-7 shows consistent growth of the peak demand for the affected load area served by Todd-Wadena. The historical peak load average annual growth rate was calculated to be about 3.41 percent.

Great River Energy also considered the load growth percentage as forecasted by Todd-Wadena. The load projection was done for individual substations that serve the affected load area. The load projection takes into account the projected land use data that are available from city and county agencies in Todd-Wadena's service territory. The number of new residential, commercial and industrial consumers for each substation was projected as part of long range load forecast analysis. **Table 5-7** shows the projected average annual load growth percentages for each substation.

Table 5-7. Forecasted Average Annual Growth Rate

Todd-Wadena Substations	Annual Growth Rate
Sebeka	1.00%
Menahga	1.00%
Leaf River	1.00%
Twin Lakes	1.00%
Orton	1.00%

When determining the average annual growth rates for forecasting the future peak demand of the affected load area, Great River Energy compared the three percentage growth rates (the ten year, five year and the weighted annual average growth rate) from the data provided by Todd-Wadena. The 10-year historical peak load data showed an average annual growth rate of 2.56 percent, the five-year historical peak load data showed an average annual growth rate of about 3.41 percent

and the load projection of individual substations by Todd-Wadena showed a weighted average annual growth rate of 1.0 percent. The weighted average annual growth rate was calculated based on the following formula and uses the 2014 historical substation peak loads from **Table 5-5**.

$$\text{Weighted average annual growth rate} = \frac{\text{LC P\#1} * \%\,\text{GR1} + \text{LC P\#2} * \%\,\text{GR2} + \text{LC P\#3} * \%\,\text{GR3} + \cdots \text{etc}}{\text{LC P\#1} + \text{LCP\#2} + \text{LCP\#3} + \cdots \text{etc}}$$

Where: LCP# 1 = Historical Peak Load of Load Center 1 (Substation 1)

LCP# 2 = Historical Peak Load of Load Center 2 (Substation 2)

%GR1 = % percentage growth rate substation #1

%GR2= % percentage growth rate of substation # 2

With the power system showing inadequacies under recent historical peak load during contingencies, it was decided to use a conservative growth rate with which the forecasted peak load has the high probability of occurring on the years for which it is forecasted. The weighted average annual load growth rate produced from Todd-Wadena's load growth rate forecast (**Table 5-7**) showed a weighted annual average annual growth rate that is not as high as the historical five-year average annual growth rate or the ten year historical average annual load growth rate. Therefore, the peak demand of the affected load area will be forecasted using the average of the three forecasted annual growth rate percentages (2.32 percent) for loads served by Todd-Wadena, and individual substation peaks are forecasted using the growth rate provided for each substation in **Table 5-8**. This table shows the forecasted 2017/18 load levels per substation used when determining the need for the proposed Project. The starting load for the load forecast is the 2014 peak load recorded at each substation serving the affected load area.

Table 5-8. Forecasted 2018 Load Levels Used for the Out-Year Study

Todd-Wadena Substations	Winter Peak – 2013/14 Load		Applied Growth Rate	Winter Peak – 2017/18 Load	
	MW	MVAR		MW	MVAR
Sebeka	2.498	0.105	1.00%	2.599	0.109
Menahga	3.974	-0.053	1.00%	4.135	-0.055
Leaf River	3.433	0.070	1.00%	3.572	0.073
Twin Lakes	1.550	-0.077	1.00%	1.613	-0.080
Orton	2.106	-0.050	1.00%	2.192	-0.052
Total	**13.561**	**-0.005**	**-**	**14.112**	**-0.005**

Minnesota Power

Minnesota Power provides service in the affected load area though five distribution substations, Verndale, Blue Grass, Menahga, Sebeka-Nimrod, and Spirit Lake. Similar to the load forecast for affected area load served by Todd-Wadena, a conservative growth rate was used when forecasting affected area load served by Minnesota Power. The historical peak load growth of the affected load area served by Minnesota Power grew in the same trend as the affected load area served by Todd-Wadena. **Table 5-9** shows the 9-year historical load recorded for the substations in the affected load area served by Minnesota Power.

Table 5-9. 9-Year Historical Coincident Peak Load Data for Affected Load Area Served by Minnesota Power (MW)

Substation	2006	2007	2008	2009	2010	2011	2012	2013	2014
Verndale	0.819	0.890	0.736	0.742	0.658	0.507	0.779	0.899	1.138
Blue Grass	0.043	0.046	0.038	0.039	0.034	0.026	0.040	0.047	0.059
Menahga	0.375	0.421	0.390	0.495	0.389	0.395	0.490	0.454	0.473
Spirit Lake	1.636	1.834	1.699	2.159	1.695	1.721	2.136	1.978	2.063
Sebeka	1.216	1.364	1.263	1.605	1.260	1.279	1.588	1.470	1.534
Total	**4.089**	**4.555**	**4.126**	**5.040**	**4.036**	**3.928**	**5.033**	**4.848**	**5.267**

Figure 5-8 shows that the customer load in the affected load area served by Minnesota Power grew at an average annual rate of 2.85 percent in the last nine years (2006 – 2014). Similarly, the plot of the five-year historical peak loads, **Figure 5-9**, shows that the affected load area grew at average annual rate of 5.48 percent between 2010 and 2014.

The growth rate of the peak loads in affected load area served by Minnesota Power is growing at a faster rate than the growth rate used when studying and justifying the need for the proposed Project. The proposed Project is based on a conservative average annual growth rate of 1 percent that was applied to Minnesota Power's 2014 peak load. A one percent annual growth rate was applied to the 2013/14 peak loads when forecasting and modeling the 2017/18 (out-year) load level of the affected load area served by Minnesota Power. **Table 5-10** shows the 2013/14 peak loads recorded for Minnesota Power substations serving the affected load area, the applied growth rate and the forecasted 2017/18 load level. It should be noted that use of either nine or five-year historical load growth percentage would result in higher 2017/18 load levels than shown in **Table 5-10.**

Figure 5-8. Affected Load Area Nine-Year Historical Peak Demand Growth Trend Served by Minnesota Power

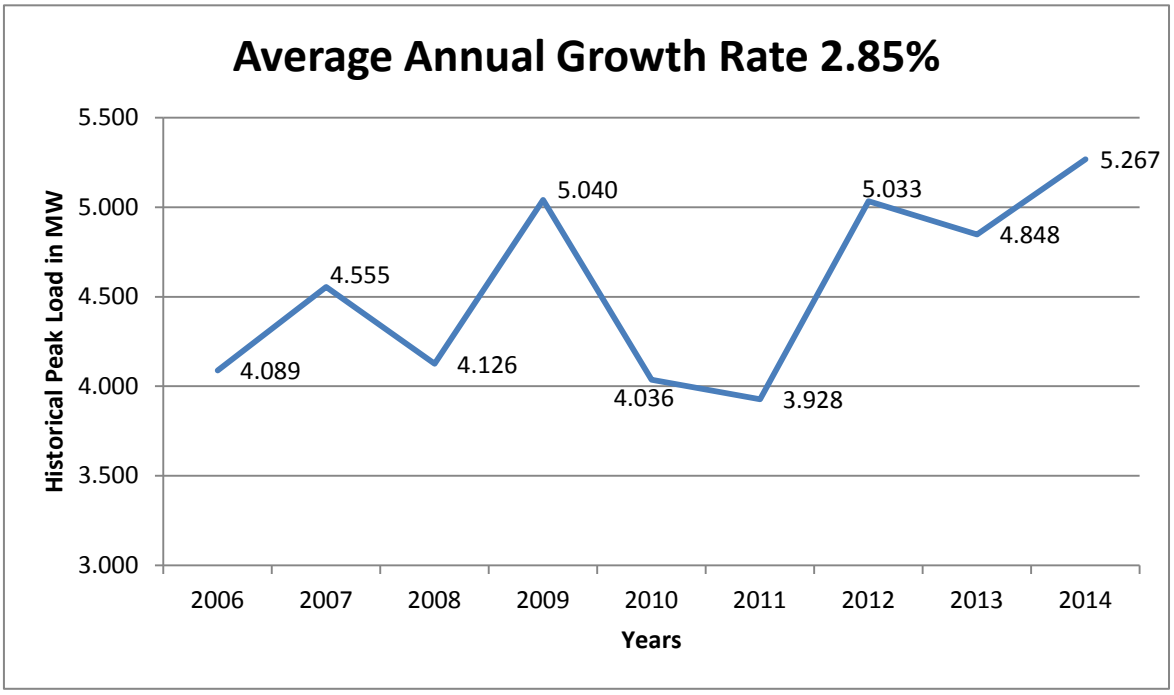


Figure 5-9. Affected Load Area Five-Year Historical Peak Demand Growth Trend Served by Minnesota Power

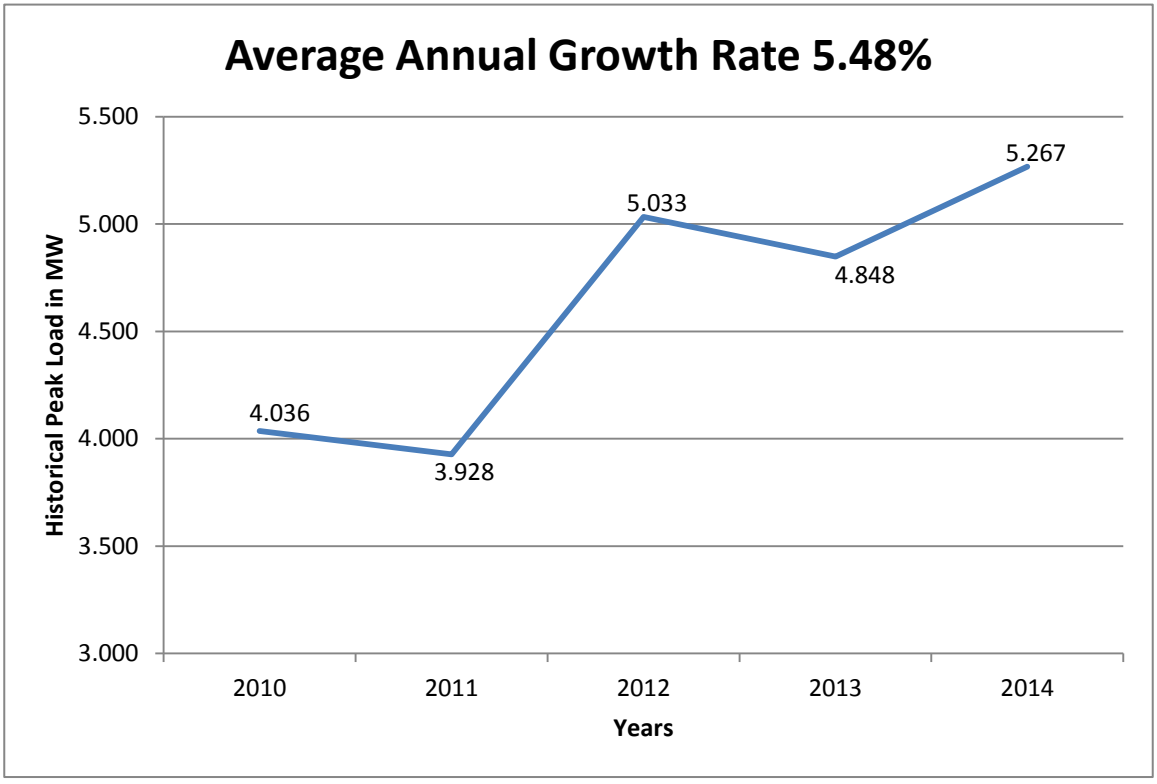


Table 5-10. Forecasted 2018 Load Levels Used for the Out-Year Study

Minnesota Power Substations	Winter Peak-2013/14 Load		Applied Growth Rate	Winter Peak-2017/18 Load	
	MW	MVAR		MW	MVAR
Verndale	1.138	0.231	1.00%	1.184	0.240
Blue Grass	0.059	0.012	1.00%	0.061	0.012
Menahga	0.473	0.096	1.00%	0.492	0.100
Spirit Lake	2.063	0.419	1.00%	2.147	0.436
Sebeka	1.534	0.311	1.00%	1.596	0.324
Total	**5.267**	**1.069**	**-**	**5.481**	**1.112**

The peak demand projection was made for the winter season using the recorded historical peak of the 2013-2014 season as the starting point. The weighted average annual load growth percentage, which is calculated from the 2014 historical substation peak demand and substation growth rates in **Table 5-8** and **Table 5-10,** is used to forecast the peak demand shown in **Table 5-11**.

Table 5-11. Winter Season Forecast Peak Demand per Year in MW (Todd-Wadena and Minnesota Power)

Winter Season	Peak Demand	Weighted Average Annual Growth Rate
2013-2014	18.83	-
2014-2015	19.02	1.00%
2015-2016	19.21	1.00%
2016-2017	19.40	1.00%
2017-2018	19.59	1.00%
2018-2019	19.79	1.00%
2019-2020	19.99	1.00%
2020-2021	20.19	1.00%
2021-2022	20.39	1.00%
2022-2023	20.59	1.00%
2023-2024	20.80	1.00%

The maximum peak demand was calculated based on the five-year hourly historical peak demand data. To eliminate switching peaks, the coincident peaks were calculated for each month as provided in **Table 5-3**. The winter coincident peak load of the affected load area was found to be 18.83 MW, which was observed in January 2014. This peak demand and the weighted average annual growth rate are used when forecasting the winter peak demand of the affected load area from winter 2013-2014 through winter 2023-2024 as shown in **Table 5-11**. The weighted average annual load growth rate is calculated to be 1.0 percent.

The recorded 2013/14 historical energy consumption of the affected load area was used as a starting point when forecasting energy consumption for the affected load area. For purposes of studying the transmission system and monitoring load growth, distribution substation data are used to calculate and forecast load. These distribution substations are closer to the load than bulk substations and the data from distribution substations are more reflective of load patterns. The growth rate used for forecasting energy is calculated from the historical five year (2009/10-2013/14) annual energy usage data. The average annual energy growth rate of the affected area in the past five years is calculated to be 0.3 percent.

5.6.2 Demand Forecast Results

Table 5-11 shows Applicants' results of forecasting peak demand in the affected load area from winter 2013-2014 through winter 2023-24.

5.6.3 Consumption Forecast Results

Table 5-12 shows Applicants' results of forecasting energy consumption in the affected load area from 2013 through 2023.

Table 5-12. Forecasted Annual Energy Consumption (Todd-Wadena and Minnesota Power)

Year	Energy (MWh)	Growth Rate
2013	28,163.00	-
2014	28,247.49	0.30%
2015	28,332.23	0.30%
2016	28,417.23	0.30%
2017	28,502.48	0.30%
2018	28,587.99	0.30%
2019	28,673.75	0.30%
2020	28,759.77	0.30%
2021	28,846.05	0.30%
2022	28,932.59	0.30%
2023	29,019.39	0.30%

5.6.4 System Capacity

Minnesota Rule 7849.0280 provides that an applicant for a CON must provide information about the ability of the existing system to meet the demand for energy predicted to occur in upcoming years. Applicants applied for an exemption from most of the requirements in this rule because they are applicable to proposed generating plants, not transmission lines. The Commission granted the exemption. The only two provisions in the rule that Applicants must respond to are subpart A (relating to planning programs) and subpart H (relating to net demand and net capability). Those discussions are provided below.

5.6.5 Transmission Planning/Net Demand and Net Capability

Great River Energy was part of the Minnesota Transmission Owners that prepared the 2007 Biennial Transmission Projects Report, which discussed a need for improvement in the affected load area and provided alternatives considered for addressing the inadequacies (tracking number 2007-NE-N3). More recently, Great River Energy cancelled Project 2007-NE-N3, submitted in the 2007 Biennial Transmission Projects Report, and replaced it with Project 2013-NE-N21, which was submitted in the 2013 Biennial Transmission Projects Report.

Load duration curves were developed to illustrate the number of hours the affected load area is exposed to inadequacies in the system. **Figure 5-10** shows the load duration curve for 2013/14 and five years of forecasted load duration curves. The forecasted load duration curves are based on the 2013/14 historical hourly flows record in the system and the weighted average annual growth rate of 1.0 percent.

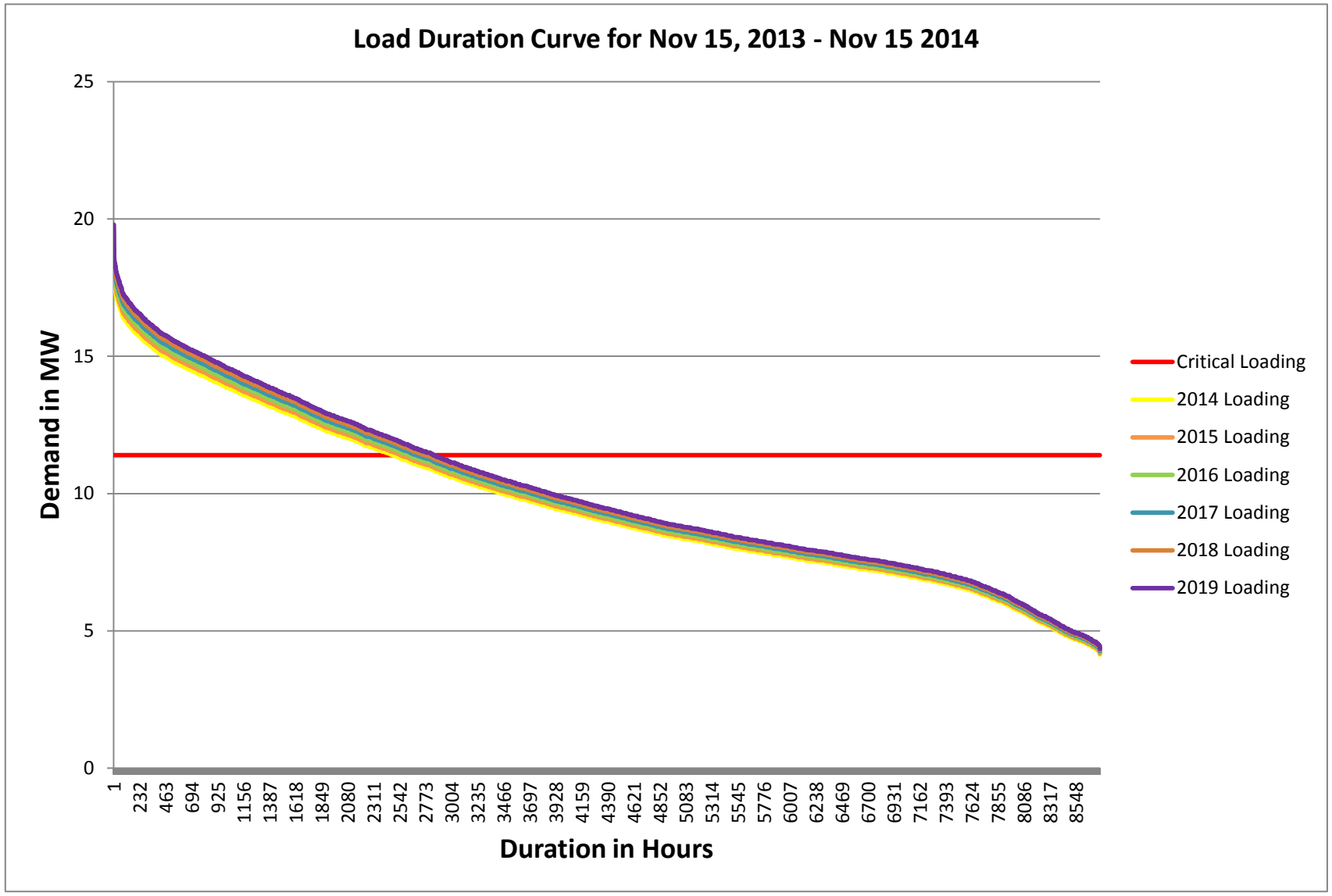
The system analysis showed that the existing transmission system serving the affected load area can reliably serve loads up to 11.39 MW level. The area was found at risk to experience thermal overloads during critical contingencies when the peak load of the affected load area exceeds the critical load level of 11.39 MW. The load duration curve shows that the system was at a risk of experiencing thermal overloads in the 2014 for about 2485 hours of the year.

Table 5-13 summarizes the number of hours the system will be at risk of experiencing inadequacies without the Project.

Table 5-13. Duration that the Affected Load Area is at Risk of Experiencing Inadequacies (Todd-Wadena and Minnesota Power)

Year	Duration at risk (hours)
2014	2485
2015	2550
2016	2632
2017	2699
2018	2773
2019	2839

Figure 5-10. Load Duration Curve – Todd-Wadena and Minnesota Power



Applicants conducted computer modeling of various alternatives designed to address the identified electric system inadequacies to determine what the impact on the system would be under various operating conditions and contingencies. The modeling showed that the development of a single circuit 115 kV line from Hubbard to the proposed new Blueberry 115/34.5 kV Substation, converting the Todd-Wadena Menahga Substation to 115 kV service, and constructing a radial 115 kV line to the proposed new Red Eye Substation in the 2017 timeframe would provide adequate and reliable service in the area up to the 2032, given anticipated growth levels. **Figure 5-11** shows the increase in available capacity of the transmission system with the proposed Project versus peak demand.

Figure 5-11. Capacity of the Affected Load Area Transmission System with the Proposed Project versus Peak Demand (Todd-Wadena and Minnesota Power)

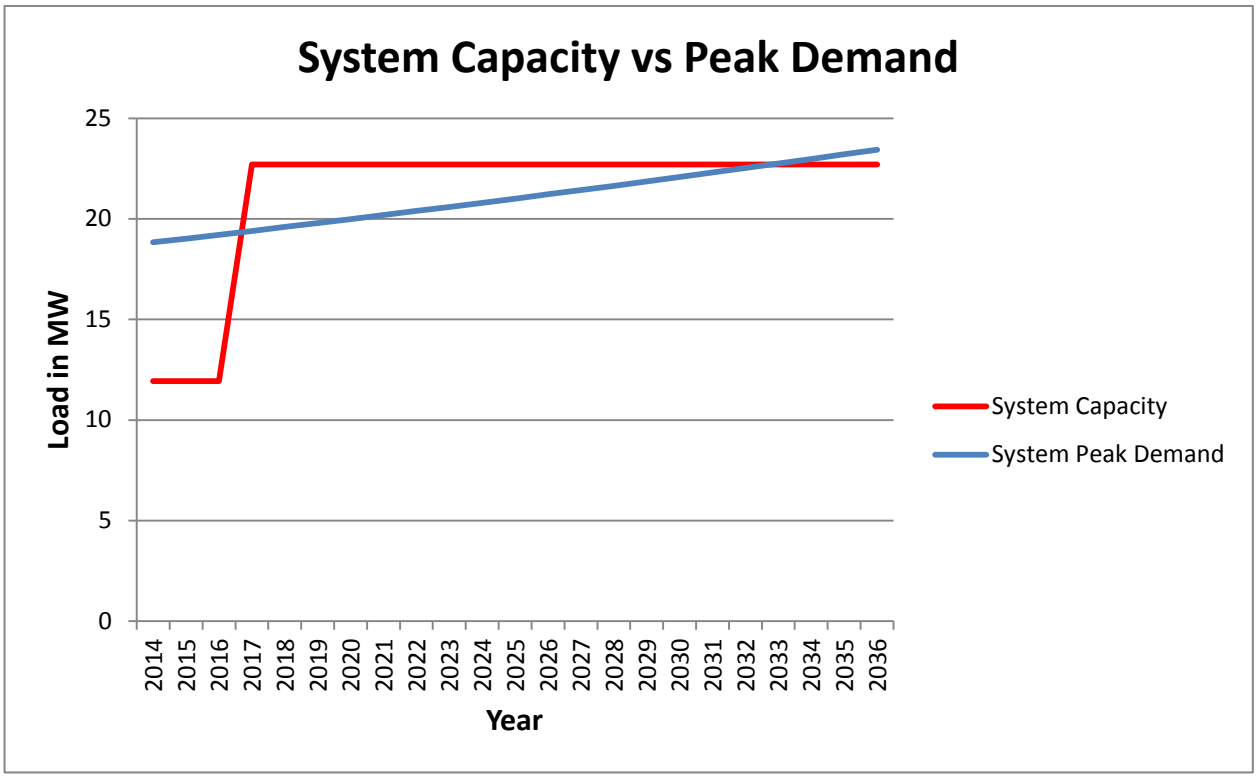


Figure 5-11 shows that transmission capacity follows the load growth of the affected load area provided that the load growth in the system will sustain as forecasted.

5.7 Increased Efficiency

The proposed Project includes building a new 115 kV circuit from Hubbard to the Menahga area and creating a new source to the Hubbard-Verndale 34.5 kV system at the Blueberry Substation. Menahga will be removed from the 34.5 kV system and will be served via the new 115 kV line from Hubbard. After the Project, Menahga will no longer create a power flow demand on the 34.5 kV system, which is more lossy than the 115 kV system. Placing the new 115/34.5 kV Blueberry source in between the Verndale and Hubbard sources creates a reduced flow of power from Hubbard and Verndale. Relocating a source closer to the loads will result in sending power over shorter distances. Therefore, the proposed Project, in general, increases the efficiency of the transmission system and results in annual loss savings of approximately 0.3 MW and annual energy savings of 977.7 MWh annually as discussed in **Section 4.5**.

5.8 Load Management and Energy Conservation Programs

5.8.1 Load Management

Pursuant to Minn. Stat. §216B.2422, Great River Energy and Minnesota Power have submitted separate Resource Plans to the Commission. These Resource Plans detail, among other things, Applicants' programs to manage customer demand and energy consumption. As a part of this effort, each of the "demand side management" (DSM) programs are directed at minimizing peak load conditions by reducing the load of participating customers at system peak conditions.

Current Great River Energy DSM activities include interruptible demand programs, off-peak storage programs and Conservation Improvement Program (CIP) programs offered in partnership with Great River Energy's member-owners. In aggregate, the load management programs for the entire Great River Energy system curtail an estimated 15 percent of maximum seasonal peak demand (360 MW summer/320 MW winter).

Current Minnesota Power DSM activities include the CIP along with Dual Fuel, Controlled Access, and Interruptible Rates.

The impact of the load management program is included in the Great River Energy and Minnesota Power load forecasts, and do not provide enough capacity to delay or avoid the need for the proposed facilities.

5.8.2 Energy Conservation

<u>Great River Energy</u>

Great River Energy has a robust portfolio of rebate programs, promotions and energy efficiency expertise. These programs help Great River Energy achieve the requirements outlined in Minnesota Statutes Section 216B.241. In 2013, Great River Energy and its member cooperatives invested approximately $19.8 million in the energy efficiency, conservation and DSM programs.

Great River Energy and its member owners not only provide rebates to meet the Minnesota Energy Conservation Policy goals, but also consider energy conservation and load management as an important resource in the planning process. Individual member-system participation goals

are used in conjunction with Great River Energy's diversified demand assumptions and loss factors to calculate total system peak reduction. Great River Energy's goal is to maintain and enhance existing programs and continue to introduce new programs that provide net benefits to cooperative members, cooperatives and Great River Energy. The programs are designed to save natural resources and delay the need for additional transmission and/or generation resources.

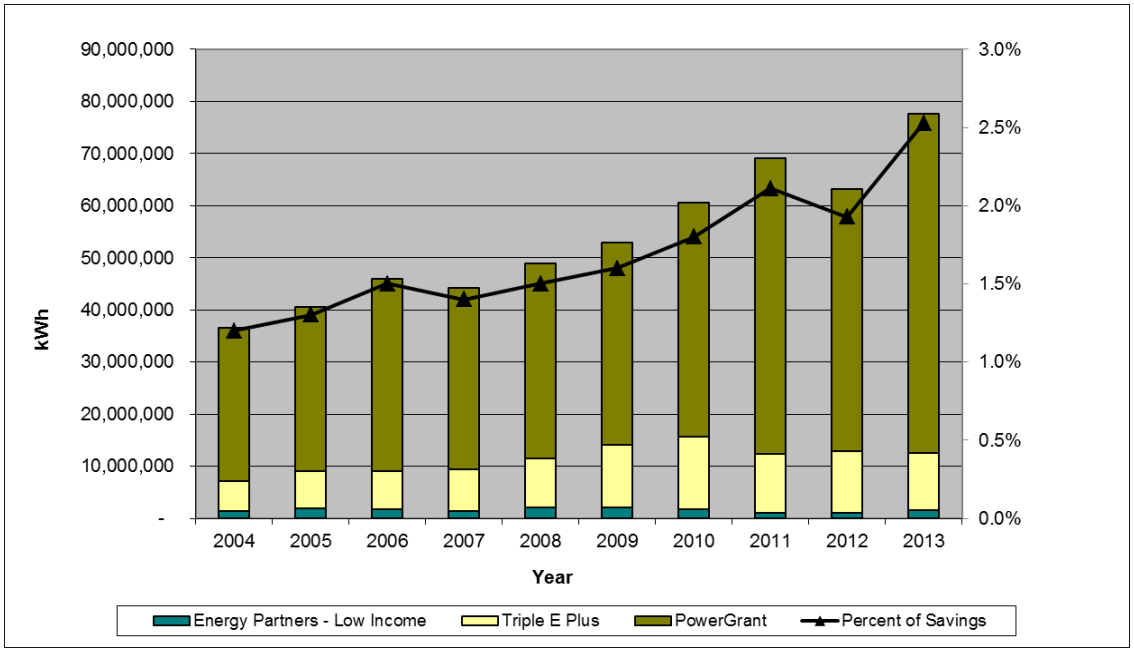
Great River Energy's conservation programs are described in more detail in **Appendix I**.

Minnesota Power

Minnesota Power's CIP remains part of core service offerings and is highlighted as part of its *Energy***Forward** resource strategy.[2] CIP focuses on increased efficiencies that reduce the amount of energy needed for certain uses and processes. Minnesota Power's CIP includes residential, commercial, and small scale renewable programs.

The Next Generation Energy Act of 2007 introduced, in addition to a minimum spending requirement of 1.5 percent, an energy-saving goal of 1.5 percent of gross annual retail electric energy sales by 2010. Minnesota Power has a proven track record with successful conservation program delivery, meeting or exceeding the 1.5 percent energy-saving goal in Minnesota. As shown in **Figure 5-12**, Minnesota Power has delivered at or above the 1.5 percent savings target since the goal went into effect in 2010 and delivered similar savings levels in the two years preceding the establishment of an energy-savings goal as defined in the Next Generation Energy Act of 2007.

Figure 5-12. Minnesota Power's 2004–2013 CIP Achievements



[2] Minnesota Power's Integrated Resource Plan; Docket No. E015/RP-13-53.

Minnesota Power's commercial program under its CIP delivers around 80 percent of total claimed savings. Energy savings and rebates paid under the commercial program specific to the Menahga Project area from 2005 – 2013 are provided in **Table 5-14** (the towns around the Project are Park Rapids, Menahga, Sebeka, Hubbard, Nimrod and Huntersville).

Table 5-14. Minnesota Power - CIP Projects in the Menahga Project Area

City	# of Projects	Year	kWh Saved	kW Saved	Rebate
Menahga	3	2005	16,972	8.79	$1,794
Menahga	1	2006	10,440	2.61	$522
Menahga	2	2007	40,119	17.92	$5,325
Menahga	2	2008	129,979	66.40	$14,085
Menahga	7	2009	59,555	11.90	$3,692
Menahga	2	2010	13,870	2.80	$791
Menahga	4	2011	376,235	14.60	$14,860
Menahga	4	2012	35,472	10.60	$3,554
Park Rapids	11	2005	836,562	44.22	$33,605
Park Rapids	11	2006	4,772,923	403.22	$151,100
Park Rapids	4	2007	3,309,082	204.20	$45,815
Park Rapids	25	2008	2,063,422	233.21	$98,181
Park Rapids	18	2009	2,680,867	243.52	$104,273
Park Rapids	31	2010	3,069,795	212.30	$116,910
Park Rapids	23	2011	562,757	71.40	$24,036
Park Rapids	27	2012	846,516	114.30	$51,482
Park Rapids	19	2013	2,580,550	255.60	$90,451
Sebeka	2	2006	1,050	0.37	$84
Sebeka	1	2007	3,675	1.50	$294
Sebeka	5	2008	86,568	19.40	$5,606
Sebeka	1	2010	12,791	2.20	$448
Sebeka	2	2011	8,598	3.00	$466
Sebeka	5	2012	149,537	59.10	$15,233
Sebeka	1	2013	6,759	5.20	$1,017
Total	**211**		**21,674,094**	**2008.36**	**$783,624**

5.8.3 Conclusion

The load levels shown in **Table 5-11** assume Applicants will be successful in reaching the DSM and CIP energy savings objectives in their Resource Plans. As shown in **Figure 5-11**, near-term winter peak load levels are already exceeding the capacity of the system to reliably serve all load in the affected load area without remedial actions such as switching operations to shift load off the system. For DSM or CIP to be feasible alternatives to the Project, these programs would not only need to meet their objectives, they would also have to provide additional reductions in demand to offset projected load growth in the affected load area. Based on historic DSM and CIP savings as well as forecasted load growth, it is not realistic to expect that DSM and conservation measures can achieve the level of reduction necessary within the affected load area.

5.9 Delay of the Project

Minnesota Rule 7849.0300 requires a discussion of anticipated consequences to its system, neighboring systems, and the power pool should the Project be delayed one, two, and three years, or postponed indefinitely. The 2016/17 winter peak has been designated as the in-service date for the Project; therefore, a One Year Delay translates to a 2017/18 winter date.

The inadequacies in the affected load area are thermal overloading of transformers and voltage regulators. As discussed in **Section 5.6**, the affected load area has shown growth rate in the past five years. A robust transmission system is required to address the deficiencies in the existing system and provide service to new loads that come to the affected load area.

The analysis using the historical load data shows that the loads in the affected load area have grown above the maximum load-serving capability of the transmission system. Delay of the Project worsens thermal overload concerns. Maintenance of the transmission lines would also be more difficult as the Project is delayed. As discussed in **Section 5.6** and shown in the duration curve, the number of hours that the affected load area is vulnerable to inadequacies increases. To bring the transmission system within the proper operating conditions, curtailment of loads in the affected load area is required. This would result in an unavailability of power to a significant portion of consumers in the affected load area. The critical demand analysis in **Table 5-15** summarizes the duration at which load is at risk and the magnitude of the load that needs to be curtailed to bring the system in to normal operating conditions.

Table 5-15. Critical Demand Analysis – Todd-Wadena and Minnesota Power

Scenario	2016/17 Winter Forecast	One Year Delay	Two Year Delay	Three Year Delay	Infinite Delay[2]
# Hours above Critical Demand	2699	2773	2839	2907	3134
Curtailed Demand in MW[3]	7.99	8.20	8.39	8.59	9.20
% of Local Deman3d Curtailed	41.2	41.8	42.4	43.0	44.6
Annual # of Days at Risk[1]	112	115	118	121	130

[1] Based on 2013-14 load curve
[2] Based on 2023 demand projections
[3] Curtailment assumes no remedial actions (switching)

5.10 Effect of Promotional Practices

The growth in demand in the Project service area is a result of a new industrial load (pump station) and growth in the number of customers and in the energy that each customer is consuming. Applicants have not engaged in any promotional practices to encourage the use of more power. Just the opposite, as described in **Section 5.8,** Applicants have spent significant sums of money promoting conservation and demand side management.

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6 ALTERNATIVES TO THE PROJECT

6.1 Analysis of Alternatives

In any CON proceeding on a proposed transmission line project, an applicant is required to consider various alternatives to the proposed project. Minnesota Statutes Section 216B.243, subdivision 3(6) provides that in assessing need, the Commission will evaluate "possible alternatives for satisfying the energy demand or transmission needs." The Commission has also provided in its rules that an applicant for a CON must discuss in the application the possibility of a number of alternatives. Minnesota Rule 7849.0260 provides:

Each application for a proposed large high voltage transmission line (LHVTL) must include:

B. a discussion of the availability of alternatives to the facility, including but not limited to:

1. new generation of various technologies, sizes, and fuel types;
2. upgrading of existing transmission lines or existing generating facilities;
3. transmission lines with different design voltages or with different numbers, sizes, and types of conductors;
4. transmission lines with different terminals or substations;
5. double circuiting of existing transmission lines;
6. if the proposed facility is for DC (AC) transmission, an AC (DC) transmission line;
7. if the proposed facility is for overhead (underground) transmission, an underground (overhead) transmission line; and
8. any reasonable combinations of the alternatives listed in subitems (1) to (7).

Minnesota Rule 7849.0340 also requires an applicant to consider the option of not building the proposed facility.

In this section, the various alternatives to the proposed Project that were considered by Applicants are discussed. These alternatives include: 1) various generation options including peaking generation, distributed generation, and renewable (solar and wind) generation; 2) various transmission solutions, including upgrading other existing facilities, different voltage levels and different endpoints; and 3) a no-build alternative focusing on reactive power supply improvements and demand side management. Discussion of each alternative focuses on why that alternative is unacceptable or inferior to the Project.

6.2 Generation Alternative

6.2.1 Peaking Generation

Generation and distributed generation were considered as an alternative to the new transmission of the proposed Project. The type of small generators that could reasonably be considered for such an alternative (typically 1.5 or 2 MW diesel or natural gas-fueled generators) would not be sufficient to meet the need in the Hubbard-Verndale 34.5 kV system because the existing transformers and regulators are at full capacity on the Hubbard-Verndale 34.5 kV system. A rebuild of this system would be necessary if generation were added to the system.

The Project is proposed to address inadequacies in the 34.5 kV transmission in the Hubbard-Verndale system. The Project will provide approximately 11.38 MW of incremental load-serving capability beyond the 2017 load level. For comparison purposes, the generation solution must address the existing inadequacies of these systems and provide an equivalent level of load-serving capability.

A study was performed and showed that the equivalent load-serving capability could be achieved by operating multiple gas-fired or diesel generators for a total of 17 MW at the Sebeka Regulator Substation. The use of generation to address the needs this Project would address was not selected for the following reasons:

1. Operation of these generators to address system inadequacies at non-peak hours may be required, resulting in high operations costs.

2. Capital investment to install generation of this type is significant. With a typical estimate of $1,000/kW, installation of 17 MW of diesel generators is estimated to cost approximately $17 million.

3. Operation and maintenance costs associated with generation units are significantly higher than that of transmission systems.

4. Reliability of peak generation is less than that of transmission lines. Installation of redundant generation would be necessary to achieve equivalent reliability.

5. Addition of generation would not improve transmission system reliability of the aged infrastructure at issue in the Project area.

6.2.2 Distributed Generation

A distributed generation alternative was analyzed. Distributed generation, however, is not a viable alternative to address the proposed pump station load or the inadequacies identified in the existing transmission system. Due to the size of the pump station load, the affected load area and the performance achievable by the proposed Project, a large number of distributed generation units (1.5 to 2 MW each) would be required to address the load-serving performance achievable by the Project. This option was not selected for the following reasons:

1. Installation of the number of generators of this scale to address the pump station load and the inadequacies in the area and provide equivalent incremental load-serving capability is more costly than the proposed Project.

2. Operation and maintenance cost of these generators is high.

3. The area also serves industrial loads that consist of large motors. Motors such as these require a large amount of power at startup. Distributed generators are not capable of providing the large amount of power that may be needed by these motors.

4. Reliability of generators, in general, is less than that of transmission.

6.2.3 Renewable Generation

A system solution is needed that will provide reliable and effective power for the proposed pump station and the affected load area. Renewable generation is dependent on natural events, such as sunlight or wind speed. Neither wind generation nor solar generation is considered a reasonable alternative to the Project. Energy from these resources is not necessarily available at the times when they are most necessary to serve customers. Residential loads peak between 4 p.m. and 6 p.m., when people are returning to their homes after being away for the day. This is the time when energy for the pump station and in the affected load area is needed the most. Solar energy output and wind energy output typically decrease during these hours of the day.

This option was not selected for the following reasons:

1. Unpredictable sources of energy and inability to make use of resources when power is demanded for the pump station and within the affected load area.

2. Installation costs of both wind and solar generation resources are higher than those of the proposed Project.

6.3 Upgrade of Existing Facilities

The voltage of the existing transmission system in the area (34.5 kV) is not robust enough to serve the proposed pump station. Even if the 34.5 kV system was rebuilt with larger conductor to provide more capacity, the system voltage would go into violation upon contingency, and reactive power supplies (capacitor banks) are not feasible as the system has already reached its peak use of reactive power supplies.

Upgrading the existing facilities would involve rebuilding the transmission line from Hubbard to Verndale, which is 30 miles of line, costing about $11.5 million. The two 115/34.5 kV transformers at Verndale would need to be replaced to a higher capacity and the bus work at Verndale would need to be rebuilt to accommodate the new transformers with a higher rating, at an approximate cost of $4.5 million. Additionally the Sebeka regulators would need to be upgraded, costing about $500,000. The estimated total cost to upgrade the existing facilities is $16.5 million.

Even if the existing 34.5 kV facilities were upgraded, the system voltage would collapse on contingency. Simply stated, the 34.5 kV system cannot support a large industrial load such as the proposed pump station. Although the proposed Project is estimated to be $23 million and is more expensive than rebuilding the existing facilities, rebuilding the existing 34.5 kV system is not a feasible solution.

6.4 Alternative Voltages

Applicants are proposing to build a new 115 kV circuit from Hubbard-Blueberry-Red Eye to reliably serve the proposed MPL Sebeka pump station and the load growth in this area. However, Applicants considered the possibility of resolving the inadequacies in the Project area and affected load area by implementing a solution of a different voltage level, as discussed below.

6.4.1 Distribution Voltage

Using distribution voltage to address the system inadequacies was analyzed as an alternative to the Project. Transferring load between distribution systems is feasible to solve transmission issues when the receiving distribution system is served from an independent transmission network. Loads in the affected load area are from a single, and lengthy, 34.5 kV transmission system. Loads can only be transferred between distribution substations, but remain on the same 34.5 kV transmission network throughout the Hubbard-Verndale system. This will not improve loading or low voltage concerns on the Hubbard-Verndale system. Distribution substations served by a transmission system separate from the Hubbard-Verndale system are not located in close proximity. To use an independent distribution system to provide support to the Hubbard-Verndale system would require constructing lengthy distribution lines to transfer loads. This transfer would, overall, result in weaker voltage and increased loss on a high impedance distribution system. For these reasons, this alternative is not considered a reasonable alternative to the Project.

6.4.2 Higher Voltages

A higher voltage solution above 115 kV was not investigated at this time because Applicants determined that a 115 kV solution in the Project area would provide adequate and necessary support to the proposed pump station and the affected load area for the foreseeable planning horizon. Voltage solutions higher than 115 kV are typically implemented to facilitate the transfer of electricity over long distances. The Hubbard-Verndale system does not contain any 161 kV transmission lines, and construction of these facilities in this area would be non-standard. A 230 kV transmission system is not a load-serving system and was therefore not considered further as an alternative to the Project.

6.5 Different Conductor

The Hubbard-Verndale 34.5 kV system is mainly 3/0 ACSR and 336 ACSR conductor, which is a suitable size conductor for the 34.5 kV system. Rebuilding the 34.5 kV system with a conductor larger than 336 ACSR or a ACSS or composite conductor would provide more capacity on the system; however, the Verndale transformers and the Sebeka Regulator Station are still power flow-limiting elements. If the Hubbard-Verndale 34.5 kV system were rebuilt with a larger or different conductor, the amount of added capacity on the system would not be

enough to serve the proposed new MPL Sebeka pump station, and other pieces of equipment would need to be upgraded (Verndale transformers and Sebeka Regulator Station).

Great River Energy uses several types of conductors for system transmission lines. The standard bare aluminum overhead transmission conductors, ACSR and aluminum conductor steel supported (ACSS), offer known reliable power performance, operating at temperatures up to 100°C and 200°C, respectively. At these temperatures, for the 115 kV line proposed for the Project, ACSR would provide 196 MVA of capacity and ACSS would provide 315 MVA of capacity. ACSS typically costs approximately 10 percent more than ACSR conductor. Great River Energy is proposing to use 477 ACSR conductor for the Menahga Area 115 kV Project.

Two-composite conductor alternatives can offer substantial increases in capacity and the ability to span greater distances between poles by use of innovative modern composites, but at a significantly increased cost and lower efficiency. The modern materials and manufacturing process required for these composite conductors result in a material cost that is 300-500 percent higher compared to standard ACSR and ACSS. Composite conductors also experience higher losses because they are operated at higher temperatures. As a result, this type of conductor is used only in special circumstances, where long spans are required. Circumstances do not warrant use of this type of conductor for the Menahga Area 115 kV Project.

6.6 Alternative Endpoints

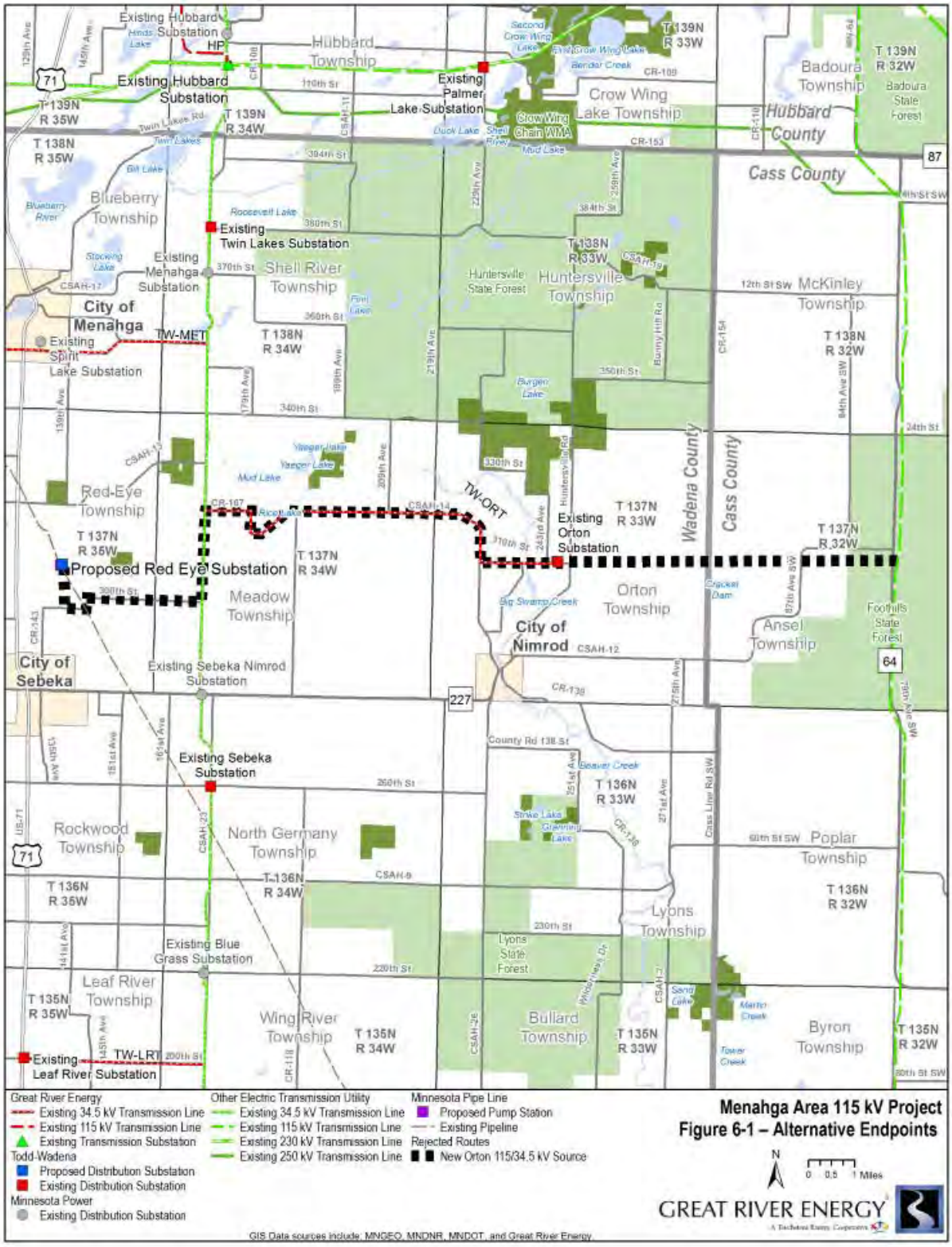
The proposed Project, with endpoints at the Hubbard Substation and the Red Eye Substation, was ultimately selected because it is the most robust solution addressing many system needs, not only in the affected load area but also in the Project area, which had experienced operational issues under certain contingencies. The endpoints of the Project were selected to facilitate serving the pump station and to provide additional incremental load-serving capability to serve future load growth in the affected load and Project areas.

However, during its analysis of how to address the pump station load and the operational concerns on the Hubbard-Verndale 34.5 kV system, Great River Energy did analyze one additional project with alternative endpoints. A discussion of this alternative project and why it was deemed inferior to the proposed Project is provided below.

6.6.1 New Orton 115/34.5 kV Source

Great River Energy analyzed whether adding a new 115/34.5 kV source to the Hubbard-Verndale 34.5 kV system sourced from a new tap off the Badoura – Dog Lake 115 kV line would address the pump station load and concerns identified in the affected load area. This alternative would be approximately 22.5 miles and include tapping the Badoura – Dog Lake 115 kV line and running a 115 kV transmission line west towards Orton, where a 115/34.5 kV substation would be located. The 115 kV line would continue south and westward towards the proposed Sebeka pump station. The point of interconnection for the new 115 kV line along the Badoura – Dog Lake 115 kV line would be near the intersection of County Road 20 and State Highway 64 (**Figure 6-1**). This alternative would address the pump station load and the transmission system thermal overload concerns on the transmission system serving the Hubbard-Verndale 34.5 kV system.

Figure 6-1. Alternative Endpoints



Although this alternative would be an effective solution for strengthening the system in the affected load area and provide service to the proposed pump station, and the cost of this alternative is estimated to be similar to the proposed Project (approximately $20.5 million – but could be higher because there are more wetlands in this alternative, which can increase permitting and construction costs), this alternative does not add redundancy to the largest load in the area (Menahga). This alternative also would not facilitate a planned Great River Energy project to the north that would address load-serving needs in the Osage area in the future. For these reasons, this alternative was considered inferior to the proposed Project.

6.7 Double Circuiting

Double circuiting is the construction of two separate circuits (three phases per circuit) on the same structures. Great River Energy has proposed double circuit construction to the greatest extent practical in the Project area.

The Menahga Project includes approximately 4.5 miles of double circuit 115 kV/115 kV line from the existing Great River Energy Hubbard Substation west to CR 115. Double circuiting in this area makes sense from a planning perspective, as the second 115 kV circuit would be used for a future Great River Energy project to the north to address load-serving needs in the Osage area. Great River Energy is requesting that the second circuit be permitted as part of the Menahga Project so that the second circuit can be strung during construction of the Project, as it would be safer, more cost-effective, and would result in fewer environmental impacts (see additional discussion in **Section 8.1.2**).

Other opportunities for double circuit construction within the Project area were not identified.

6.8 Direct Current Alternative

High voltage direct current (HVDC) lines are typically proposed for transmitting large amounts of electricity over long distances because line losses are significantly less over long distances on a HVDC line than on an alternative current (AC) line. A HVDC line is not a reasonable alternative to the proposed Project. The Project is being proposed to serve a proposed pump station and for local load-serving purposes, whereas HVDC lines are typically proposed for regional transmission projects. The Project must be readily tapped now and in the future to serve customers in the Project area. HVDC lines require expensive conversion stations at each delivery point because the direct current (DC) power must be converted to AC power before it can be used by customers. Such conversion stations would add significantly to the cost of the Project. There is no justification – in terms of reliability, economy, performance, or otherwise – for a HVDC line in this case.

6.9 Undergrounding

Undergrounding is an alternative that is seldom used for high voltage transmission lines such as those proposed for the Project. One of the primary reasons underground high voltage transmission lines are seldom used is that they are significantly more expensive than overhead lines. The cost range depends on the design voltage, the type of underground cable required, the extent of underground obstructions such as rock formations, the thermal capability of the soil, the

number of river crossings, and other factors, but the construction cost of locating the entire length of the Project's proposed transmission underground is estimated to be as much as 8 to 10 times greater per mile than if it were to be constructed overhead as proposed. This cost does not include the large reactors that would likely be required at each substation to counteract the large line charging currents present on underground high voltage lines. In addition, there are increased line losses and additional maintenance expenses incurred throughout the useful life of an underground high voltage line that further increase the total additional cost of building an underground line instead of an overhead line.

A common argument in favor of implementing underground lines is that they will minimize the human and environmental impacts above ground. However, there are still human and environmental impacts both during and after construction. The predominant environmental impact from the construction, operation, and maintenance of underground transmission lines arises from the need to obtain and maintain completely cleared ROWs. While construction activities for overhead transmission lines are typically concentrated around the line's structures, leaving areas between structures relatively undisturbed apart from some vegetation removal, construction of underground transmission lines requires the entire ROW to be completely cleared and utilized for construction activities. This results in increased impact to wetland areas due to the likely need to install an access road capable of supporting the heavy construction equipment required for trenching activities, and cable installation. After construction, the ROW needs to be maintained free of woody vegetation to reduce soil moisture loss, because high voltage underground conductors make use of soil moisture for conductor cooling. A permanent road must also be maintained along the ROW for maintenance and repair.

Underground lines can also be more challenging to operate and maintain. While overhead lines are typically subject to more frequent outages than underground cables, service can usually be quickly restored. This is accomplished by automatic reclosing of circuit breakers, which results in only a momentary outage of the line. Because circuit breakers on underground lines are typically not reclosed until it can be verified that a fault has not occurred on the underground cable, the smaller number of outages is typically offset by their increased duration. A faulted underground line takes much longer to restore because of the difficulty in locating the fault and accessing the site to make repairs. If the fault is due to a failure in the cable, the segment of failed cable must typically be replaced. This usually involves completely replacing the failed cable between two man-hole splice points, which are ordinarily located every 1,500 to 2,000 feet along the line. To replace a failed cable, it must be possible to bring heavy equipment, including cable reels weighing 30,000 to 40,000 pounds, into the ROW during all seasons of the year. If the fault occurs in a wetland area where all-season roads are not maintained, restoration can be delayed due to the need to install wetland matting to gain access to the manholes involved in replacing the failed cable. Additionally, specialized equipment is often required to repair 115 kV underground transmission facilities and, as Great River Energy has no 115 kV underground facilities on its transmission system, this specialized equipment is not readily available in case of an outage.

Due to the construction, maintenance, reliability, and cost drawbacks of high voltage underground transmission lines, Applicants believe that undergrounding is not a viable alternative for any segment of the proposed Project.

6.10 No-Build Alternative

Before proposing a transmission or generation solution, Applicants considered the viability of managing the existing system such that building additional facilities could be avoided. As discussed in **Section 5.9**, a true "do-nothing" alternative would leave the transmission system in the affected load area and Project area strained by load growth and vulnerable to localized voltage collapses, and unable to serve the proposed pump station. Specifically, as shown in **Figure 5-11**, the affected load area peak demand already exceeds system capacity. The following discussion of the no-build alternative focuses on two different ways the pump station load might be served and inadequacies in the affected load area and Project area might be addressed without building new transmission or generation.

6.10.1 Demand Side Management and Conservation

As documented in **Section 5.8** and **Appendix I**, effective conservation measures in the affected load area have helped to defer the need for additional reliability improvements. However, the proposed Project is largely driven by the addition of a new large, high load factor electric load, in particular a proposed new pump station. This load is not only subject to modern energy efficiency standards for motors, but is typically designed to be as efficient as possible. Such an addition is also a clear target for enhanced efficiency due to its size and long run hours, so the ability to drive additional efficiency is limited. As such, conservation and energy efficiency is particularly inadequate in the Hubbard-Verndale system and Project area, where the addition of a highly efficient large industrial load is a large driver for the need for the Project. Additionally, peak demand in the affected load area already exceeds system capacity. Although conservation programs will continue to be implemented in the affected load area and the Project area to maximize efficient use of electricity, these programs are insufficient to mitigate the projected inadequacies in the transmission system.

6.10.2 Reactive Power Supply

The Hubbard-Verndale 34.5 kV system concerns are thermal overload rather than voltage issues. A reactive power supply is used to bolster voltage, which is not needed for this Project.

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7 ALTERNATIVE ROUTES

7.1 Alternative Requirement

Minnesota Statutes Section 216E.04, subdivision 3 and Minnesota Rule 7850.3100 require an applicant to identify any alternative routes that were considered and rejected for the Project. Applicants did evaluate an alternative route and an alternative route segment (**Figure 7-1**) for the new transmission line. These alternatives are described below, along with the reasons they were rejected.

7.2 Rejected Route Alternatives

7.2.1 East Alternative

Applicants evaluated a completely different alternative that followed a more easterly route between the existing Great River Energy Hubbard Substation and the proposed Todd-Wadena Red Eye Substation (approximately 16 miles). This alternative exits the Hubbard Substation south along Hubbard CSAH 6, continues south along Wadena CSAH 23, then turns west along 310th Street to the Red Eye Substation. This alternative would also have to include construction of the Blueberry Substation and approximately 6.3 miles of 115 kV transmission line from the Menahga Switch to the Blueberry Substation (with the Great River Energy TW-MET underbuilt) to address loading issues on the 34.5 kV system at Menahga.

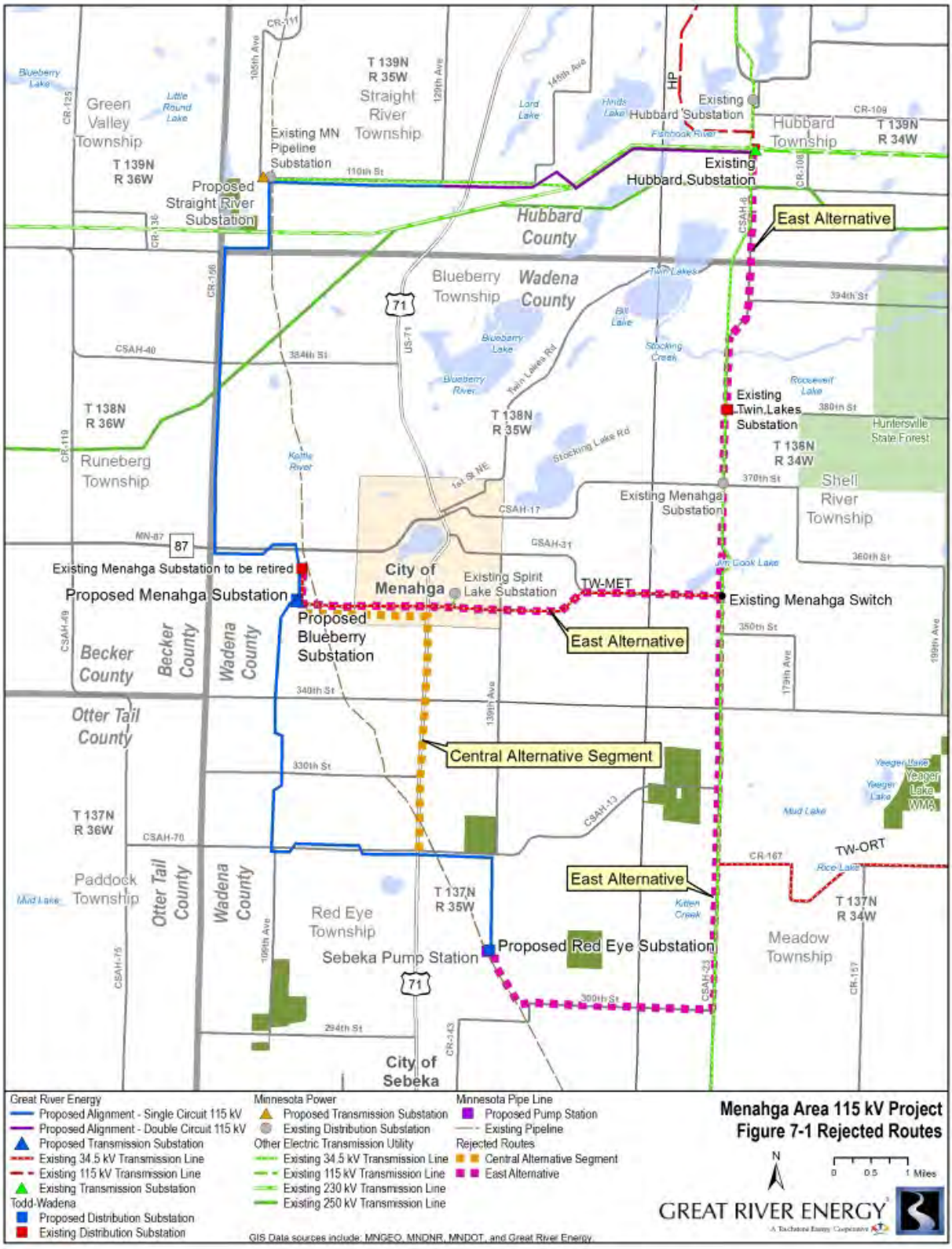
Great River Energy plans to create two 115 kV line outlets from the existing Hubbard Substation (one for this Project and one for a future project to the north). Because the Hubbard Substation is space-constrained, Great River Energy needs to remove one of the two 115/34.5 kV transformers to create a new 115 kV line position for this Project. This 115/34.5 kV transformer serves the Minnesota Power Pipeline Substation, which in turn servers MPL's pump station there. Because this 115/34.5 kV transformer would still need to be relocated to the Blueberry Substation under this alternative and therefore would no longer serve the Minnesota Power Pipeline Substation, this alternative would also have to include approximately 7.5 miles of new 34.5 kV sub-transmission line to serve the Minnesota Power Pipeline Substation. The total mileage of new line for this alternative is therefore 29.8 miles.

This route was rejected because, in comparison to the proposed route, it would:

1) not meet future system needs in the area (future project to the north);

2) not provide redundant electric service (would not have the Blueberry Substation as a backup) to the Todd-Wadena Menahga Substation, the largest load on the Hubbard-Verndale 34.5 kV system;

Figure 7-1. Rejected Routes



3) involve a long distance of either 115 kV with 34.5 kV underbuild or a transmission line on each side of CSAH 6 and CSAH 23, and a contingency between Hubbard and Twin Lakes would have the same effect (assuming either common structures or corridor) on the system today as it would if this alternative were built (essentially there is no additional system capacity with this alternative);

4) be considerably longer (approximately 7.3 miles) than the proposed Project, which would result in more impacts to human settlement and environmental resources;

5) involve a difficult routing area near Jim Cook Lake;

6) have more construction impacts if we had to underbuild and keep the 34.5 kV line in service (may need to offset the line closer to residences); and

7) be a radial line and therefore a less reliable solution if the 115 kV line were built between the Menahga Switch Station and the Blueberry Substation (with the Great River Energy TW-MET line underbuilt).

7.2.2 Central Alternative Segment

Applicants did not consider routing the transmission line along Highway 71 from the City of Menahga north because the highway goes right through the City of Menahga and is adjacent to a golf course.

Applicants did evaluate an alternative segment to the proposed Project that would exit the Blueberry Substation to the east and follow Great River Energy's TW-MET 34.5 kV line for 2.25 miles, then turn south along Highway 71 for 3.25 miles to County Road 13. Although tree removal and agricultural impacts would be similar, it was determined that the Project as proposed is preferable due to the greater development along Highway 71, some of which created difficulties with residences/businesses directly across from one another and close to the road. With the proposed route, there are more opportunities to avoid homes by crossing the road and they were therefore more easily avoided.

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8 ENGINEERING, DESIGN, CONSTRUCTION AND RIGHT-OF-WAY ACQUISITION

8.1 Transmission Line Engineering and Operation Design

8.1.1 Transmission Structure Design and Right-of-Way Requirements

Transmission structure design and the ROW requirements are discussed in **Section 4.1.1**. A schematic of typical structures is provided in **Figure 4-2**.

8.1.2 Design Options to Accommodate Future Expansion

A portion of the Menahga Project is proposed to accommodate a future project in the area. The first 4.5 miles of the 115 kV transmission line between the existing Great River Energy Hubbard Substation west to CR 115 is proposed to be designed and built for a second 115 kV circuit. This circuit would be used for a planned Great River Energy project to the north that would address load-serving needs in the Osage area in the future. The future proposed circuit for the Osage area would terminate on a structure at the intersection of CR 111 (110th St. SW) and CR 115 (129th Ave), while the other circuit would continue to the proposed new Minnesota Power Straight River Substation and then on to the Red Eye Substation endpoint.

Great River Energy is requesting that the second circuit be permitted as part of the Menahga Project so that the conductor could be strung during construction of the Menahga Project, due to the following safety, environmental and cost concerns:

- An outage would not be possible on the circuit to the Minnesota Power Straight River Substation if the second circuit were to be installed at a later date. There would be safety risks to line construction personnel if they had to string the second circuit in close proximity to the energized circuit. Therefore from a safety perspective, it would be ideal to install both circuits at the same time.

- There are two water crossings and a half mile of wetlands that would have to be traversed a second time if the second circuit is not installed as part of the Menahga Project, resulting in increased environmental impacts.

- Mobilization of construction crews a second time would be more costly than installing both circuits at the same time.

8.2 Identification of Existing Utility and Public Rights-of-Way

The proposed transmission line alignment will parallel road ROW for the majority of its length. In areas where the line is not proposed to follow road ROW, the line will follow either

Minnesota Energy's natural gas pipeline, MPL's existing pipelines, or will replace Minnesota Power's existing 34.5 kV 522 feeder line.

The east-west section of the Project (approximately 7 miles) between the existing Great River Energy Hubbard Substation and the proposed Minnesota Power Straight River Substation will replace the existing Minnesota Power 34.5 kV 522 feeder line.

The generally north-south section of the Project (approximately 15.5 miles) between the Minnesota Power Straight River Substation and the Todd-Wadena Red Eye Substation parallels the existing MPL Line 4 pipeline for approximately 1.0 mile, the Minnesota Energy natural gas pipeline for approximately 2.25 miles in Red Eye and Blueberry Townships, and various roads (Hubbard Line Road, CR 156, Wadena Line Road, TH 87, 111th Ave., 350th St., 109th Ave., CSAH 13, and 139th Ave.) for approximately 12.25 miles.

The new transmission line poles will generally be placed with a 3- to 7-foot offset outside of road ROW. Additional setbacks may be utilized to incorporate requests from landowners and/or agencies. Transmission or distribution lines that are overtaken by Great River Energy may be temporarily leaned or moved to allow construction of the new line if they are to be removed once the Project is energized. Great River Energy will work with the owners of transmission or distribution lines that must remain intact after the Project is complete. These lines may be co-located with and/or underbuilt on the new transmission line poles or be placed underground.

8.3 Transmission Line Right-of-Way Acquisition Procedures

Great River Energy will obtain new easements for the entire length of the Project, although there may be existing easements held by Minnesota Power or Todd-Wadena in areas where transmission and distribution lines may be overtaken by the proposed line.

Should a route permit be issued by the Commission, land rights acquisition will commence subsequent to survey and preliminary determination of the transmission centerline. Land rights acquisition includes acquisition of a permanent easement for the transmission line. As a general practice, landowners will be contacted in-person or by U.S. mail with a request to meet to discuss and provide information on the easement and share the Project details with the property owner(s).

During the acquisition phase of the Project, landowners are given a copy of the route permit, the transmission line easement, offer of compensation, and information on the Project schedule, construction practices, vegetation removal, and damage settlement. Additional information may also be given to each landowner that shows preliminary pole placement (if available at that time), structure design or photos, and power line safety.

In addition to permanent easements necessary for the construction of the line, marshalling yard agreements may be obtained from certain landowners for temporary construction or staging areas for temporary storage of poles, vehicles, or other related items. Landowners will be notified in the event site access for soil boring is required to determine soil suitability in areas where certain soil characteristics may require special transmission structure design.

If a negotiated agreement to an easement cannot be reached, Great River Energy has the power of eminent domain to obtain the necessary easement by Minnesota Statutes Chapter 117. In eminent domain the landowner has the authority to have compensation for the easement determined by impartial commissioners through a court process that is initiated by Great River Energy.

8.4 Construction Procedures

Procedures to be used for construction of the transmission lines are discussed below.

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 or maintenance 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 in **Figure 8-1**, as allowed by the terms in the existing or the new easement that is acquired. Danger trees generally are those that are dead, diseased, 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.

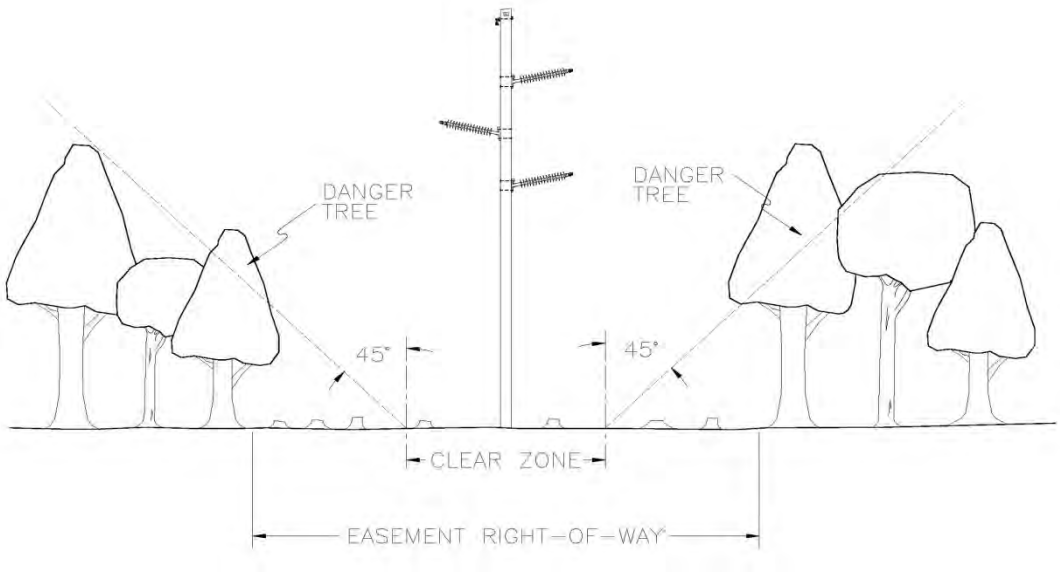
All materials resulting from the clearing operations will either be chipped on site and spread on the ROW, stacked in the ROW for use by the property owner, or removed and disposed of otherwise as agreed to with the property owner during easement negotiations.

The final survey staking of pole locations may again occur after the vegetation has been removed and just prior to 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 existing utilities along the route.

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. Compensation related to these activities will be discussed with the landowner during easement negotiations.

Figure 8-1. Standard Tree Removal Practices



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. For example, 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 standard construction and mitigation practices that were developed from experience with past projects as well as industry-specific BMPs. BMPs address ROW clearing, 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 installation that will assist in minimizing impacts to sensitive environments. Any contractors involved in construction of the transmission line will be advised of these BMP requirements.

During construction of the first 7 miles of the Project between the Hubbard Substation and the Straight River Substation, the existing Minnesota Power 522 feeder line will have to remain energized. The 522 feeder line will therefore be leaned out of the way to accommodate the new construction and then removed when the new line is complete.

New structures are installed directly in the ground, by augering or excavating a hole typically 8 to 11 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. Based on typical soil types in Minnesota, it is anticipated that the average structure depth of a standard 70-foot long pole would be approximately 9 feet deep. In poor soil conditions, a galvanized steel culvert is sometimes installed vertically with the structure set inside. Concrete foundations may be necessary in special cases. 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, Great River Energy 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 and shield wire once the 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. In addition, the conductors are protected from damage.

Crossing of rivers, streams and wetlands will require particular attention during construction. The transmission lines will cross a number of wetlands and will span several waterways (Shell River, Blueberry River, Kettle Creek and Kitten Creek). Great River Energy will not allow construction equipment to be driven 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.

8.5 Restoration Procedures

During construction, limited ground disturbance at the structure sites will occur. Marshalling yard agreements will be obtained from property owner(s) or agency(ies) for temporary storage of materials and equipment. 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 uses various methods to alleviate the compaction, or as negotiated with landowners.

The ROW agent will contact landowners after construction is completed to determine if the cleanup measures have been to their satisfaction and if any other damage may have occurred. If damage has occurred to crops, fences or the property, Great River Energy 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.

8.6 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, Great River Energy will inspect the transmission lines once per year. Inspections will be limited to the ROW and to areas where off-ROW access is required due to ROW obstructions or terrain impediments. If problems are found during inspection, repairs will be performed and property 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 or accessing and traversing the ROW of the transmission line will be allowed to reestablish in the ROW. Great River Energy's practice generally 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.

The estimated annual cost of ROW maintenance and operation and maintenance of Great River Energy's transmission lines (69 kV to 500 kV) in Minnesota currently average about $2,000 per mile. Actual transmission line specific maintenance costs will depend on the environmental 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.

8.7 Electric and Magnetic Fields (EMF)

As it pertains to the Project, the term "EMF" refers to the extremely low frequency (ELF) decoupled electric and magnetic fields that are present around any electrical device or conductor and can occur indoors or outdoors. Electric fields are the result of electric charge, or voltage, on a conductor. The intensity of an electric field is related to the magnitude of the voltage on the conductor. Magnetic fields are the result of the flow of electricity, or current, traveling through a conductor. The intensity of a magnetic field is related to magnitude of the current flow through the conductor. Electric and magnetic fields can be found in association with transmission lines, local distribution lines, substation transformers, household electrical wiring, and common household appliances.

8.7.1 Electric Fields

Voltage on a wire produces an electric field in the area surrounding the wire. The voltage on the conductors of a transmission line generates an electric field extending from the energized conductors. The intensity of transmission line electric fields is measured in kilovolts per meter (kV/m), and the magnitude of the electric field rapidly decreases with distance from the transmission line conductors. The presence of trees, buildings, or other solid structures in the path of the field can also significantly reduce the magnitude of the electric field. Because the magnitude of the voltage on a transmission line is near-constant (ideally within ±5 percent of nominal), the magnitude of the electric field will be near-constant for each of the proposed configurations, regardless of the power flowing on the line.

Although there is no state or federal standard for transmission line electric field exposures, the EQB developed a standard of a maximum electric field limit of 8 kV/m at one meter above ground. This standard has been adopted by the Commission. Applicants have calculated the approximate electric field for the Project's transmission configurations and estimate the peak magnitude of electric field density among all possible configurations to be well below the EQB standard at approximately 2.49 kV/m underneath the conductors, one meter (3.28 feet) above ground. **Table 8-1** summarizes the electric fields calculated for the proposed single and double circuit transmission lines on the Project. These electric field calculations are also shown graphically in **Figures 8-2 through 8-4**.

Table 8-1. Calculated Electric Fields (kV/M) for Proposed Transmission Line Designs (One meter (3.28 feet) above ground)

Scenario	Max. Operating Voltage (kV)	Distance to Proposed Centerline										
		-300'	-200'	-100'	-50'	-25'	Max.	25'	50'	100'	200'	300'
115/115 kV Double Circuit (**Figure 8-2**)	121/121	0.01	0.03	0.09	0.08	0.66	2.49	0.66	0.08	0.09	0.03	0.01
115 kV with 7.2 kV Underbuild (**Figure 8-3**)	121/8	0.01	0.02	0.06	0.20	0.36	0.70	0.49	0.18	0.06	0.02	0.01
115 kV Single Circuit (**Figure 8-4**)	121	0.01	0.02	0.06	0.21	0.49	1.40	0.65	0.19	0.07	0.02	0.01

Figure 8-2. 115/115 kV Double Circuit Line Electric Field Profile

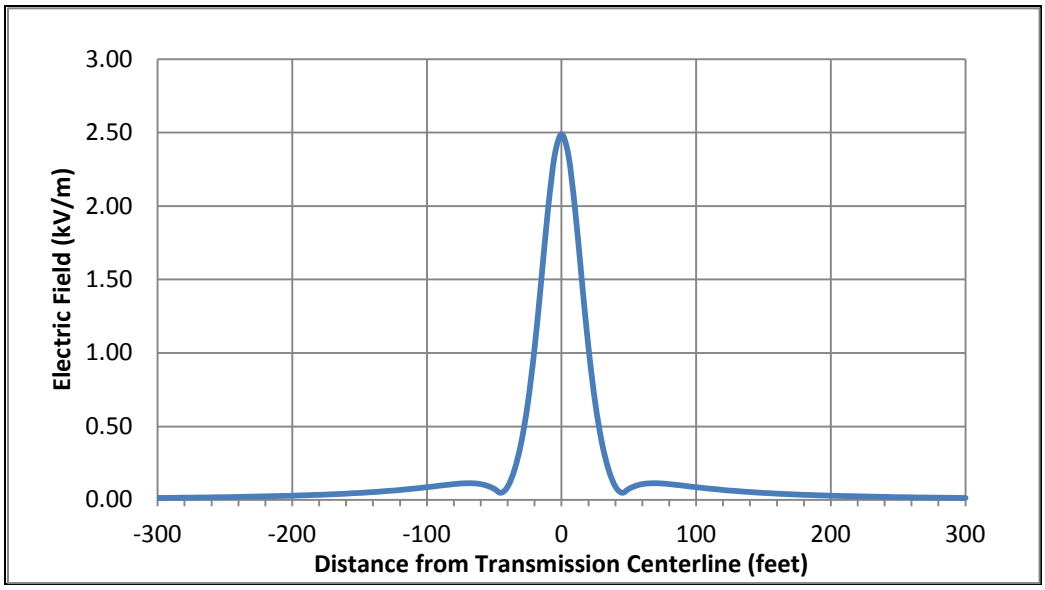


Figure 8-3. 115 kV with 7.2 kV Underbuild Line Electric Field Profile

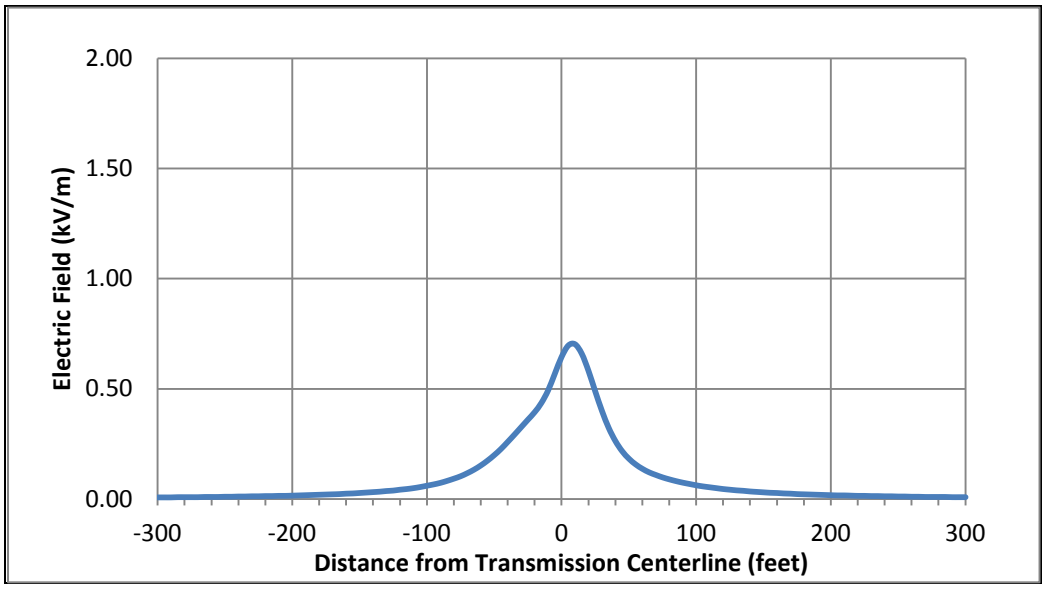
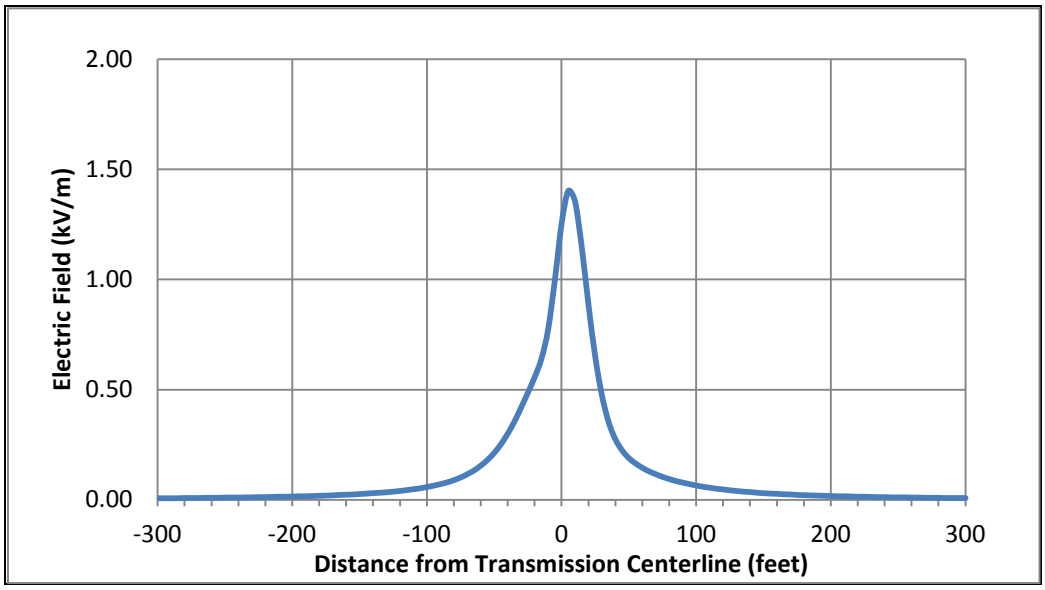


Figure 8-4. 115 kV Single Circuit Line Electric Field Profile



Induced Voltage

When an electric field reaches a nearby conductive object, such as a vehicle or a metal fence, it can induce 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 could 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 root mean square (mA rms). Applicants would 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 rms NESC limit.

Implantable Medical Devices

High intensity EMF 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 with these types of IMDs could occur in electric fields ranging from 1.2 to 1.7 kV/meter. **Table 8-1** and **Figures 8-2 through 8-4** show that the electric fields for all of the 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 to 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.[3]

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.

8.7.2 Magnetic Fields

Current passing through any conductor, including a wire, produces a magnetic field in the area around the wire. The current flowing through the conductors of a transmission line generates a magnetic field that, in similar fashion to the electric field, extends outward from the energized conductors. The intensity of the magnetic field associated with a transmission line is proportional to the amount of current flowing through the line's conductors, and the magnitude of the magnetic field rapidly decreases with the distance from the conductors. Unlike electric fields, magnetic fields are not significantly affected by the presence of trees, buildings, or other solid structures nearby. The value of the magnetic field density is expressed in the unit of gauss (G) or milligauss (mG).

There are no federal or Minnesota exposure standards for magnetic fields. The EQB and the Commission have recognized Florida (a 150-mG limit) and New York (a 200-mG limit) state standards. Both state standards are to be considered at the edge of ROW. Recent studies of the health effects from power frequency fields conclude that the evidence of health risk is weak.[4] The general standard is one of prudent avoidance.

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[3] 2007 Minnesota Power Systems Conference Proceedings (University of Minnesota), *Electromagnetic Compatibility of Active Implantable Medical Devices (AIMD) and Their Interaction with High Voltage Power Lines*, at 23.

[4] Minnesota Department of Health. *EMF White Paper on Electric and Magnetic Field* (EMF) Policy and Mitigation Options. 2002; National Research Council. *Possible Health Effects of Exposure to Residential Electric and Magnetic Fields*. 1997; www.niehs.nih.gov/health/topics/agents/emf/.

Magnetic field levels associated with some common electric appliances are provided in **Table 8-2.**

Table 8-2. Magnetic Fields of Common Electric Appliances (mG) [5]

Appliance	Distance from Source		
	6 inches	1 foot	2 feet
Hair Dryer	300	1	--
Electric Shaver	100	20	--
Can Opener	600	150	20
Electric Stove	30	8	2
Television	NA	7	2
Portable Heater	100	20	4
Vacuum Cleaner	300	60	10
Copy Machine	90	20	7
Computer	14	5	2

Table 8-3 summarizes the magnetic fields calculated for each of the Project's proposed transmission line configurations with power flow at peak loading and at the average loading. The magnetic field calculations are also shown graphically in **Figures 8-5 through 8-7.** Out of all the possible transmission line configurations, the maximum magnetic field under expected peak demand conditions is 28.52 mG, which is below most of the levels shown in **Table 8-2**.

Because the actual power flow on a transmission line could potentially vary widely throughout the day depending on electric demand, the actual magnetic field level could also vary widely from hour to hour. In any case, the typical magnitude of the magnetic field associated with the Project's transmission line is expected to be well below the calculated intensity at the expected peak loading.

[5] *EMF In Your Environment* (EPA 1992)

Table 8-3. Calculated Magnetic Fields (mG) for Proposed Transmission Line Designs(One meter (3.28 feet) above ground)

Scenario	Max. Operating Voltage (kV)	Line Current (Amps)	Distance to Proposed Centerline										
			-300’	-200’	-100’	-50’	-25’	Max.	25’	50’	100’	200’	300’
115/115 kV Double Circuit Peak Load (**Figure 8-5**)	121/121	115 kV: 110 115 kV: 138	0.28	0.62	2.36	7.64	17.33	28.52	16.62	7.38	2.31	0.62	0.28
115/115 kV Double Circuit Average Load (**Figure 8-5**)	121/121	115 kV: 80 115 kV: 82	0.18	0.41	1.53	4.92	11.11	18.61	11.06	4.90	1.52	0.41	0.18
115 kV with 7.2 kV Underbuild Peak Load (**Figure 8-6**)	121/8	115 kV: 110 7.2 kV: 26	0.55	0.84	1.94	4.76	9.36	17.11	12.35	6.54	2.63	1.05	0.65
115 with 7.2 kV Underbuild Average Load (**Figure 8-6**)	121/8	115 kV: 80 7.2 kV: 17	0.36	0.56	1.31	3.30	6.51	11.83	8.54	4.51	1.79	0.71	0.43
115 kV Single Circuit Line Peak Load (**Figure 8-7**)	121	110	0.13	0.29	1.08	3.45	7.92	15.88	9.38	3.94	1.17	0.31	0.14
115 kV Single Circuit Line Average Load (**Figure 8-7**)	121	80	0.10	0.21	0.79	2.51	5.76	11.55	6.82	2.86	0.85	0.22	0.10

Figure 8-5. 115/115 kV Double Circuit Line Magnetic Field Profile

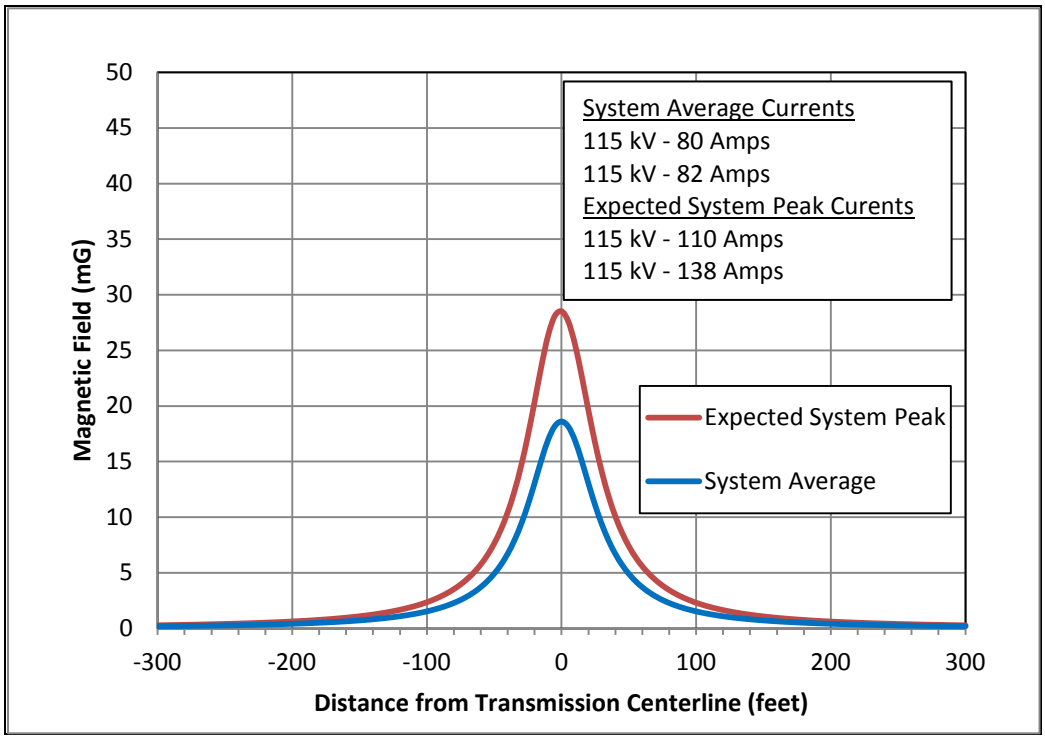


Figure 8-6. 115 kV with 7.2 kV Underbuild Line Magnetic Field Profile

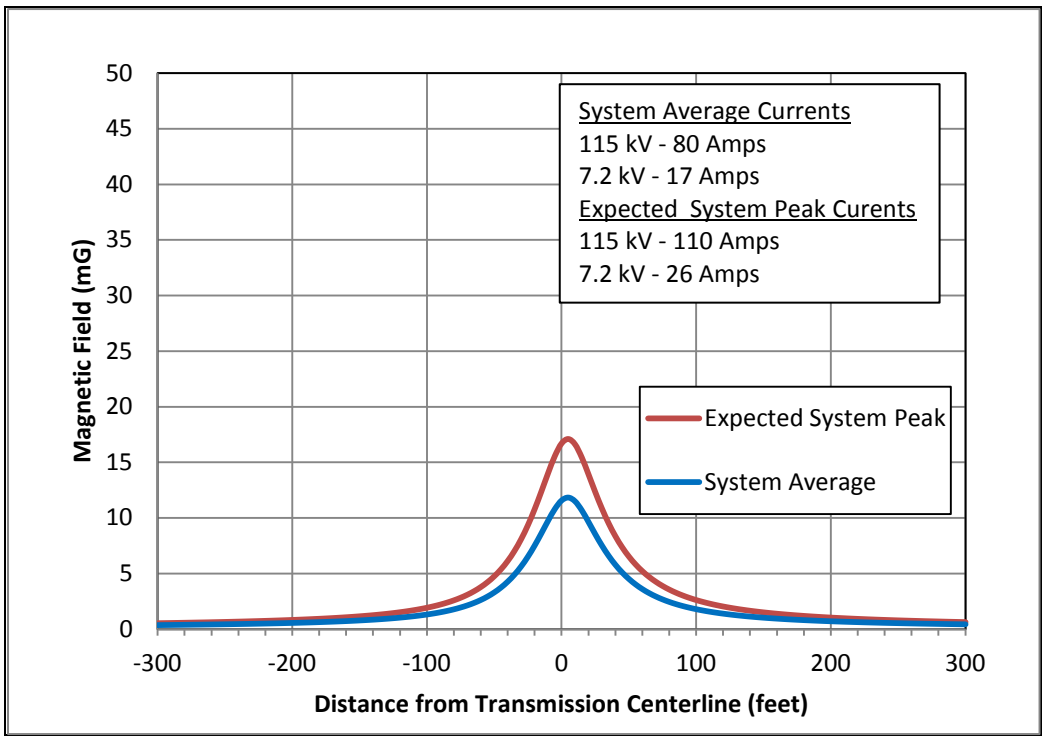
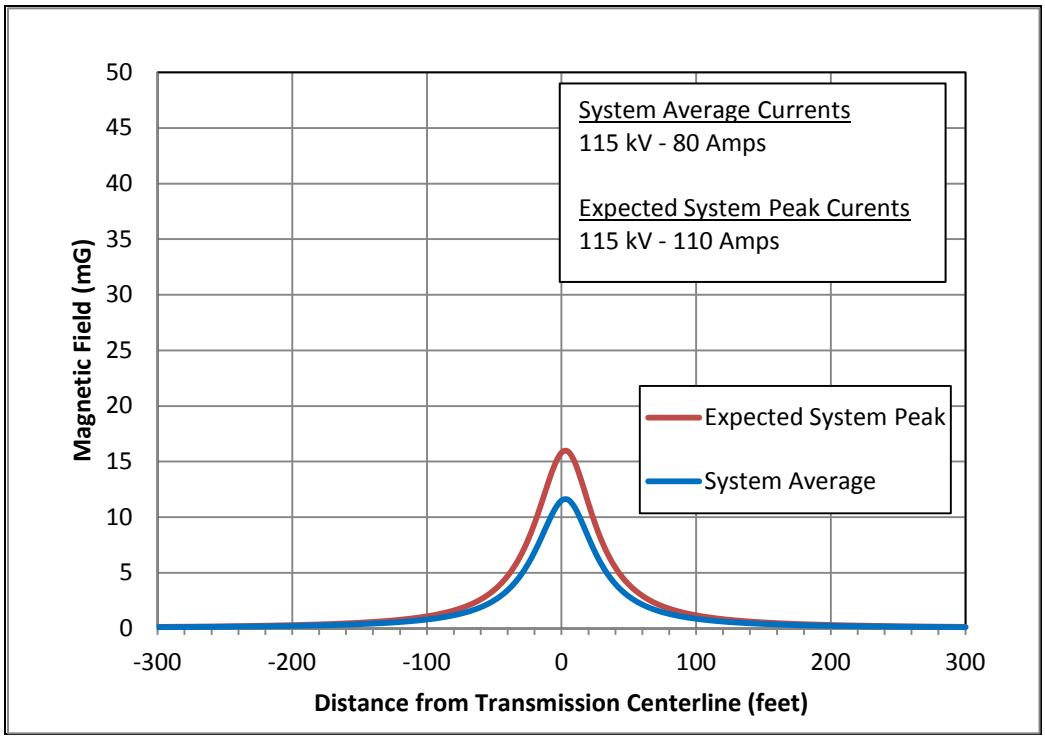


Figure 8-7. 115 kV Single Circuit Line Magnetic Field Profile



8.8 Stray Voltage

"Stray voltage" is a condition that can occur on the electric service entrances to structures from distribution lines. More precisely, stray voltage is a voltage that exists between the neutral wire of the service entrance and grounded objects in buildings such as barns and milking parlors.

Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses and residences. Transmission lines can, however, induce a current on a distribution circuit that is parallel and immediately under the transmission line. Appropriate measures would be taken to mitigate problems associated with induced currents on distribution circuits when the proposed Project parallels or crosses distributions lines.

If a landowner has stray voltage concerns on their property, Applicants suggest they contact their electric service provider to discuss the situation with technical staff, including the possibility of an on-site investigation.

8.9 Corona

Under certain conditions, the localized electric fields near an energized transmission line conductor can produce small electric discharges, ionizing nearby air. This is commonly referred to as the "corona" effect. Most often, corona formation is related to some sort of irregularities on the conductor, such as scratches or nicks, dust buildup, or water droplets. The air ionization caused by corona discharges can result in the formation of audible noise and radio frequency

noise. If the discharges are excessive, the audible noise can reach annoyance levels and the radio frequency discharges can cause interference with radio and television reception. The potential for radio and television signal interference, however, is largely dependent on the magnitude of the corona-induced radio frequency noise *relative to* the strength of the broadcast signals.

Corona formation is a function of the conductor radius, surface condition, line geometry, weather condition, and most importantly, the line's operating voltage. Corona-induced audible noise and radio and television interference are typically not a concern for power lines with operating voltages below 161 kV, because the electric field intensity is too low to produce significant corona. The expected electric field intensity due to the Project's transmission lines is provided in **Section 8.7.1**.

8.9.1 Radio and Television Interference

Because the likelihood of significant corona formation on the Project's 115 kV lines is minimal, the likelihood of radio and television interference due to corona discharges associated with the Project's transmission is also minimal. Applicants are unaware of any complaints related to radio or television interference resulting from the operation of existing 115 kV facilities in the Project area and do not expect radio and television interference to be an issue along the proposed route.

8.9.2 Audible Noise

Transmission lines can cause audible noise due to corona discharges from the conductors. This noise, which resembles a crackling sound, is typically only within the threshold of human hearing during rainy or foggy conditions, and even then is largely imperceptible due to background noise. The impacts and mitigation of audible noise due to the Project are discussed further in **Section 9.2.3**.

8.9.3 Ozone and Nitrogen Oxide Emissions

In addition to potentially causing audible and radio frequency noise, corona can also produce ozone and oxides of nitrogen in the air surrounding the conductor. Ozone is a very reactive form of oxygen molecule that combines readily with other elements and compounds in the atmosphere, making it relatively short lived. Ozone forms naturally in the lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants such as hydrocarbons from auto emissions. The natural production rate of ozone is directly proportional to temperature and sunlight, and inversely proportional to humidity. Thus the conditions that are most likely to cause corona formation on a transmission line – humid, rainy, or foggy conditions – actually inhibit the production of ozone.

Like audible and radio frequency noise, corona-induced ozone and nitrogen oxides are typically not a concern for power lines with operating voltages below 161 kV, because the electric field intensity is too low to produce significant corona. Therefore, Applicants expects ozone and nitrogen oxide concentrations associated with the Project to be negligible, and well below all federal and state standards.

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9 ENVIRONMENTAL ANALYSIS OF ROUTES

This portion of the Application provides a description of the land use and environmental resources in the Project area, potential impacts, and proposed mitigative measures.

The name of each owner whose property is within the proposed route is provided in **Appendix J.**

The Project has been reviewed by a number of state and federal agencies. All environmental review correspondence related to the proposed Project is provided in **Appendix K.**

9.1 Environmental Setting

The Project lies in the Pine Moraines and Outwash Plains Subsection of the Laurentian Mixed Forest Province, according to the DNR Ecological Classification Systems.

The Laurentian Mixed Forest Province is characterized by broad areas of conifer forest, mixed hardwood and conifer forests, and conifer bogs and swamps. The landscape ranges from rugged lake-dotted terrain with thin glacial deposits over bedrock, to hummocky or undulating plains with deep glacial drift, to large, flat, poorly drained peatlands.

The Pine Moraines and Outwash Plains Subsection is a mix of outwash plains, end moraines, till plains, and drumlin fields.

The Project area is dominated by forested land, lakes, wetlands, and agricultural land. The closest communities near the Project include the town of Hubbard (unincorporated), and the cities of Menahga and Sebeka.

The environmental setting of the Project area includes hydrologic features such as rivers, creeks, ditches, wetlands and riparian areas. A mix of groundcover is present along the proposed routes. The physiographic features (topography, soils, geology and farmland) are typical of this area and do not preclude the development of this Project. Wildlife habitat exists in pockets throughout the Project area.

Land use in the Project area includes a mix of public, residential, business, open space, forested lands and agricultural lands. The residential areas within the Project area are primarily single-family homes of varying density. Open space areas include forested areas, cultivated land, grassland, shrub land, and wetlands.

9.2 Human Settlement

9.2.1 Public Health and Safety

Proper safeguards would be implemented for construction and operation of the transmission facilities. The Project will be designed in compliance with local, state, NESC, and Great River Energy standards regarding clearance to the ground, clearance to crossing utilities, strength of materials and ROW widths. Construction crews and/or contract crews would comply with local, state, and NESC standards regarding installation of facilities and standard construction practices. Great River Energy's established safety procedures, as well as industry safety procedures, would be followed during and after installation of the transmission line, including clear signage during all construction activities.

The Project would be equipped with protective devices to safeguard the public if an accident occurs and a structure or conductor falls to the ground. The existing substations are already equipped with breakers and relays located where existing transmission lines connect to the substations. The protective equipment is designed to de-energize the transmission lines should such an event occur.

Electric and Magnetic Fields

Considerable research has been conducted since the 1970s to determine whether exposure to power-frequency, commonly referred to as "extremely-low frequency" or "ELF" (60 hertz), electric fields (EF) and magnetic fields (MF) can cause biological responses and adverse health effects. The multitude of epidemiological and toxicological studies has shown, at most, a weak association (*i.e.*, no statistically significant association) between ELF-MF exposure and health risks and no association between ELF-EF exposure and health risks.

In 1999, the National Institute of Environmental Health Sciences (NIEHS) issued its final report on "Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields" in response to the Energy Policy Act of 1992. In the report, the NIEHS concluded that the scientific evidence linking EMF exposures with health risks is weak and that this finding does not warrant aggressive regulatory concern. However, in light of the weak scientific evidence supporting some association between EMF and health effects and the fact that exposure to electricity is common in the United States, the NIEHS stated that passive regulatory action, such as providing public education on reducing exposures, is warranted.[6]

The United States Environmental Protection Agency (EPA) seems to have come to a similar conclusion about the link between adverse health effects, specifically childhood leukemia, and power-frequency EMF exposure. On its website, the EPA states:

> Many people are concerned about potential adverse health effects. 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 to magnetic fields, is related to an increased risk of childhood

[6] Report is available at http://www.niehs.nih.gov/health/topics/agents/emf/

> 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.[7]

Minnesota, California, and Wisconsin have each conducted their own literature reviews or research to examine this issue. In 2002, Minnesota formed an Interagency Working Group to evaluate the research and develop policy recommendations to protect the public health from any potential problems arising from EMF effects associated with HVTLs. The Minnesota Department of Health published the Working Group's findings in *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options*. The Working Group summarized its findings as follows:

> Research on the health effects of EMF has been carried out since the 1970s. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to EMF and health effects, some have shown a weak association. More recently, laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer. A number of scientific panels convened by national and international health agencies and the United States Congress have reviewed the research carried out to date. Most researchers concluded that there is insufficient evidence to prove an association between EMF and health effects; however, many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe.[8]

In 2007, the World Health Organization (WHO) conducted an intensive review of the health implications of ELF-MFs. WHO concluded that "virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level ELF magnetic fields and changes in biological function or disease status."[9] Based on its review, WHO did not recommend exposure limits but provided that "[t]he best source of guidance for both exposure levels and the principles of scientific review are international guidelines."[10] The guidelines referred to by WHO are those of the International Commission on Non-Ionizing Radiation Protection (ICNIRP)[11] and the Institute of Electrical and Electronic Engineers (IEEE) exposure limit guidelines.[12] At the time WHO completed its review, the ICNIRP continuous general public exposure guideline was 833 mG and the IEEE continuous general public exposure guideline was 9,040 mG. In 2010, ICNIRP revised its continuous general public exposure guideline to 2,000 mG. The WHO has

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[7] http://www.epa.gov/radtown/power-lines.html

[8] Minnesota Department of Health. 2002. *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options*

[9] World Health Organization. 2007. *Environmental Health Criteria Volume No. 238 on Extremely Low Frequency Fields* at 12.

[10] *Id.* at 12-13.

[11] ICNIRP is a non-governmental organization in formal relations with WHO.

[12] *Id.*

not provided any analysis of the 2010 ICNIRP continuous general public exposure guideline to date.

Based on findings like those of the Working Group and NIEHS, the Commission has consistently found that "there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects."[13] This conclusion was further justified in the Route Permit proceedings for the Brookings County – Hampton 345 kV Project ("Brookings Project"). In the Brookings Project Route Permit proceedings, the Applicants (Great River Energy and Xcel Energy) and one of the intervening parties both provided expert evidence on the potential impacts of ELF-EF and ELF-MF, including the WHO findings. The ALJ in that proceeding evaluated written submissions and a day-and-a-half of testimony from the two expert witnesses. The ALJ concluded: "there is no demonstrated impact on human health and safety that is not adequately addressed by the existing State standards for [EF and MF] exposure."[14] The Commission adopted this finding on July 15, 2010.[15]

Impacts and Mitigation

No impacts to public health and safety are anticipated as a result of the Project. The Project will be designed in compliance with local, state, NESC, and Great River Energy standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials, and right-of-way widths. The proposed transmission line will be equipped with protective devices to safeguard the public from the transmission line if an accident occurs, such as a structure or conductor falling to the ground.

Great River Energy will ensure that safety requirements are met during the construction and operation of the facilities. Additionally, when crossing roads or railroads during stringing operations, guard structures will be utilized to eliminate traffic delays and provide safeguards for the public. With implementation of these safeguards and protective measures, no additional mitigation is proposed.

9.2.2 Displacement/Proximity of Project to Businesses and Residences

No displacement of residential homes, structures or businesses will occur as a result of this Project. The NESC and Great River Energy standards require certain clearances between transmission line structures and buildings or structures within the ROW for safe operation of the proposed transmission line. Displacement of residential homes, structures or businesses in the

[13] See, for example, *In the Matter of the Application for a HVTL Route Permit for the Tower Transmission Line Project,* Docket No. ET-2, E015/TL-06-1624, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to Minnesota Power and Great River Energy for the Tower Transmission Line Project and Associated Facilities (August 1, 2007)

[14] *In the Matter of the Route Permit Application by Great River Energy and Xcel Energy for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota,* Docket No. ET-2/TL-08-1474, ALJ Findings of Fact, Conclusions and Recommendation at Finding 216 (April 22, 2010 and amended April 30, 2010)

[15] *In the Matter of the Route Permit Application by Great River Energy and Xcel Energy 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 (September 14, 2010)

ROW would occur only if a transmission line alignment and design could not accomplish these necessary clearances. Applicants believe the proposed Project route provides sufficient design flexibility and distances from existing homes, structures and businesses for a transmission line design that achieves the requisite clearances.

Proximity of the proposed transmission centerline to commercial/industrial properties and residences (and non-residential buildings) along the route is summarized in **Table 9-1** and shown on the detailed route maps in **Appendix G**. Distances to commercial/industrial properties and residences were measured from the proposed alignment.

The proposed transmission line is near one commercial/industrial property (an active gravel pit within 100 feet of the proposed transmission line centerline, **Sheet 20, Appendix G**) and is near a formerly active area of another gravel pit. See **Section 9.4.4** for a discussion of mining in the area.

There are four homes within 50-150 feet of the proposed centerline, but the majority of the residences (24) are set back a distance of 150 feet or more from the proposed centerline.

Table 9-1. Proximity of Homes and Businesses to Proposed Transmission Line Centerline

Transmission Line Segment	Number of Residences/Businesses within Various Distances (feet) Either Side of Transmission Line Centerline					
	0-50’	50-100’	100-150’	150-200’	200-250’	Total
Hubbard Substation to CR 115 (double circuit)	0	1	1	3	0	5
CR 115 to Straight River Substation (single circuit)	0	0	0	2	0	2
Straight River Substation to CSAH 13 (single circuit)	0	0/1	2	11	4	18
CSAH 13 to Red Eye Substation (single circuit)	0	0	0	3	1	4
Total	**0**	**2**	**3**	**19**	**5**	**29**

Impacts and Mitigation

The Project will be designed in compliance with local, state, NESC, and Great River Energy standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials, and right-of-way widths. The proposed transmission line will be equipped with protective devices to safeguard the public from the transmission line if an accident occurs, such as a structure or conductor falling to the ground.

Great River Energy will work with landowners to address alignment adjustments or pole placement, as necessary. If there are other structures (e.g. farm buildings) within the ROW it may be possible to install taller transmission line poles to meet clearances to existing structures in the ROW, place all energized conductors on one side of the transmission line pole away from

the structure, or avoid the structure completely by placing the transmission line on the other side of the road if conditions warrant these measures.

9.2.3 Noise

There will be some noise associated with the construction phase of the Project, and from operation of the transmission line and substations.

Because human hearing is not equally sensitive to all frequencies of sound, the most noticeable frequencies of sound are given more "weight" in most measurement schemes. The A-weighted scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in dBA, which is the A-weighted sound level recorded in units of decibels.

A noise level change of 3 dBA is barely perceptible to human hearing. A 5 dBA change in noise level, however, is clearly noticeable. A 10 dBA change in noise level is perceived as a doubling of noise loudness, while a 20 dBA change is considered a dramatic change in loudness. **Table 9-2** shows noise levels associated with common, everyday sources.

Table 9-2. Common Noise Sources and Levels

Sound Pressure Level (dBA)	Noise Source
140	Jet Engine (at 25 meters)
130	Jet Aircraft (at 100 meters)
120	Rock and Roll Concert
110	Pneumatic Chipper
100	Jointer/Planer
90	Chainsaw
80	Heavy Truck Traffic
70	Business Office
60	Conversational Speech
50	Library
40	Bedroom
30	Secluded Woods
20	Whisper

Source: Minnesota Pollution Control Agency (2008)

The MPCA established daytime and nighttime noise standards by Noise Area Classifications (NAC) are provided in **Table 9-3**. The standards are expressed as a range of permissible dBA within a one hour period; L_{50} is the dBA that may be exceeded 50 percent of the time (30 minutes) within an hour, while L_{10} is the dBA that may be exceeded 10 percent of the time (6 minutes) within the hour.

Table 9-3. MPCA Noise Limits by Noise Area Classification (dBA)

Noise Area Classification	Daytime		Nighttime	
	L_{50}	L_{10}	L_{50}	L_{10}
1 Residential-type Land Use Activities	60	65	50	55
2 Commercial-type Land Use Activities	65	70	65	70
3 Industrial-type Land Use Activities	75	80	75	80

Land areas, such as picnic areas, churches, or commercial spaces, are assigned a NAC based on the type of activities or use occurring in the area and the sensitivity of the activities to noises. The NAC is listed in the MPCA noise regulations to distinguish the categories. Residential areas, churches, and similar type land use activities are included in NAC 1; commercial-type land use activities are included in NAC 2; and industrial-type land use activities are included in NAC 3.

Typically the most noise-sensitive receptors along the routes will include residences, businesses, churches, and schools. 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.

Noise Related to Construction

Construction noise is expected to occur during daytime hours as the result of heavy equipment operation and increased vehicle traffic associated with the transport of construction personnel and materials to and from the work area.

Noise Related to Transmission Lines

Operational noise levels produced by a 115 kV transmission line are generally less than outdoor background levels and are therefore not usually perceivable. Proper design and construction of the transmission line and substations in accordance with industry standards will help to ensure that noise impacts are not problematic. Noise associated with operation of the transmission facilities is discussed further below.

Transmission lines can generate a small amount of sound energy during corona activity where a small electrical discharge caused by the localized electric field near energized components and conductors ionizes the surrounding air molecules. Corona is the physical manifestation of energy loss and can transform discharge energy into very small amounts of sound, radio noise, heat, and chemical reactions of the air components. Several factors, including conductor voltage, shape and diameter, and surface irregularities such as scratches, nicks, dust, or water drops can affect a conductor's electrical surface gradient and its corona performance.

Noise emission from a transmission line occurs during certain weather conditions. In foggy, damp, or rainy weather, power lines can create a crackling sound due to the small amount of electricity ionizing the moist air near the wires. During heavy rain, the background noise level of the rain is usually greater than the noise from the transmission line. As a result, people do not normally hear noise from a transmission line during heavy rain.

The industry standard for utilities is calculated based on L_{50} and L_5 for audible noise emissions. The worst-case scenario is when the transmission line is exposed to heavy rain conditions (one inch per hour). Anticipated noise 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 9-4**.

Table 9-4. Anticipated Transmission Line Noise Levels with Heavy Rain

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

Noise Related to Substations

Noise associated with substations includes the operation of transformers and switchgear. The transformers produce a constant low-frequency humming noise while the switchgear produces an impulsive or short duration noise during infrequent activation of the circuit breakers. Due to the infrequent operation of the switchgear, the noise generated would be considered temporary in nature and not predicted to exceed the MPCA Noise Limits.

The proposed new Straight River, Blueberry and Red Eye substations and the relocated Menahga Substation will be designed to comply with Minnesota Noise standards (Minnesota Rules part 7030). The controlling limit for substations is the nighttime Noise Area 1 Classification (Table 4-2). Under this classification, noise levels are limited to 50 dBA during nighttime hours at the nearest location where a person is reasonably expected to sleep.

Typical noise levels from the type of transformers that will be used in the Straight River and Red Eye substations are 67 dBA when the transformer cooling fans are not running and 70 dBA when the fans are running (measured 1 meter (approximately 3 feet) from the equipment). Typical noise levels from the type of transformers that will be used in the Blueberry and Menahga substations are 70 dBA when the transformer cooling fans are not running and 73 dBA when the fans are running. To conservatively predict future noise levels and compliance with the 50-dBA limit, the 70 dBA and 73 dBA noise levels were treated as a point source at the transformers and modeled to determine the distance where the noise levels would be reduced to 50 dBA.

A simplified, conservative model[16] was used to determine the distance at which the noise would attenuate to 50 dBA. Noise propagation through the outdoor atmosphere typically decreases in level with increasing distance between the source and the receiver. The noise attenuation is the result of several mechanisms, including geometrical spreading of the sound waves, shielding provided by physical structures, atmospheric absorption of the acoustic energy and ground effects on the sound waves. In general, the noise or sound pressure levels emitted from the substation will decrease approximately 6 dB for each doubling of distance from the source to the receiver. The simplified model was prepared based on this 6-dB reduction with a doubling of distance. The model is conservative in that it does not factor in geometric spreading or any attenuation from shielding or ground effects.

Noise from each of the substations at the nearest receptors is predicted to be 25 dBA or less, well below the NAC 1 limit of 50 dBA.

At the proposed Straight River Substation, substation noise level would attenuate to the 50 dBA noise limit at a distance of approximately 30 feet from the transformer. The nearest residence is approximately 600 feet west of the substation, and at this distance, the predicted noise level would be approximately 24 dBA.

At the proposed Blueberry/relocated Menahga Substation, substation noise level would attenuate to the 50 dBA noise limit at a distance of approximately 60 feet from the transformer. The nearest residence is approximately 1050 feet south of the substation, and at this distance, the predicted noise level would be approximately 25 dBA.

At the proposed Red Eye Substation, substation noise level would attenuate to the 50 dBA noise limit at a distance of approximately 30 feet from the transformer. The nearest residence is approximately 730 feet southwest of the substation, and at this distance, the predicted noise level would be approximately 22 dBA.

Impacts and Mitigation

Noise associated construction of the Project will be temporary in nature. To mitigate noise impacts associated with construction activities, work will be limited to daytime hours between 7 a.m. and 10 p.m. weekdays. Occasionally there may be construction outside of those hours mentioned or on a weekend if Applicants have to work around customer schedules, line outages, or if the schedule has been significantly impacted due to permitting delays or other factors. Heavy equipment will also be equipped with sound attenuation devices such as mufflers to minimize the daytime noise levels.

[16] The simplified model is based off the following formula: S2 = S1 - 20 * Log(d2/d1). S2 = Noise level at distance d2 (dBA), S1 = Measured sound level at d1 (dBA), D1 = Distance from noise source to S1 noise measurement (ft), and D2 = Distance from noise source at which S2 is calculated (ft).

Transmission line and substation operational noise levels are expected to be well below the state noise limits, therefore no mitigation is proposed.

9.2.4 Aesthetics

The transmission line and the Straight River, Blueberry and Red Eye substations would be new features visible along the route. The structures for the double circuit portion of the Project will be wood poles approximately 60 to 90 feet above ground with spans between poles ranging from 350 to 450 feet. The structures for the single circuit portion of the Project will be wood poles approximately 60 to 90 feet above ground with spans between poles ranging from 275 to 400 feet. A maximum span will be used between the structures as necessary while still keeping the conductor within the ROW under blowout conditions. Some sections of the new line will have distribution underbuild, which would be attached to new 115 kV transmission line structures spaced 250 to 300 feet apart.

The typical ROW required for 115 kV structures is 100 feet wide.

The new infrastructure will be visible in the general area of the Project. The landscape in the Project area is a mix of rural residential development, forested land, agricultural land, recreational areas, and open space; with commercial and residential development in the City of Menahga. The visual effect will depend largely on the perceptions of the observers across these various landscapes. 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, distribution lines and substations that already exist in the vicinity of the proposed Project will limit the extent to which the new infrastructure viewed as a disruption to the area's scenic integrity.

Impacts and Mitigation

To minimize impacts to the aesthetics and visual character of the Project area, Applicants identified a proposed route that predominantly uses existing transmission line and road corridors and avoids residences and businesses to the greatest extent practicable.

Great River Energy will work with landowners to identify concerns related to the transmission line and aesthetics. In general, mitigation includes enhancing positive effects as well as minimizing or eliminating negative effects. Potential mitigation measures include:

- Location of structures, ROW, and other disturbed areas will be determined by considering input from landowners or land management agencies to minimize visual impacts.

- Care shall be used to preserve the natural landscape. Construction and operation shall be conducted to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work.

- Landowners will be compensated for the removal of trees and vegetation during easement negotiations.

- Structures will be placed at the maximum feasible distance from highway, trail, and water crossings, within limits of structure design.

- To the extent practicable, rivers shall be crossed in the same location as existing transmission lines.

9.2.5 Socioeconomic

The Project is located primarily within Hubbard and Wadena counties with a small portion in Becker County in north central Minnesota.

The socioeconomic setting of the proposed Project area was evaluated on a regional basis, comparing data for the area along the Project route with average data for Hubbard, Wadena and Becker counties and the state of Minnesota. Data were compiled from the 2000 and 2010 U.S. Census. **Table 9-5** summarizes the socioeconomic characteristics within the Project area.

Table 9-5. Socioeconomic Characteristics within the Project Area

LOCATION	POPULATION 2000	POPULATION 2010	CHANGE (%)	MEDIAN HOUSEHOLD INCOME	POPULATION BELOW POVERTY LEVEL (%)
State of Minnesota	4,919,479	5,303,925	7.8%	$59,126 (2008-2012)	11.2 (2008-2012)
Hubbard County	18,376	20,428	11.2%	$45,623 (2008-2012)	12.1 (2008-2012)
Wadena County	13,713	13,843	0.9%	$35,767 (2008-2012)	18.4 (2008-2012)
Becker County	30,000	32,504	8.3%	$49,159 (2008-2012)	11.8 (2008-2012)
City of Menahga	1220	1306	7.0%	$33,292 (2008-2012)	18.0 (2008-2012)
Hubbard Township, Hubbard County	786	784	-0.2%	$46,875 (2008-2012)	4.0 (2008-2012)
Blueberry Township, Wadena County	732	721	-1.5%	$55,000 (2008-2012)	14.8 (2008-2012)
Red Eye Township, Wadena County	421	490	16.4%	$56,875 (2008-2012)	20.2 (2008-2012)
Runeberg Township, Becker County	387	486	25.6%	$48,594 (2008-2012)	12.3 (2008-2012)

Impacts and Mitigation

Constructing the new substations and transmission line will result in some short and long term economic impacts for the surrounding communities. Long term benefits will result from the new utility infrastructure and will include improved utility service, which supports local economies.

Increasing the transmission outlet capability within the Project area will benefit the surrounding communities in general, and upgrading the transmission system will serve the growing demand of the region and the proposed MPL pump station.

Short term impacts will result from the activities associated with construction. Impacts to social services would be unlikely because of the short-term nature of the construction project. In the short-term, revenue would likely increase for some local businesses, such as hotels, restaurants, gas stations, and grocery stores, due to workers associated with construction of the Project.

Because impacts to socioeconomics will be generally short-term and beneficial, no mitigation is proposed.

9.2.6 Cultural Values

Cultural values include those perceived community beliefs or attitudes in a given area, which provide a framework for community unity. The populations of Hubbard, Wadena and Becker counties derive from a diverse ethnic heritage. However, according to Wikipedia, the majority (63-69 percent) of the reported ethnic backgrounds are of European origin (German, Norwegian, Swedish, English and Finnish).

In Hubbard County, German heritage comprises the largest percentage of the total county population (35 percent), followed by Norwegian (20.5 percent), English (6 percent) and Swedish (5.8 percent). Hubbard County is home of the Historical Society Museum, the Hubbard County Fair, the Tamarac Fall Festival, the North Country Hiking Fest, and Legends and Logging Days.

Wadena County has a similar heritage, with German heritage comprising the largest percentage of the total county population (37.5 percent), followed by Norwegian (14 percent), Finnish (12.5 percent) and Swedish (5.3 percent). Examples of cultural events in Wadena County include the Wadena County Fair, the Mid-Summer Celebration and St. Urho Days in Menahga, and the Red Eye River Celebration in Sebeka.

In Becker County, German heritage also comprises the largest percentage of the total county population (32 percent), followed by Norwegian (26 percent) and Swedish (5.2 percent). Becker County is host to the Becker County Fair, We Fest, and Spirit Fest.

Cultural representation in community events appears to be more closely tied to geographic features, seasonal events, national holidays, and municipal events than to those based in ethnic heritage.

Construction of the proposed Project is not expected to conflict with the cultural values of the area.

Impacts and Mitigation

The construction of the proposed transmission facilities will provide the region with a stable power supply. The available power supplied by Project will provide essential support and contribute to a stable economic environment in which to live and work. In addition, opportunities presented by the diverse economy may continue to encourage civic pride, and tourism may benefit from this unity as well.

Because no adverse impacts to cultural values are anticipated, no mitigation is proposed.

9.2.7 Recreation

There are a number of existing recreational resources within the Project vicinity, including parks, trails, rivers, and lakes. Popular activities include camping, fishing, hunting, bird watching, canoeing/kayaking, boating, swimming, golfing, biking, hiking, cross country skiing and riding ATVs and snowmobiles. The DNR Wildlife Management Areas (WMAs) provide opportunities for viewing wildlife and intact ecosystems.

Recreational resources in the vicinity of the Project are listed in **Table 9-6** and shown on **Figures 9-1A through 9-1C.**

Table 9-6. Recreational Resources in the Project Vicinity

Location	Resource	Characteristics/Uses
State	Lowe WMA (DNR)	Wetland/forest complex in a mixed agricultural/forested landscape (includes 40-acre shallow lake and 80 acres of sedge meadow). Acquired for waterfowl habitat. Recreation Opportunities: Hunting/Wildlife Viewing
State	Red Eye WMA (DNR)	Mix of Lowland Brush, Crop Land (includes a 22-acre row crop plot), Emergent Wetlands and Grasses/Open/Hay Land. Recreation Opportunities: Hunting
State	Kitten Creek WMA (DNR)	Variety of aquatic, forest and open land habitats. Recreation Opportunities: Hunting/Wildlife Viewing
State	Wood Eye WMA (DNR)	Variety of aquatic, forest and open land habitats. Recreation Opportunities: Hunting/Wildlife Viewing

Figure 9-1A. Recreation Areas – North

Figure 9-1B. Recreation Areas – Central

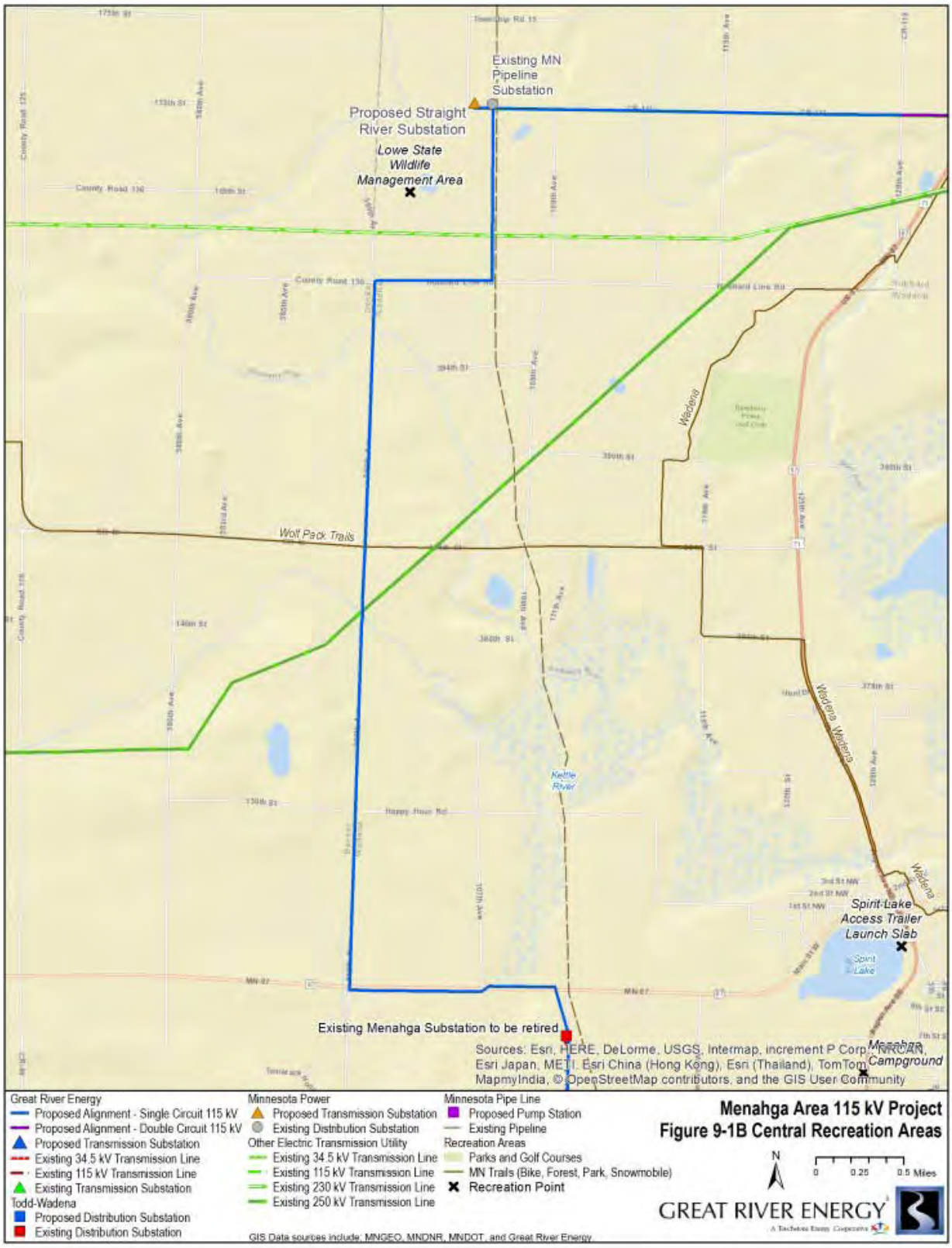


Figure 9-1C. Recreation Areas – South

Impacts and Mitigation

The proposed transmission line will come closest to the Red Eye WMA, but the line is proposed to be on the opposite side of the road as the WMA, therefore the WMA will not be impacted. The Project does not cross state forest lands, Scientific and Natural Areas (SNAs) or any WMAs (**Figures 9-1A through 9-1C**).

Clearing vegetation underneath the utility lines may decrease the wildlife habitat within the immediate vicinity, potentially impacting viewing opportunities for the short term. Permanent disturbance of wildlife habitat will be minimized, to avoid impacts to hunting and wildlife observation.

Great River Energy will coordinate with the DNR, USFWS, and other resource agencies 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.

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

9.2.8 Public Services and Transportation

The Project is located in rural areas with typical public services (police, fire protection, waste collection, natural gas, wells, septic systems, cable television, electricity, telephone, etc.).

Other existing utilities, such as gas/oil pipelines and electric distribution lines, and site improvements, such as septic systems and wells, will be located during survey activities.

The proposed route follows existing utility and/or road ROWs for nearly the entire route. The majority of the proposed transmission line and poles will be located outside of road and other utility easements.

The proposed Project is nearly five miles from the Park Rapids Municipal Airport in Park Rapids, approximately 15 miles from the Wadena Municipal Airport in Wadena, and approximately 16 miles from the New York Mills Municipal Airport in New York Mills, Minnesota.

The MnDOT Office of Aeronautics was contacted[17] requesting information on the possible effects of the proposed Project on airports or airstrips in the Project area. In an email[18] dated October 7, 2014 (**Appendix K**), MnDOT indicated that the project description Early Notification Memo was received and reviewed by the Office of Aeronautics, and determined the Project would have no significant effect on operations at the Park Rapids Municipal Airport, the Wadena Municipal Airport, or the New York Mills Municipal Airport.

[17] Letter from Carole Schmidt, Great River Energy to Cathy Huebsch, MnDOT. 15 September 2014. *See* Appendix K.

[18] Email from Debra Sorenson-MnDOT Aeronautics, to Carole Schmidt, Great River Energy. 7 October 2014. *See* Appendix K.

Impacts and Mitigation

Based on the location of other existing utilities and site improvements that are identified during survey activities, the transmission line will be designed to meet or exceed required clearances and pole locations will be designed to be outside of existing utility easements, with the exception of Todd-Wadena distribution lines. Great River Energy will work with Todd-Wadena to modify or co-locate the existing distribution system that is on the proposed route.

Because the route follows existing utility and road ROWs, and the majority of transmission poles will be located outside of existing utility easements and road ROW, no impacts to public services are anticipated and therefore no mitigation is proposed.

The proposed Project is not anticipated to affect any ongoing or future road projects within the Project area. Great River Energy will coordinate with and obtain approval from road authorities if it were necessary to locate any poles for the proposed transmission line within road ROW.

Temporary access for construction of the transmission line 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.

Short-term localized traffic delays are anticipated. Impacts resulting from construction and operation of the proposed transmission line would be minimal for transportation.

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.

9.3 Land Use/Zoning

The Project covers a variety of land use patterns in rural environments. Land use along the route is a mix of forest, cropland, shrub land, grassland, and wetlands and waters (**Figures 9-2A through 9-2C**).

Zoning information for the Project area is provided in **Figures 9-3A through 9-3C**.

Hubbard County

The portion of the Project located in southern Hubbard County is dominated by forest and agricultural land, with some shrub land, grassland and wetlands/water (**Figure 9-2A**).

Figure 9-2A. Land Use-North

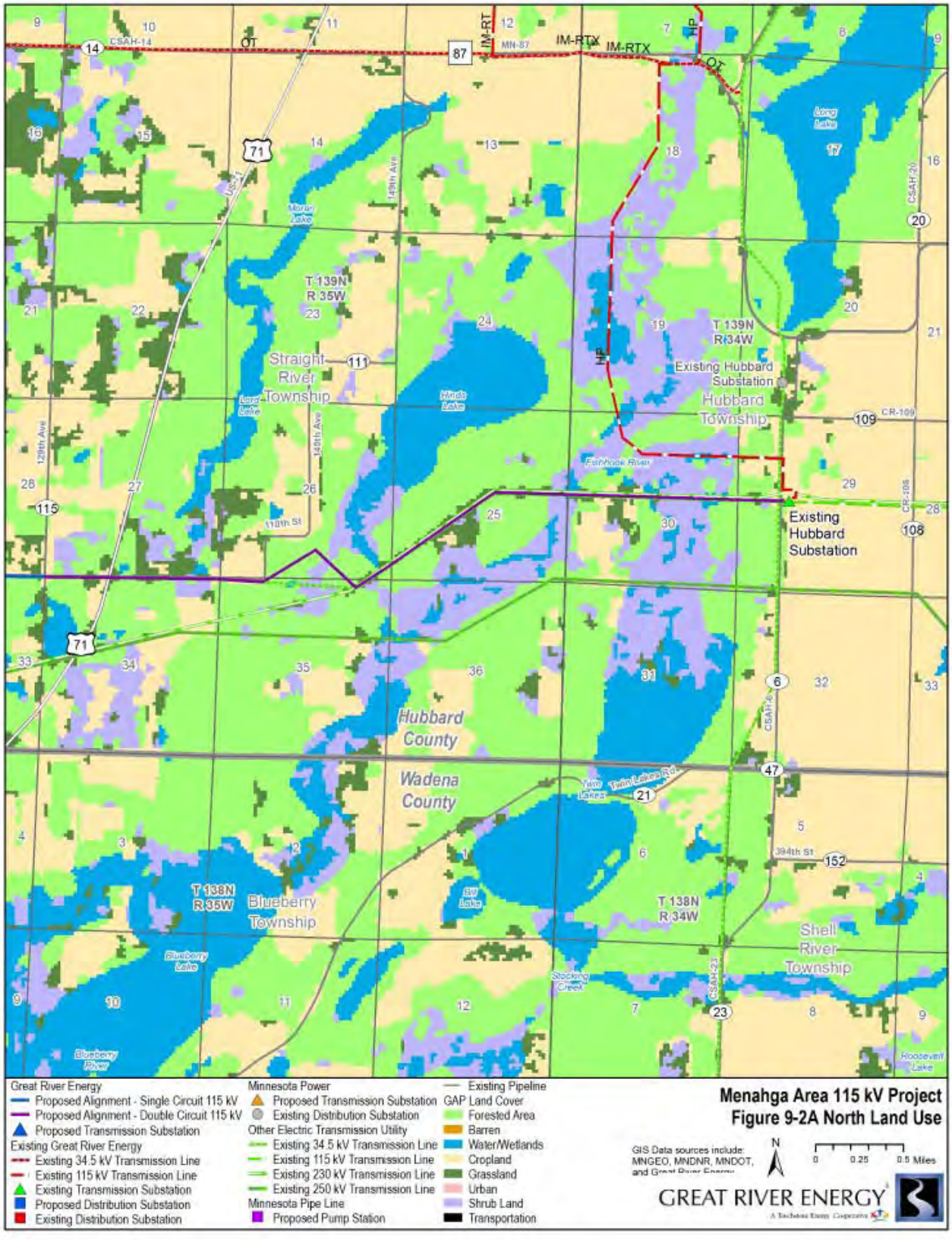


Figure 9-2B. Land Use-Central

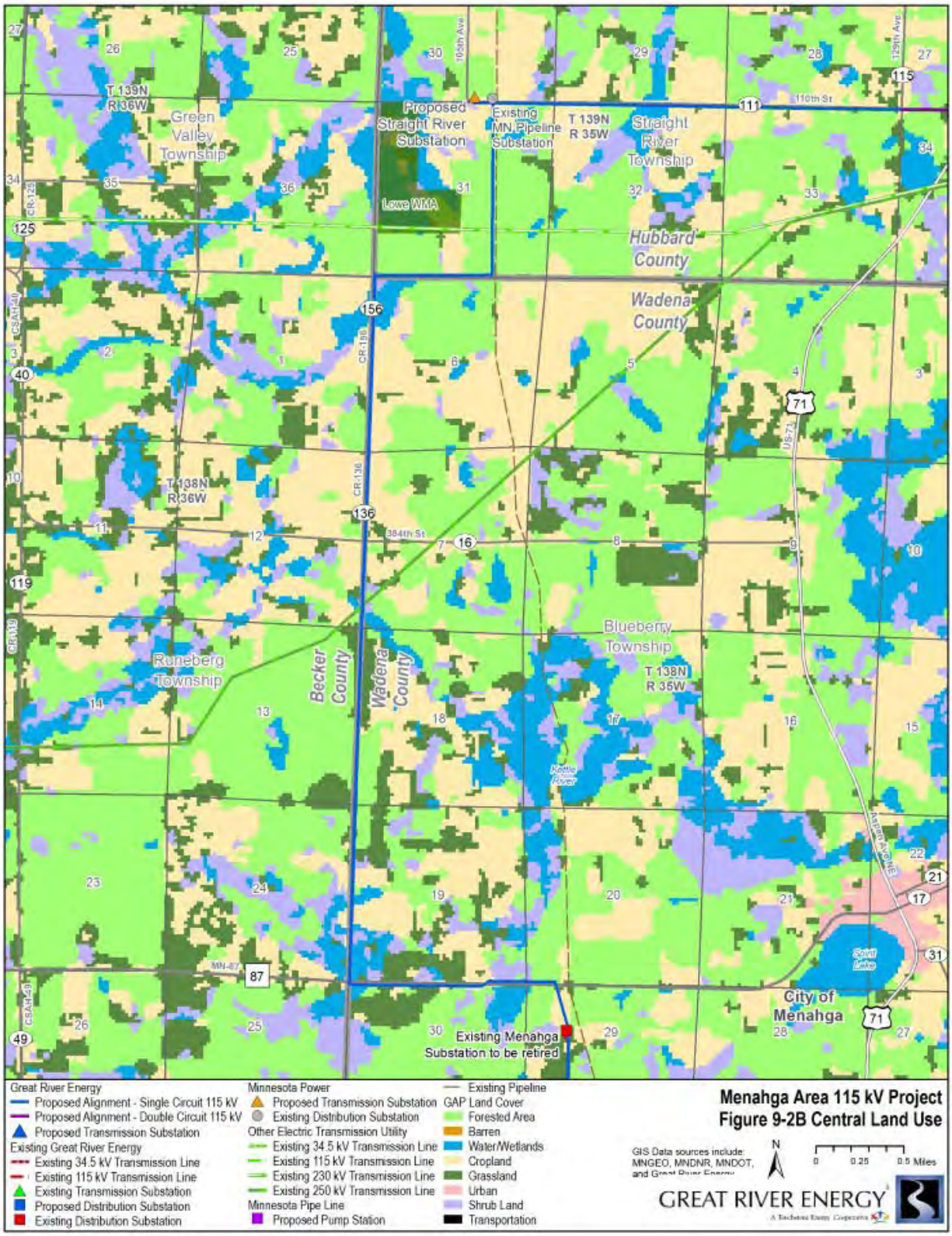


Figure 9-2C. Land Use-South

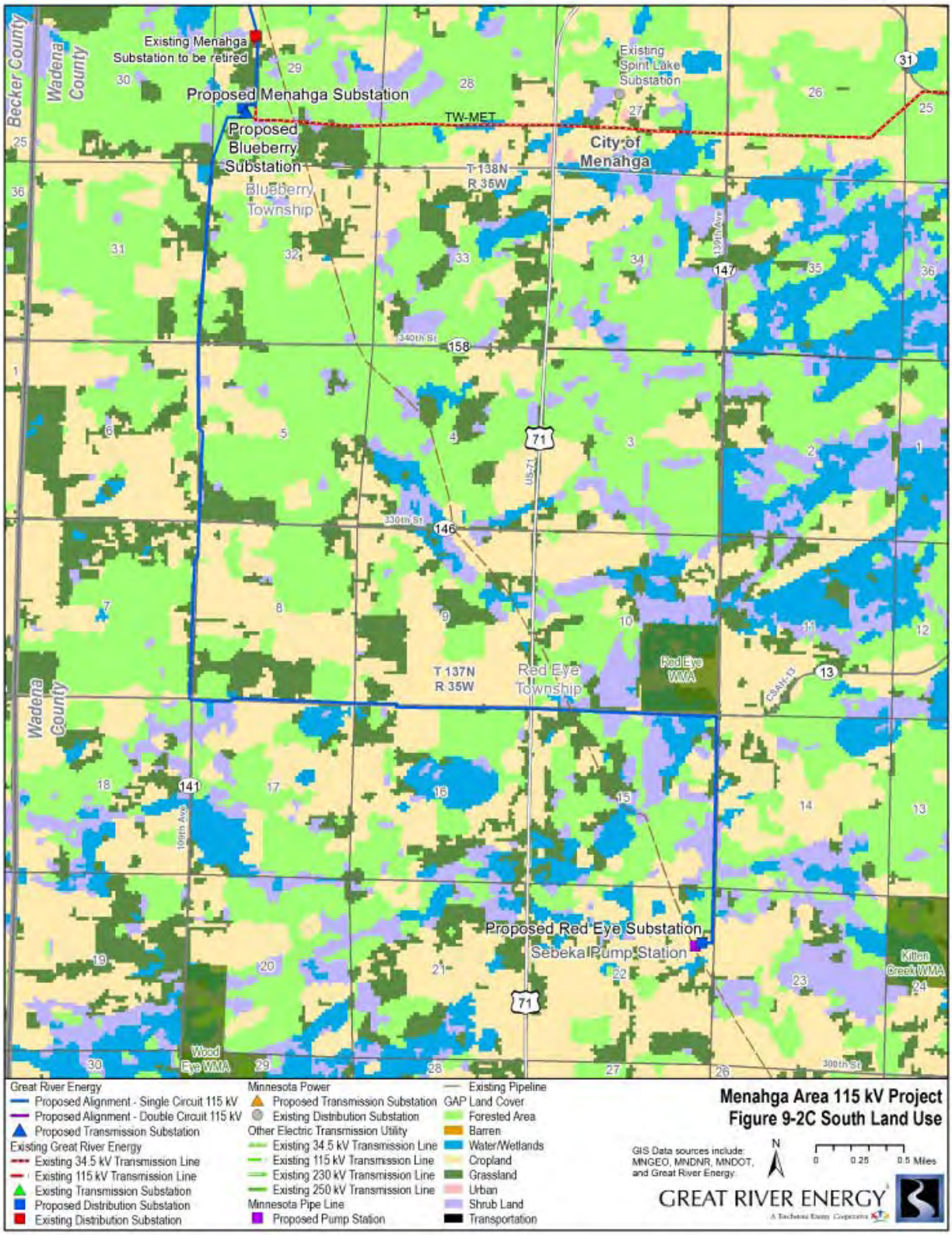
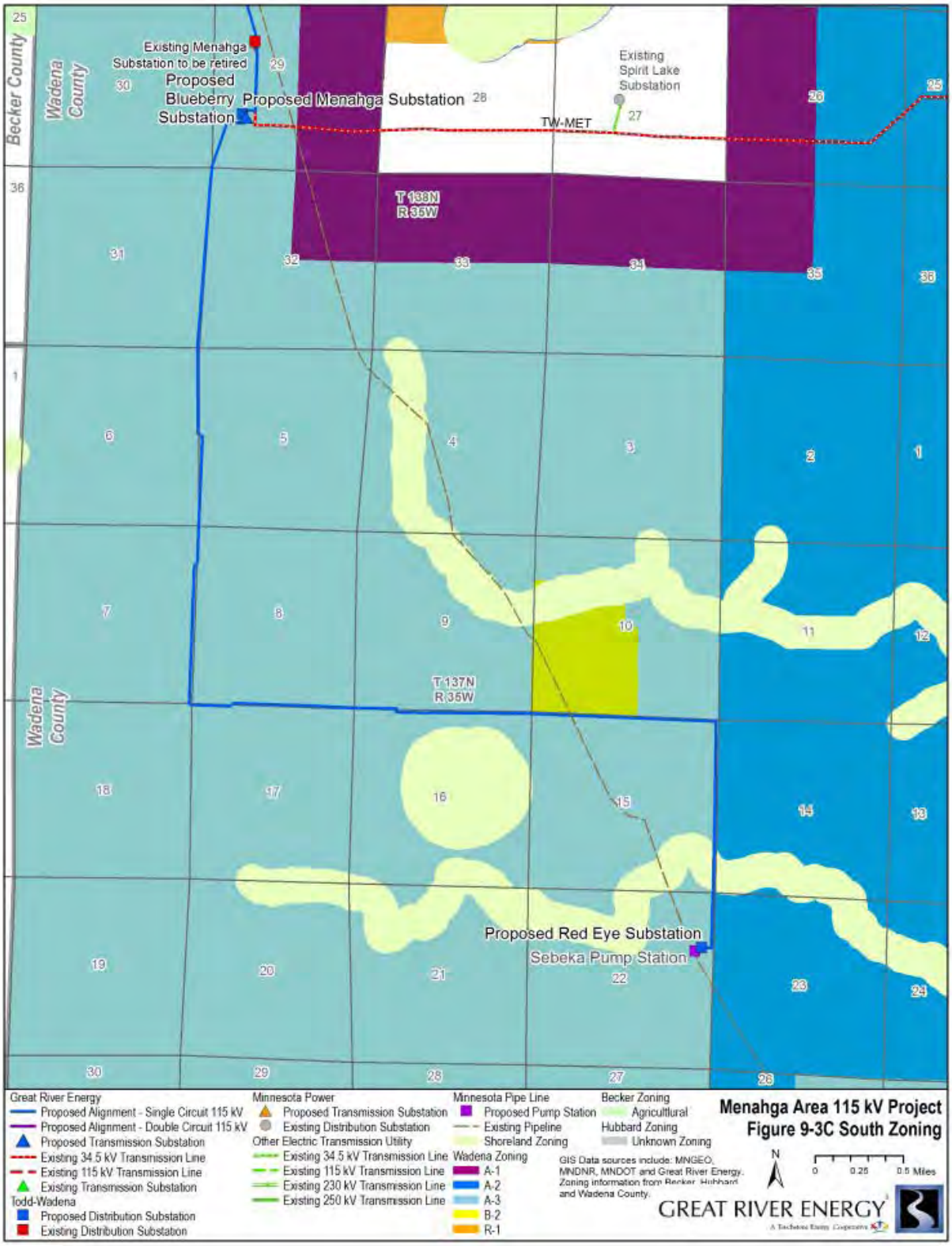


Figure 9-3A. Zoning-North

Figure 9-3B. Zoning-Central

Figure 9-3C. Zoning-South



Straight River Township and Hubbard Township do not have zoning, with the exception of the Hubbard County Shoreland Ordinance, which applies within 1,000 feet of a lake and 500 feet of a river. No mapping was available for either township.

Wadena County

The portion of the Project in Wadena County is also dominated by forest and agricultural land, with some shrub land, grassland and wetlands/water (**Figure 9-2B and Figure 9-2C**).

Zoning (**Figure 9-3B and Figure 9-3C**) along the proposed route is predominantly General Agriculture (A-3) with very small areas of Mixed Agriculture/Forestry (A-2), General Business District (B-2), and Shoreland.

Becker County

The portion of Becker County that is adjacent to the Project is dominated by agricultural land and forest, with some shrub land, grassland and wetlands/water (**Figure 9-2B**) and is zoned Agricultural (**Figure 9-3B**).

Impacts and Mitigation

Impacts to land use as a result of the Project are expected to be minimal. In the northern portion of the Project, construction within transmission ROW will minimize land use conflicts. Construction of the facilities would not change the possible land uses for any area. No impacts to residential or commercial/industrial land uses are anticipated; therefore no mitigation is proposed.

As discussed in **Section 9.4.1**, some temporary agricultural impacts (rutting, compaction) may occur during construction, as equipment accesses the ROW to install the structures and to string conductor. Permanent agricultural impacts will be the footprint of the pole and the area immediately surrounding it (about 4 square feet), although the majority of the ROW easement will be available for agricultural cultivation. Great River Energy 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.

9.4 Land-based Economies

9.4.1 Agriculture

According to the 2012 United States Department of Agriculture (USDA) Census of Agriculture, Hubbard County has 406 individual farms with an average farm size of 288 acres. Agricultural lands cover 116,941 acres, representing approximately 18 percent of all land in the county. Over $46 million was generated from both crop and livestock sales in 2012.

According to the 2012 USDA Census of Agriculture, Wadena County has 643 individual farms with an average farm size of 232 acres. Agricultural lands cover 148,887 acres, representing approximately 43 percent of all land in the county. Over $57 million was generated from both crop and livestock sales in 2012.

According to the 2012 USDA Census of Agriculture, Becker County has 1,107 individual farms with an average farm size of 393 acres. Agricultural lands cover 434,917 acres, representing over 47 percent of all lands in the county. Over $261 million was generated from both crop and livestock sales in 2012.

Agricultural lands in the Project area consist primarily of pastureland with some cropped land (**Figures 9-2A to 9-2C**). There is one known center pivot irrigation system within the proposed route. Of the total approximately 22.5 miles of transmission line, approximately 8.8 miles of agricultural land will be crossed by the line (about 39 percent of the length of the proposed transmission line).

Impacts and Mitigation

Some agricultural land will be temporarily removed from production during transmission line construction, but permanent agricultural land conversion associated with the transmission line poles will be minimal.

Determination of temporary agricultural impacts that will result from construction is dependent upon final engineering design. The acreage anticipated to be included in temporary construction access points is comprised of numerous small agricultural properties in the vicinity of the proposed route. Construction of new transmission structures (and removal of existing structures on the north end) will require repeated access to structure locations to install the structures and to string conductor. Equipment used in the construction process includes backhoes, cranes, boom trucks and assorted small vehicles. Operation of these vehicles on adjoining farm fields can cause rutting and compaction, particularly during springtime and otherwise wet conditions.

Permanent agricultural impacts will occur as a result of structure placement along the Project centerline. The area of impact will be the footprint of the pole itself and the area immediately surrounding the pole (approximately 4 square feet per pole, less than 500 square feet for the entire Project), although the majority of the ROW easement will be available for agricultural cultivation.

Great River Energy 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.

Specific mitigation measures to be implemented 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 Great River Energy 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.

- The transmission line will be designed to accommodate existing or proposed center pivot irrigation systems, with transmission poles located as near as practicable to the outer edge of the road ROW and the placement of pole locations to avoid the maximum radius of the system as it passes along the road ROW. Irrigation stops or electrical supply apparatus are allowable in the easement area and appropriate grounding requirements will be discussed with the landowners.

- 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, Great River Energy 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.

9.4.2 Forestry

Hubbard County is about 66 percent forested land (with 39 percent publicly administered), Wadena County is 44 percent forested and Becker County is 39 percent forested land. These areas are a combination of both deciduous and evergreen forests.

Forested areas in the Project area are shown on **Figures 9-2A to 9-2C.** The transmission line would cross approximately 4.7 miles of forested land. Forests in the Project area have routinely been logged for the forest industry and personal use, such as for firewood for heating, and it is expected that this practice will continue into the future. Some of the forests in the Project area provide windbreak to fields or home sites.

Impacts and Mitigation

The entire width of the ROW would need to be cleared of vegetation to ensure the safe and reliable operation of the transmission line. Because the proposed alignment primarily follows existing utility and road ROWs, additional forest impacts due to additional ROW acquisition and subsequent clearing will be reduced.

Mitigation measures for potential impacts to forest resources would be as follows:

- Compensation for the removal of vegetation in the ROW will be offered to landowners during easement negotiations.
- If possible, windbreaks comprised of compatible (maturing to a height of 15 feet or less) vegetation may be allowed in the outer edges of the ROW, to be determined through negotiation with individual landowners.

9.4.3 Tourism

Tourist destinations within the Project vicinity include parks, trails, rivers, and State WMAs. Popular activities include camping, fishing, hunting, bird watching, canoeing/kayaking, boating, golfing, swimming, biking, hiking, golfing, skiing, riding ATVs and snowmobiles. The WMAs and state and county forests within the Project area provide opportunities for viewing wildlife and intact ecosystems. Historic areas provide the chance to learn about the regional and local history.

Impacts and Mitigation

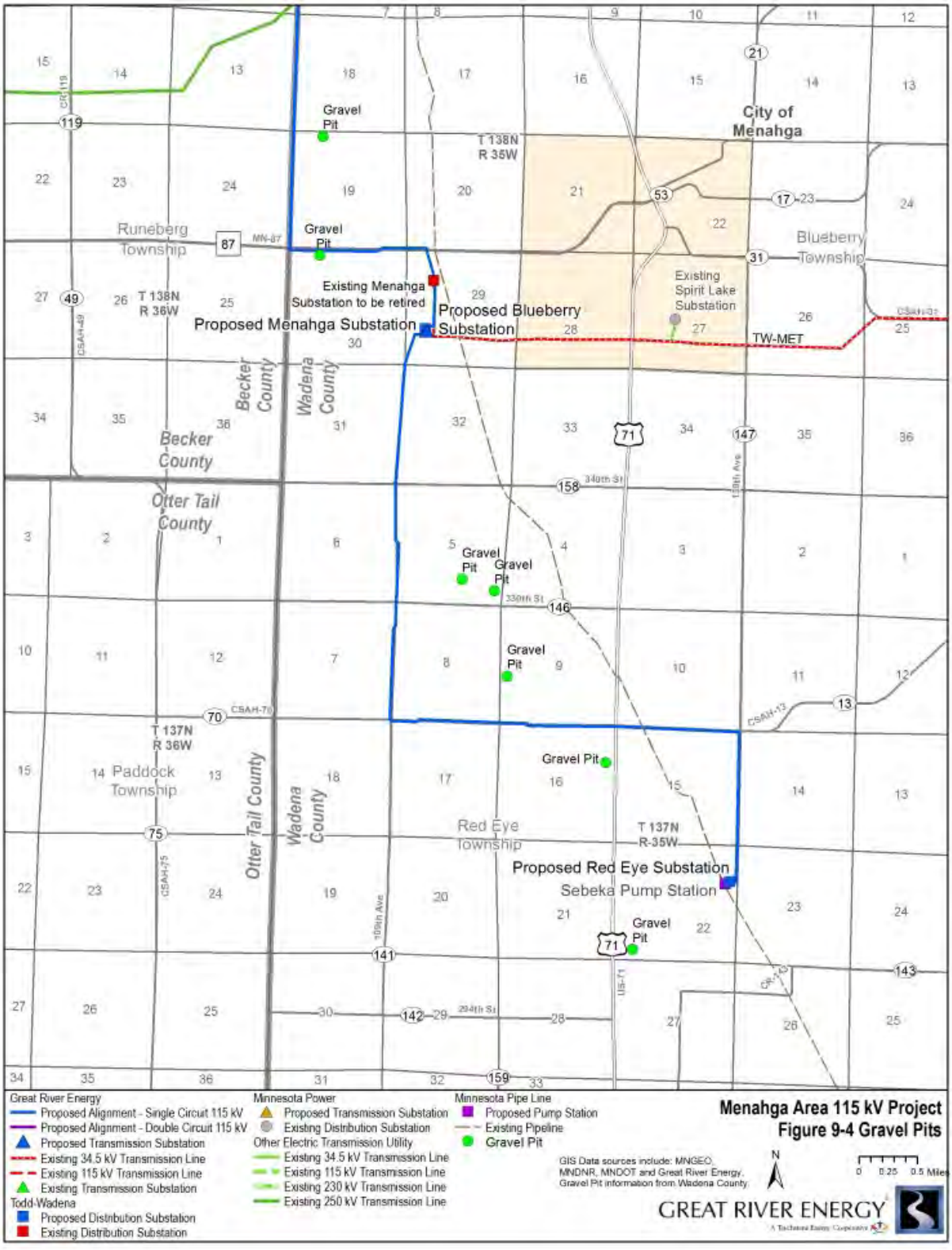
The proposed route avoids many of the areas in the Project vicinity that would be considered tourist destinations, and the Project would not preclude tourism activities or appreciably diminish the use or experience at tourist destinations. Although the transmission line is proposed to be near the Red Eye WMA, it is proposed to be on the opposite side of the road and will not affect use of that WMA. Although some tree clearing will be required, it will be along the edge of existing ROWs and should not affect wildlife viewing opportunities.

As no impacts on tourism are expected, no mitigation is proposed.

9.4.4 Mining

There are a number of gravel pits in Blueberry and Red Eye Townships in Wadena County in the vicinity of the Project (**Figure 9-4**). The proposed alignment is located near two known gravel pits, one active pit located in Section 30 of Blueberry Township (see **Sheet 20, Appendix G)**, and one inactive pit located in Section 31 of Blueberry Township.

Figure 9-4. Gravel Pit Locations in the Project Area



Impacts and Mitigation

At the known gravel pits, the proposed alignment would be located 3 to 7 feet outside of public road ROW and on the perimeter of the gravel pits. Due to required setbacks for gravel extraction from property lines and based on a preliminary field investigation, it is anticipated that the proposed transmission line will not affect any gravel extraction activities. At the active gravel pit, the transmission line will be located next to the road at the edge of the property, and design of pole locations and height would minimize impacts to the operation of the gravel pit to the extent possible. Additional pole-setting depth could be implemented to accommodate future gravel extraction at or near pole locations, if determined necessary when working with the landowner.

9.5 Archaeological and Historic Resources

A cultural resource literature review of the proposed transmission line and a one-mile buffer was conducted online and at the Minnesota State Historic Preservation Office (SHPO) located at the Minnesota History Center in St. Paul, Minnesota. Current topographic maps and aerial photographs, historic maps and documents, original land survey maps and original land patent records were examined. The archaeological and architectural site files were examined to obtain a list of all previously recorded archaeological sites and architectural properties in the Project's study area, defined as a one mile buffer around the route.

9.5.1 Previously Recorded Archaeological Sites

There are eight previously recorded archaeological sites within the study area (**Table 9-7**), six in Hubbard County and two in Wadena County (see map in **Appendix K**). None of the sites are within the proposed route.

Available information suggests the locales crossed by the proposed Menahga Area 115 kV Project in southern Hubbard and northern Wadena counties have a moderate to high potential to intersect currently non-recorded, pre-contact archaeological sites, including artifact scatters and earthworks. Such resources are generally considered to have a greater potential to be significant; in addition, pre-contact earthworks are almost always protected under the Minnesota Private Cemeteries Act (MN 307.08). Two of the eight sites are in Wadena County (with 21WDj overlapping into Hubbard County) and suggest moderate potential to cross similar sites along the balance of the Project. Extant sites are more likely in areas not disturbed by historic and modern (non-agricultural) development.

Table 9-7. Previously Recorded Archaeological Resources in Project Vicinity

Site Number/Site Name/ Site Type	County Location (TRS)	Site Significance	Location Relative to Project
21HB0046/Hubbard Mill/Historic-period industry	Hubbard 139N/34W/20	Unknown	North of Project terminus at existing Great River Energy Hubbard Substation
21HB0047/Hubbard Mounds/Pre-contact earthworks	Hubbard 139N/34W/20	Protected under MN 307	North of Project terminus at existing Great River Energy Hubbard Substation
21HB0085/Pre-contact single artifact	Hubbard 139N/34W/36	Unknown	South of Project; adjacent to existing MP 250 kV DC line
21HB0086/Pre-contact single artifact	Hubbard 139N/34W/36	Unknown	South of Project; adjacent to existing MP 250 kV DC line
21HB0087/Pre-contact lithic scatter	Hubbard 139N/34W/36	Unknown	South of Project; adjacent to existing MP 250 kV DC line
21HB0089/Pre-contact artifact scatter	Hubbard 139N/34W/36	Unknown	South of Project; adjacent to existing MP 250 kV DC line
21WDj/ Pre-contact earthworks	Wadena (Hubbard) 139N/35W/35 (138N/35W/2)	Unknown	South of Project
21WD0025/Heino/Pre-contact artifact scatter	Wadena 137N/35W/15	Unknown	West of Project

9.5.2 Previously Recorded Standing Historic Structures

There are six previously recorded standing historic structures in the study area, four in Hubbard County and two in Wadena County (**Table 9-8)**. Five of the six structures are a considerable distance from the proposed route (see map in **Appendix K**). The sixth structure was recorded as an abandoned and modified school/town hall building (located within a residential yard south of the intersection of 107th Avenue and Highway 87). This site is within the proposed route but not within the proposed ROW.

All six structures were inventoried during a 1985 county survey. Because it is unlikely that other structures in the vicinity have become notable since that time, additional inventory along the Project alignment is not warranted.

Table 9-8. Previously Recorded Standing Historic Structures in Project Vicinity

Site Number/Site Name/Site Type	County Location (TRS)	Site Significance	Location Relative to Project
HB-HUB-002/Hubbard School	Hubbard 139N/34W/20	Unknown	North of Project
HB-HUB-003/United Methodist Church	Hubbard 139N/34W/20	Unknown	North of Project
HB-HUB-005/Bridge No. 8219	Hubbard 139N/34W/30	Unknown	North of Project
HB-SRT-002/Straight River Township Hall	Hubbard 139N/35W/28	Unknown	North of Project
WD-BLB-001/Blueberry Township School, Town Hall	Wadena 139N/34W/30	Unknown	South of Proposed Centerline
WD-REY-001/log sauna	Wadena 137N/35W/27	Unknown	South of Project

Impacts and Mitigation

Given public and private development over the 30-year period since the 1985 survey, Applicants believe it is unlikely that additional historic structures would be identified near the proposed transmission facilities and feel that no further architectural review is warranted for the Project.

Applicants do not believe there will be any adverse impact on known or suspected archaeological resources as a result of this Project. However, if a Corps permit is required and Section 106 consultation is initiated, given the relatively high site density along the northern reaches of Project alignment, Great River Energy anticipates conducting a Phase I archaeological reconnaissance survey of the Project ROW once the route is well defined.

The Minnesota Historical Society (MHS) was contacted[19] requesting information on the possible effects of the proposed Project on historic properties in the Project area. In a letter dated October 22, 2014[20], MHS concurred that a Phase I archaeological survey should be completed (**Appendix K**).

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. If human remains are encountered during construction activities, all ground-disturbing activity will cease and local law enforcement will be notified per MN 307.08.

Great River Energy will make every effort to avoid impacts to identified archaeological and architectural resources. In the event that an impact would occur, Great River Energy will consult

[19] Letter from Carole Schmidt, Great River Energy to Sarah Beimers, MHS. 19 September 2014. Appendix K.

[20] Letter from Sarah Beimers, MHS to Carole Schmidt, Great River Energy. 22 October 2014. Appendix K.

with the appropriate reviewing agency to determine the necessary steps regarding treatment of the resource. While avoidance of the resource would be a preferred action, mitigation for Project-related impacts on archaeological and architectural resources eligible for the National Register of Historic Places may include an effort to minimize Project impacts on the resource and/or additional documentation through data recovery.

9.6 Natural Environment

9.6.1 Air Quality

The only potential air emissions from a transmission line result from corona, which may produce ozone and oxides of nitrogen. This can occur when the electric field intensity exceeds the breakdown strength of the air. Because the conductor surface gradient for a 115 kV transmission line is typically below the air breakdown level, it is unlikely that any measurable emissions would occur from the conductor surface.

Impacts and Mitigation

No impacts to air quality are anticipated due to the operation of the transmission line.

Temporary and localized air quality impacts caused by construction vehicle emissions and fugitive dust from ROW clearing and construction are expected to occur. Exhaust emissions from diesel equipment will vary during construction, but will be minimal and temporary. The magnitude of emissions is influenced heavily by weather conditions and the specific construction activity taking place. Appropriate dust control measures will be implemented.

9.6.2 Water Resources

Hydrologic features in the Project area and along the proposed route are shown in **Figures 9-5A through 9-5C**. 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 Crow Wing River watershed, in the north central portion of the Upper Mississippi River Basin.[21]

Ground Water

The DNR divides Minnesota into six groundwater provinces. Hubbard, Wadena and Becker counties fall into the Central Province, which is described as sand aquifers in generally thick sandy and clayey glacial drift overlying Precambrian and Cretaceous bedrock.[22]

[21] http://www.pca.state.mn.us/water/basins/Lake Superior/index.html (2010)

[22] http://files.dnr.state.mn.us/natural_resources/water/groundwater/provinces/gwprov.pdf (2010)

Figure 9-5A. **Hydrologic Features-North**

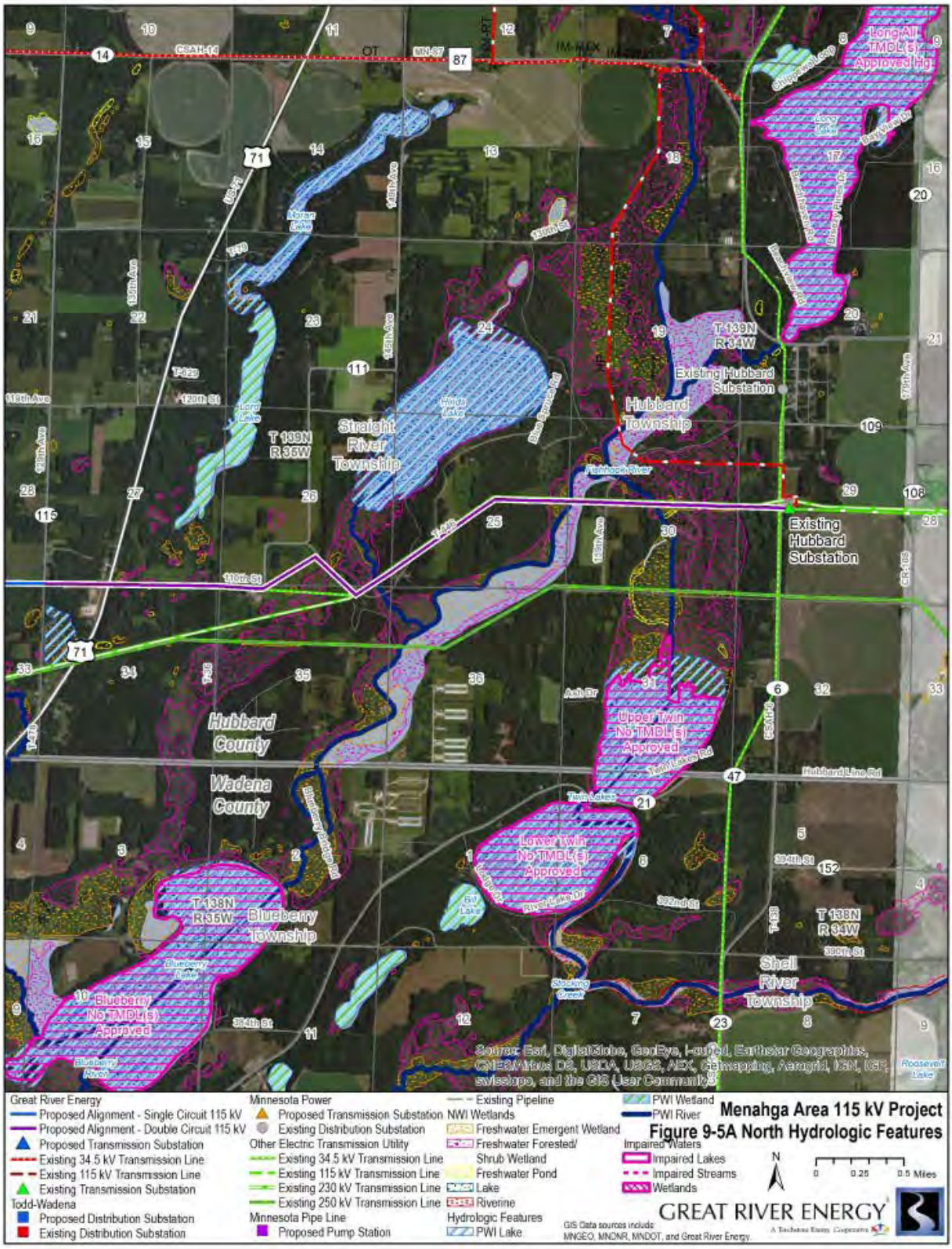


Figure 9-5B. Hydrologic Features-Central

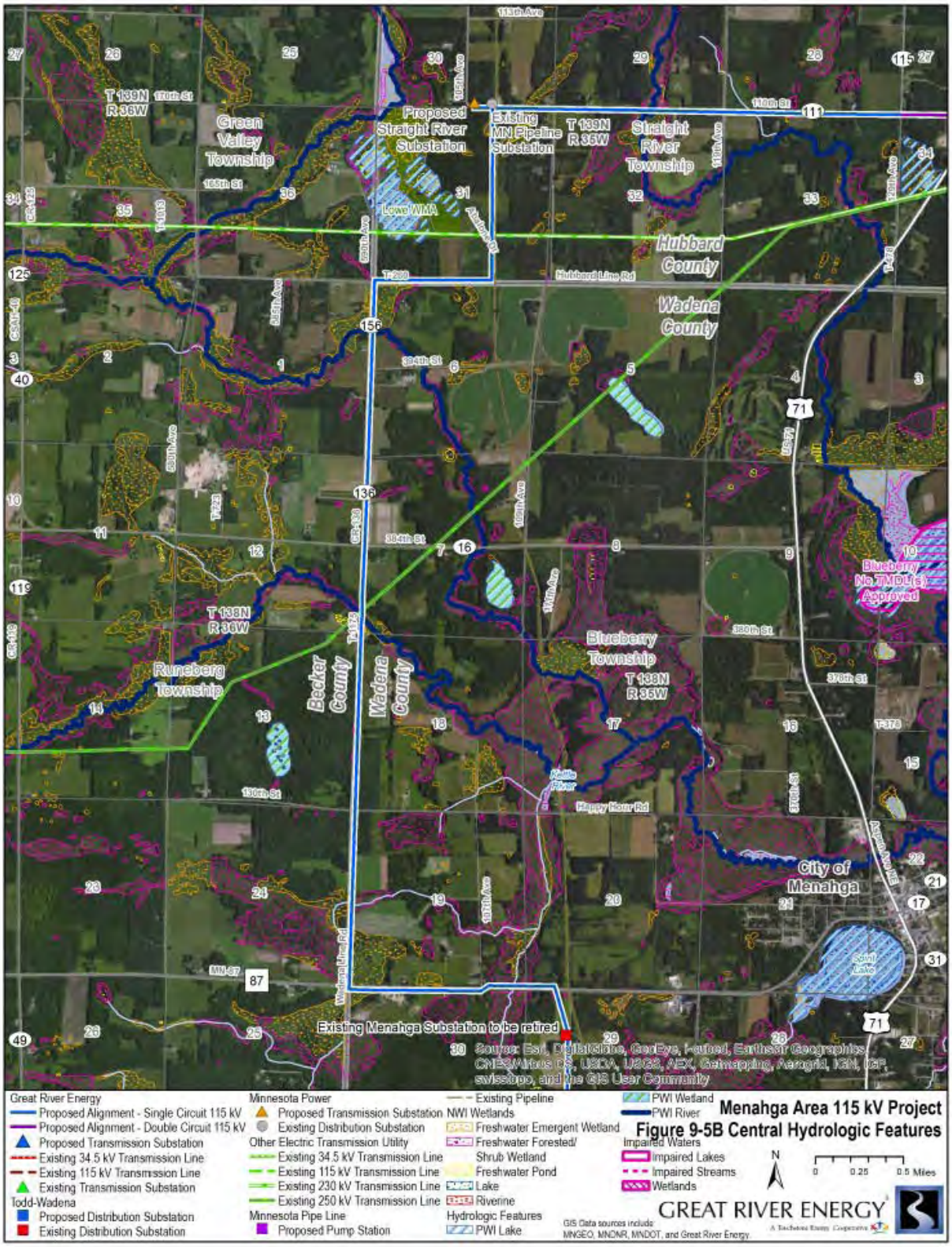
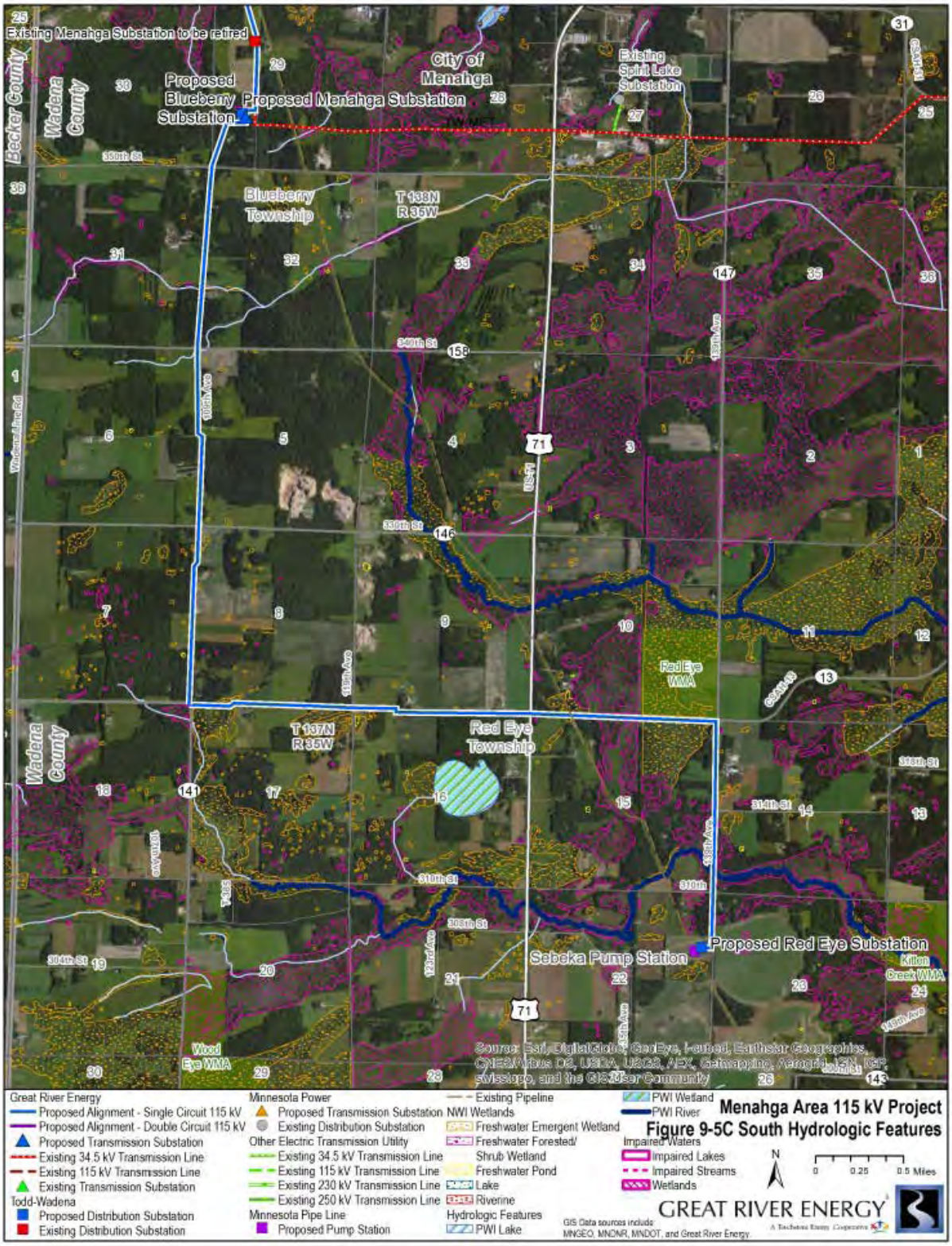


Figure 9-5C. Hydrologic Features-South



Lakes

Lakes in the Project area include Hinds Lake (305 acres), Upper Twin Lake (212 acres), Lower Twin Lake (252 acres), Blueberry Lake (532 acres), Stocking Lake (357 acres), and Spirit Lake (114 acres)[23] (**Figures 9-5A through 9-5C**). The route is closest to Hinds Lake, about 1525 feet from open water.

Rivers and Streams

There are a number of rivers and streams in the Project area, including the Shell River, Fishhook River, Kettle Creek, Blueberry River, Cat River, Kitten Creek and their tributaries (**Figures 9-5A through 9-5C**).

The proposed transmission line would cross the Shell River (4 times), the Blueberry River, Kettle Creek, and Kitten Creek.

Floodplains

The transmission line would cross the floodplains of the rivers listed above.

Riparian Areas

Riparian areas are ecosystems that occur along watercourses or at the fringe of water bodies. For purposes of this Application, the riparian areas are defined as the land within 300 feet of streams and within 1,000 feet of lakes. These distances were selected because they 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 listed above.

Public Waters

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 DNR Public Waters Inventory (PWI) maps[24].

The proposed transmission line would cross seven Public Waters in Hubbard and Wadena counties. The Public Waters are shown on **Figures 9-5A through 9-5C** and listed in **Table 9-9**.

[23]http://www.dnr.state.mn.us/lakefind/index.html; http://www.dnr.state.mn.us/maps/compass.html (2010)

[24] MNDNR: *Public Waters Inventory Maps.*
http://files.dnr.state.mn.us/waters/watermgmt_section/pwi/CARL1OF1.pdf (2010)
http://files.dnr.state.mn.us/waters/watermgmt_section/pwi/STLO1OF7.pdf (2010)

Table 9-9. PWI Waters (Hubbard and Wadena Counties)

Name	Type	Location
Shell River	River	T139N, R34W, Section 30
Shell River	River	T139N, R35W, Section 25
Tributary of Shell River	River	T139, R35W, Section 26
Shell River	River	T139N, R35W, Section 32
Blueberry River	River	T138N, R35W, Section 6
Kettle Creek	Creek	T138N, R35W, Section 7
Kitten Creek	Creek	T137N, R35W, Section 15

Impaired Waters

Section 303(D) of the Federal Clean Water Act requires states to publish, every two years, a list of streams and lakes that are not meeting their designated uses because of excess pollutants (impaired waters). The list, known as the 303(d) list, is based on violations of water quality standards. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters. These waters are described as "impaired." Lower Twin Lake and Blueberry Lake are impaired for nutrients/eutrophication and mercury in fish tissue. Upper Twin Lake and Stocking Lake are impaired for mercury in fish tissue (**Figures 9-5A through 9-5C**).

Wetlands

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 Natural Resources Conservation Service (NRCS) soil surveys starting in the 1970s. These wetlands are known as the National Wetland Inventory (NWI). Wetlands listed on the NWI may be inconsistent with current wetland conditions; however, NWIs are the most accurate and readily available database of wetland resources within the Project area and were therefore used to identify wetlands in proposed ROW.

Information on wetlands within the proposed ROW is provided in **Table 9-10.**

There are 46 wetland basins (13 are forested or scrub-shrub) and approximately 22 acres of wetlands (5.6 acres are forested or scrub-shrub) within the Project ROW. The transmission line will only affect some of these basins, depending on the final alignment.

Table 9-10. Wetland Types within the ROW (NWI)

Cowardin Type[1]	No. of Basins	Wetlands in ROW (Acres)	Percent of Wetland Type within Proposed ROW
Hubbard Substation to CR 115 (double circuit)			
PEM/SS1C	1	1.21	2.21%
PEMC	2	4.97	9.06%
PSS1/EMBg	1	0.08	0.15%
PSS1/EMC	2	0.38	0.69%
PSS1C	1	0.02	0.04%
PUBF	2	0.34	0.62%
R2UBH	1	0.29	0.52%
R2UBHx	1	0.35	0.63%
Total	**11**	**7.64**	**13.93%**
CR 115 to CR 156 (single circuit)			
PEMC	3	1.48	2.98%
PFO1C	1	0.00	0.00%
PFO6C	1	0.65	1.31%
PSS1C	2	0.11	0.21%
Total	**7**	**2.24**	**4.50%**
CR 156 to CSAH 13 (single circuit)			
PEM/SS1C	3	3.63	3.16%
PEMC	5	2.54	2.21%
PFO2/4Bg	2	1.95	1.70%
PFO6/SS1C	1	0.38	0.33%
PSS1C	1	0.00	0.00%
PUBGx	2	0.17	0.15%
Total	**14**	**8.67**	**7.57%**
CSAH 13 to Red Eye Substation (single circuit)			
PEM/FO2B	1	0.31	0.59%
PEM/SS1Bg	1	0.67	1.26%
PEMC	2	0.29	0.55%
PEMCd	1	0.06	0.11%
PEMF	1	0.21	0.39%
PFO2/EMB	2	0.32	0.60%

Cowardin Type[1]	No. of Basins	Wetlands in ROW (Acres)	Percent of Wetland Type within Proposed ROW
PFO2/EMBg	1	0.61	1.16%
PFO2/SS1Bdg	1	0.87	1.65%
PSS1C	3	0.23	0.44%
PUBGx	1	0.10	0.19%
Total	**14**	**3.67**	**6.93%**
Grand Total	**46**	**22.23**	**8.16%**

[1]Cowardin et. al. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. US Department of the Interior, USFWS, Washington D.C.

The wetland type was classified using the Cowardin system that defines the habitat system, vegetative and sediment class, and water regime. The wetland classification system is hierarchical, with wetlands and deepwater habitats divided among five major systems at the broadest level. The five systems include Marine (open ocean and associated coastline), Estuarine (salt marshes and brackish tidal water), Riverine (rivers, creeks, and streams), Lacustrine (lakes and deep ponds), and Palustrine (shallow ponds, marshes, swamps, sloughs). Systems are further subdivided into subsystems that reflect hydrologic conditions. Below the subsystem is the class that describes the appearance of the wetland in terms of vegetation or substrate. Each class is further subdivided into subclasses; vegetated subclasses are described in terms of life form, and substrate subclasses in terms of composition. The classification system also includes modifiers to describe hydrology (water regime), soils, water chemistry (pH and salinity), and special modifiers relating to man's activities (e.g., impounded, partly drained).

Some common symbols used in the wetland classification system include:

SYSTEM:	P - Palustrine	L - Lacustrine
CLASS:	RB - Rock Bottom	UB - Unconsolidated Bottom
	EM - Emergent	SS - Scrub-Shrub
	FO - Forested	OW - Open Water
MODIFIERS:	A - Temporarily flooded	B - Saturated
	C - Seasonally flooded	D - Seasonally well drained
	E - Seasonally saturated	F - Semipermanently flooded
	G - Intermittently flooded	H - Permanently flooded
SPECIAL MODIFIERS:	b - beaver	d - partially drained/ditched
	f - farmed	s - spoil
	x - excavated	

Impacts and Mitigation

No impacts to groundwater in the Project area are anticipated.

The transmission line does not cross any of the lakes in the area, and no navigable waters will be affected by the Project.

Because all rivers and streams will be spanned by transmission structures, no structures will be located within these features and no direct impacts to rivers or streams are anticipated. Indirect impacts could include sedimentation reaching surface waters during construction due to ground disturbance by excavation, grading, construction traffic, and dewatering of holes drilled for transmission structures. This could temporarily degrade water quality due to turbidity. These impacts will be avoided or minimized using appropriate sediment control practices and BMPs.

Once the Project is completed, there would be no significant impact on surface water quality because wetland impacts will be minimized and mitigated, disturbed soil will be restored to previous conditions or better, and the amount of land area converted to an impervious surface will be small.

The transmission line would cross seven DNR Public Waters[25]. Great River Energy will apply for a license to cross these waters once design details are available and will follow any recommendations to minimize erosion and other impacts.

The Project should have no impact on the impairment status of the waters in the Project area. There is potential to increase turbidity due to sedimentation from construction activities; however, appropriate erosion and sediment control measures will be implemented to avoid or minimize such impacts.

Potential impacts to riparian areas along the routes would be limited to ground disturbances due to pole placement. Due to the flexibility to avoid placing poles in sensitive areas, the anticipated impacts to the riparian areas along the routes are minimal.

Construction of the transmission line is not expected to alter existing water drainage patterns or floodplain elevations due to the small cross section per pole and their relatively wide spacing. The small area of impermeable surfaces created by the pole structures will not cause an increase in susceptibility of flooding in the region.

Temporary impacts to wetlands may occur if they need to be crossed during construction of the transmission line. No staging or stringing setup areas will be placed within or adjacent to water resources, as practicable. Wetland impact avoidance measures that will be implemented during design and construction of the transmission lines include spacing and placing the power poles at variable distances to span and avoid wetlands, where possible. When it is not possible to span the wetland, several measures will be utilized to minimize impacts during construction:

[25] MNDNR: Public Waters Inventory Maps.
http://files.dnr.state.mn.us/waters/watermgmt_section/pwi/CARL1OF1.pdf (2010)
http://files.dnr.state.mn.us/waters/watermgmt_section/pwi/STLO1OF7.pdf (2010)

- When possible, construction will be scheduled during frozen ground conditions.
- Construction crews will attempt to access the wetland with the least amount of physical impact to the wetland (*i.e.,* shortest route) and will access poles near/in wetlands from roadways whenever possible to minimize travel through wetland areas.
- The structures will be assembled on upland areas before they are brought to the site for installation, when practicable.
- When construction during winter is not possible, construction mats (wooden mats or the Dura-Base Composite Mat System) will be used to protect wetland vegetation where necessary. Additionally, all-terrain construction vehicles may be used, which are designed to minimize impact to soils in damp areas.

Permanent impacts to wetlands would occur where structures must be located within wetland boundaries (approximately 20 square feet of permanent impacts per structure). Wetland vegetation would be restored in the disturbed areas following construction.

It is anticipated that a Regional General Permit under Section 404 of the Clean Water Act from the Corps will be required for the Project. If so, Great River Energy will apply for a permit once design details are available, restore the wetlands as required by the Corps, and comply with the requirements of the Wetland Conservation Act.

Vegetation maintenance procedures under transmission lines prohibit trees from establishing. Existing trees must be removed throughout the entire ROW, including forested wetlands. These forested wetlands would undergo permanent vegetative changes within the ROW, and mitigation for the conversion of forested wetlands to emergent and scrub/shrub wetlands may be required by the Corps.

In the event that impacts to hydrologic features are unavoidable, Great River Energy will work with the jurisdictional agencies to determine the best ways to minimize the impacts and create appropriate mitigation measures.

9.6.3 Flora and Fauna

Flora

Presettlement vegetation in the area consisted of jack pine, northern pin oak, aspen-birch and mixed red and white pine. The primary present day land uses in the Project area are forest management, agriculture, and recreation and tourism.

Although none are crossed by the proposed route, there are several areas in the Project area where natural vegetation is being managed, including:

- Lowe WMA
- Red Eye WMA
- Kitten Creek WMA
- Wood Eye WMA

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

Fauna

The primary wildlife species in southern Hubbard County are migratory waterfowl (geese, ducks, trumpeter swans, sandhill cranes, blue heron) [26]. In Wadena County, wildlife consists primarily of deer, bear, fox, coyote, timberwolves, furbearers, pheasant, geese, and small mammals (rabbits, skunks, raccoons) [27]. In eastern Becker County, wildlife consists mainly of deer, moose, wolves, bear and small mammals[28].

The USFWS website[29] for threatened and endangered species includes the Northern long-eared bat (proposed as endangered) in Hubbard, Wadena and Becker counties. Great River Energy does not believe the proposed Project will affect this species, but should it be listed, guidance associated with the bat will be considered.

The USFWS was contacted by letter[30], and in their email response of October 17, 2014[31], they concurred that the northern long-eared bat (*Myotis septentrionalis*) is proposed to be listed in Hubbard, Wadena and Becker counties. There are no known occurrence records in close proximity to the proposed Project; however, summer roosting habitat may be present. If removal of suitable habitat is anticipated after final listing and between April 1 and September 30, consultation with USFWS may be necessary.

Construction of the single-circuit 115 kV line from the proposed Minnesota Power Straight River Substation to the proposed Todd-Wadena Red Eye distribution substation passes in close proximity to USFWS interest property. The Marrs Farm Services Agency easement and Red Eye WMA are located in the SE 1/4 of Section 10, Township 137N, Range 35W. The USFWS indicated that any new ROW through these properties should be avoided. The USFWS also recommended that if the final route selected utilizes the existing ROW adjacent to these properties, bird flight diverters should be placed on the transmission line and raptor perch deterrents be placed on power poles adjacent to those properties.

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[26] Hubbard County Soil Survey
http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/minnesota/MN057/0/hubbard_MN.pdf

[27] Wadena County Comprehensive Plan -2013 http://www.co.wadena.mn.us/county_directory/plan_zone/Plan.pdf

[28] Becker County Comprehensive Plan -2003
http://www.co.becker.mn.us/dept/planning_zoning/PDFs/CompPlan.pdf

[29] US Fish and Wildlife Webpage Endangered Species. http://www.fws.gov/Midwest/Endangered/LISTS/minnesot-cty.html

[30] Letters from Carole Schmidt, Great River Energy to Andrew Horton, US Fish and Wildlife Service. 15 September 2014 and 29 September 2014. *See* Appendix K.

[31] Email from Andrew Horton, US Fish and Wildlife Service to Carole Schmidt, Great River Energy. 17 October 2014. *See* Appendix K.

The WMAs in the vicinity of the Project provide habitat for a variety of animal species, including birds, deer, small game and waterfowl. There are no USFWS Waterfowl Production Areas in the Project area.

Impacts and Mitigation

No impacts to native vegetation are anticipated. The proposed transmission line will follow existing transmission ROW for one-third of the Project, minimizing impacts to previously-undisturbed vegetation in that area.

There is minimal potential for the displacement of wildlife and loss of habitat from construction of the Project. Wildlife that inhabit natural areas could be impacted in the short-term within the immediate area of construction. The distance that animals will be displaced will depend on the species. Additionally, these animals will be typical of those found in agricultural and forested settings and should not incur population level effects due to construction.

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

Great River Energy will address avian issues by working with the DNR and USFWS to identify any areas that may require marking transmission line shield wires and/or to use alternate structures to reduce the likelihood of collisions.

9.6.4 Invasive Species Management

The movement of construction equipment to, from, and between various work sites has the potential to introduce and/or spread invasive species. Such species include reed canary grass, common buckthorn, purple loosestrife, and leafy spurge, in addition to various invasive aquatic species.

Impacts and Mitigation

Invasive aquatic species, including Eurasian water-milfoil, flowering rush, and zebra mussels, are not expected to be a significant issue for construction of the Project. Great River Energy anticipates a construction schedule that would allow for stringing of conductor over potentially-infested waters during winter months over the ice. To minimize the potential for the introduction or spread of invasive species, Great River Energy proposes to follow BMPs during Project construction:

- All disturbed areas will be revegetated using weed-free seed mixes. If practicable, native plant species will be used to revegetate disturbed areas. Weed-free straw or hay will be used for erosion control.

- Herbicidal or manual vegetation removal may be implemented to minimize the spread of invasive species where such removal is consistent with easement conditions or landowner restrictions.

- Construction vehicles will be cleaned and inspected to remove dirt, mud, plants, and debris from vehicles and equipment prior to arriving at, and leaving from, construction sites.

- The Construction Field Representative will oversee BMP installation and effectiveness.

After detailed design for the Project is complete, Great River Energy will coordinate with the DNR to determine if any additional invasive species mitigation measures are required on DNR lands or across DNR waterways.

9.7 Rare and Unique Natural Resources

A desktop review of the Natural Heritage Inventory System records provided by the DNR indicates no rare features within the proposed route and only two species of special concern (greater prairie chicken and creek heelsplitter) within one mile of the proposed route. Several other species in the Project area include yellow rail, eastern hog-nosed snake, Ram's-head Lady's-slipper and dragon's mouth. These resources are listed in **Table 9-11** and shown on **Figures 9-6A through 9-6C**. All of the occurrences listed in **Table 9-11** are located outside of the proposed route.

There is a colonial waterbird nesting area in the north end of the Project area, but it is a mile away from the proposed transmission line. There is also a DNR Site of Moderate Biodiversity Significance (MBS) in Becker County; however, the transmission line is proposed to be on the other side of the road (in Wadena County) in this area.

Table 9-11. Rare and Unique Resources in the Project Vicinity

Common Name	Scientific Name	Number of Occurrences	Federal Status	MN Status*	Habitat
Greater prairie chicken	*Tympanuchus cupido*	2	None	SPC	Open habitats (native prairie and grassland), cropland, grass and forb habitat, low areas with dense vegetation
Creek heelsplitter	*Lasmigona compressa*	3	None	SPC	Sand, fine gravel and mud in creeks, small rivers and upstream portions of large rivers
Eastern hog-nosed snake	*Heterodon nasicus*	1	None	Watch List	Open, sparsely vegetated habitats on well-drained soils. Dry prairie habitats are preferred, but may also inhabit oak savanna habitats
Yellow rail	*Coturnicops noveboracensis*	2	None	SPC	Sedge or grass-dominated wetlands, particularly wet prairie and rich fens, and wet meadows
Ram's-head Lady's- slipper	*Cypripedium arietinum*	1	None	THR	Variety of coniferous forest habitats. Can occur in swamps, bogs, or lowland forests and in drier upland conifer forests
Dragon's mouth	*Arethusa bulbosa*	1	None	NON	Bogs, swamps and other wet lowlands

** END – Endangered; THR – Threatened; SPC – Special Concern; NON – no legal status, data being gathered for possible future listing; None – Terrestrial communities do not have assigned status, but are considered important ecologically.*

Source: Minnesota Natural Heritage Information System: Rare Features Database through License Agreement #LA6471. Data current as of December2014.

The DNR was contacted[32] requesting information on the possible effects of the proposed Project on rare and unique features in the Project area. In an email dated December 17, 2014[33], the DNR noted the following:

- Old growth remnants north and south of the existing transmission corridor in T139N R34W Section 30 that could be impacted if there will be any disturbance outside the existing corridor.

- The proposed line is within an area that the Minnesota Biological Survey has identified as a Site of Moderate Biodiversity Significance in Section 30, T139N, R34W and Sections 25, 26, and 35, T139N, R35W. Sites of Biodiversity Significance have

[32] Letters from Carole Schmidt, Great River Energy to Lisa Joyal, Minnesota Department of Natural Resources. 15 September 2014 and 29 September 2014. *See* Appendix K.

[33] Email from Lisa Joyal, Minnesota Department of Natural Resources to Carole Schmidt, Great River Energy. 17 December 2014. *See* Appendix K.

Figure 9-6A. Rare Features-North

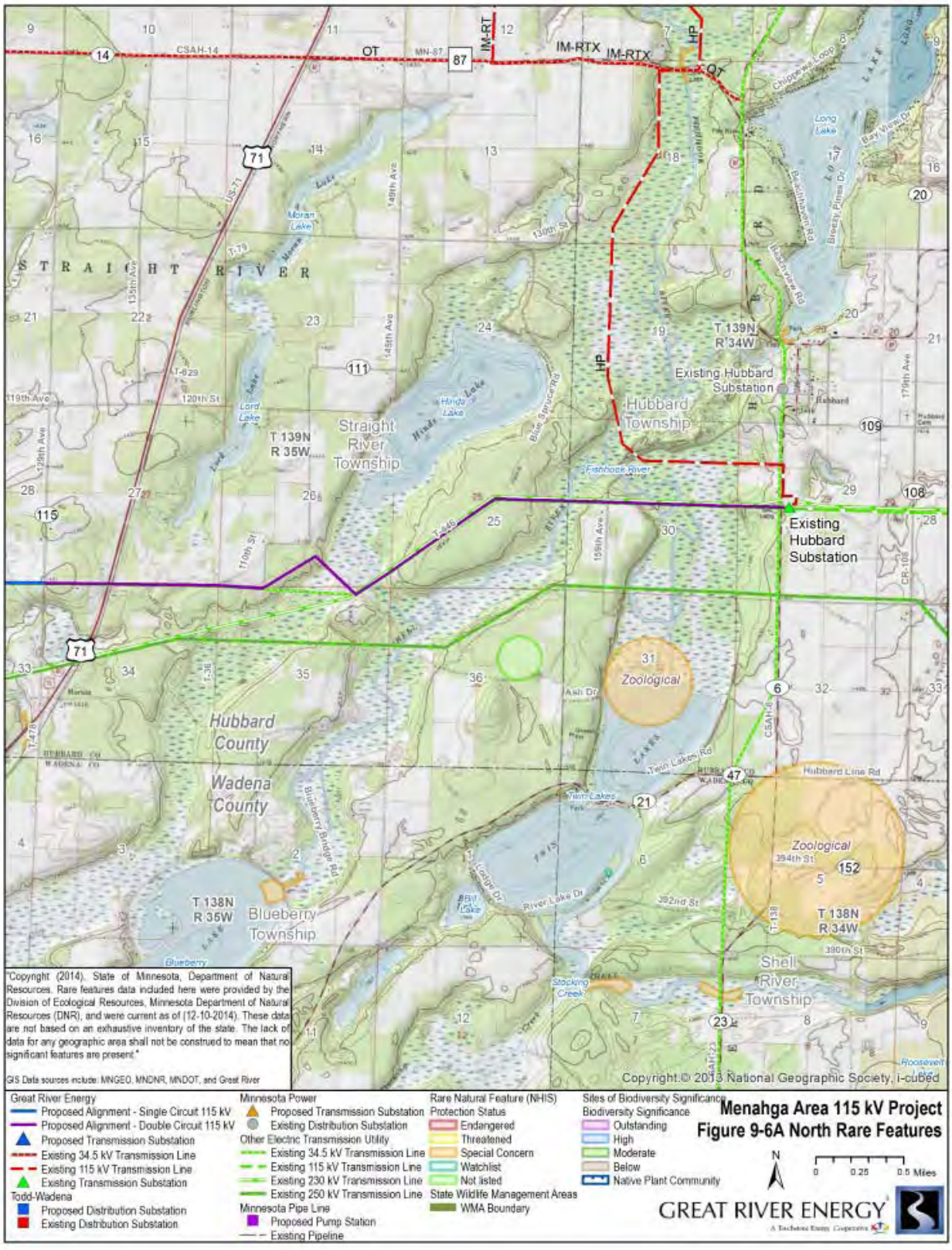


Figure 9-6B. Rare Features-Central

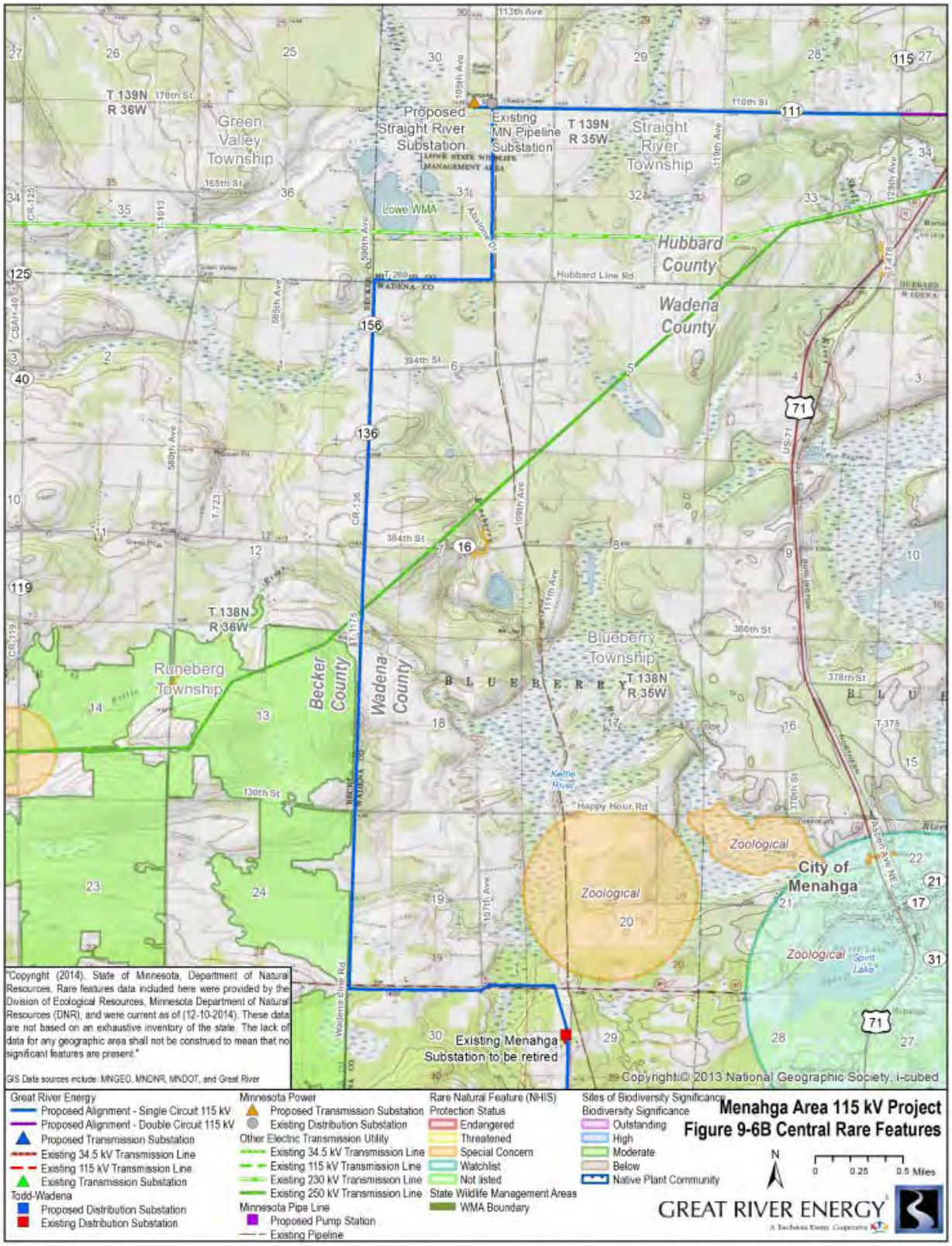
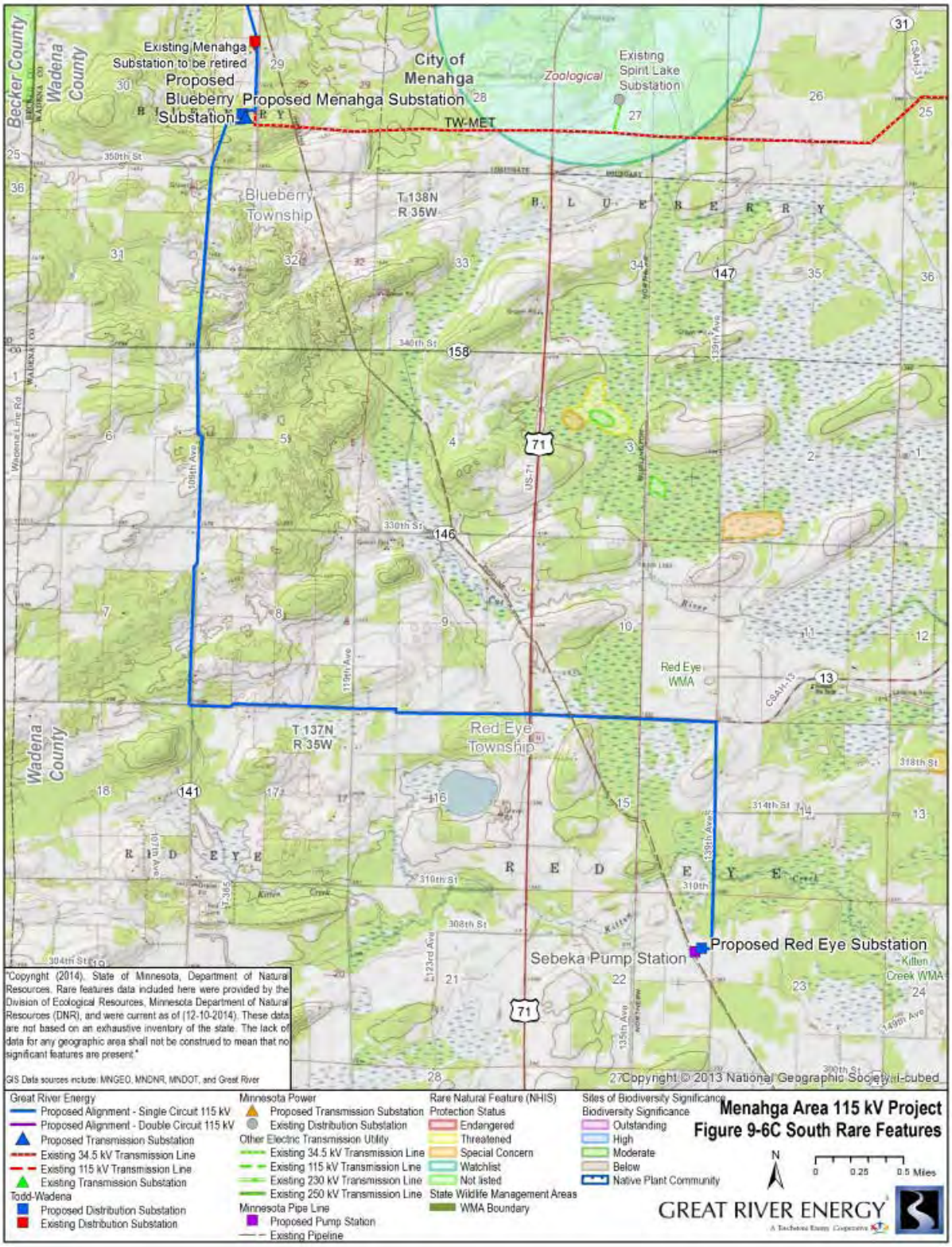


Figure 9-6C. Rare Features-South



varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Sites ranked as Moderate contain occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery. This particular Site was visited in 2006 and contains several occurrences of Jack Pine – (Bush Honeysuckle) Woodland, a rare native plant community, adjacent to the existing transmission corridor.

- The proposed line is also adjacent to other MBS sites.

- State-listed mussels of special concern have been documented in Kettle Creek and the Blueberry River in the vicinity of the proposed crossings.

Impacts and Mitigation

Constructing along existing transmission ROWs on the north end of the Project will avoid impacting undisturbed habitat in this area. Great River Energy will continue to coordinate with the DNR and USFWS to ensure that sensitive species in the Project area are not impacted by construction of the Project.

The following general 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:

- 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.

The DNR recommended the following specific measures:

- Given the ecological significance of the old growth stands, measures should be implemented to avoid or minimize disturbance.

- Given the ecological significance of the MBS area, disturbance within the site should be minimized to the extent feasible. Actions to minimize disturbance may include, but are not limited to, the following recommendations:

- As much as possible, operate within already-disturbed areas;
- Minimize vehicular disturbance in the area (allow only vehicles/equipment necessary for pipeline removal and installation);
- Do not park equipment or stockpile supplies in the area;
- Do not place spoil within MBS sites or other sensitive areas;
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species;
- If possible, conduct the work under frozen ground conditions;
- Use effective erosion prevention and sediment control measures;
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible; and
- Use only weed-free mulches, topsoils, and seed mixes.

- Given that construction activities can negatively affect adjacent native plant communities, especially through the introduction of invasive plant species, disturbance in areas that are adjacent to other MBS sites should be minimized.

- As mussels are particularly vulnerable to deterioration in water quality, especially increased siltation, effective erosion prevention and sediment control practices should be implemented and maintained near Kettle Creek and the Blueberry River.

Once a route has been defined and detailed design of the line is available, Great River Energy will coordinate with the DNR to ensure their concerns are addressed.

9.8 Physiographic Features

9.8.1 Topography

The proposed Project lies within the Pine Moraines and Outwash Plains Subsection of the Laurentian Mixed Forest Province under the DNR Ecological Classification Systems.

The Laurentian Mixed Forest Province is characterized by broad areas of conifer forest, mixed hardwood and conifer forests, and conifer bogs and swamps. The landscape ranges from rugged lake-dotted terrain with thin glacial deposits over bedrock, to hummocky or undulating plains with deep glacial drift, to large, flat, poorly drained peatlands.

The Pine Moraines and Outwash Plains Subsection is a mix of outwash plains, end moraines, till plains, and drumlin fields.

The topography of the proposed route is nearly level to rolling.

Impacts and Mitigation

Construction of the Project will not alter the topography along the route; therefore, no mitigation is proposed.

9.8.2 Geology

Depth of glacial drift over bedrock in the Pine Moraines and Outwash Plains Subsection varies from 200 to over 600 feet, with the greatest depths in the southwestern portion of the subsection. Underlying bedrock is a variety of Precambrian rock. There are some localized cretaceous marine shale, sandstone and variegated shale in the southwestern portion of the subsection.

Impacts and Mitigation

Few geological constraints on design, construction, or operation are anticipated in the Project area. If dewatering is found to be necessary during construction (i.e., during pole embedding), the effects on water tables would be localized and short term, and would not affect geologic resources. Construction of the Project will not alter the geology along the route; therefore, no mitigation is proposed.

9.8.3 Soils

USDA data[34] were reviewed to describe the soil resources in the vicinity of the Project. Soils are generally grouped into categories known as "associations." A soil association has a distinctive pattern of soils, relief and drainage, and is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. There are five soil associations along the proposed route. These soil associations are listed in **Table 9-12** and shown in **Figures 9-7A through 9-7C**.

Table 9-12. Soil Associations in the Vicinity of the Project

Soil Association	General Description
Verndale-Faunce-Dorset	**Verndale-Faunce-Dorset** are very deep, nearly level to hilly, somewhat excessively to well drained soils that formed in a loamy mantle and in underlying sandy outwash; found on outwash plains, stream terraces and moraines.
Menahga-Mahtomedi	**Menahga-Mahtomedi** are very deep, nearly level to hilly, excessively drained to well drained soils formed in sandy glacial outwash on outwash plains, moraines and drumlins.
Shooker-Nebish-Beltrami	**Shooker-Nebish-Beltrami** are very deep, nearly level to hilly, poorly to somewhat poorly to well drained soils that formed in calcareous loamy glacial till on moraines and till plains.
Rockwood-Paddock-Blowers	**Rockwood-Paddock-Blowers** are very deep, nearly level to hilly, well to somewhat poorly drained soils that formed in loamy till; found on drumlins and moraines.
Verndale-Nymore-Forada	**Verndale-Nymore-Forada** are very deep, nearly level to sloping, excessively drained to very poorly drained soils formed in loamy mantle over sandy glacial outwash; found on outwash plains, stream terraces, and valley trains.

[34] https://soilseries.sc.egov.usda.gov/OSD_Docs/.html

Figure 9-7A. Soils-North

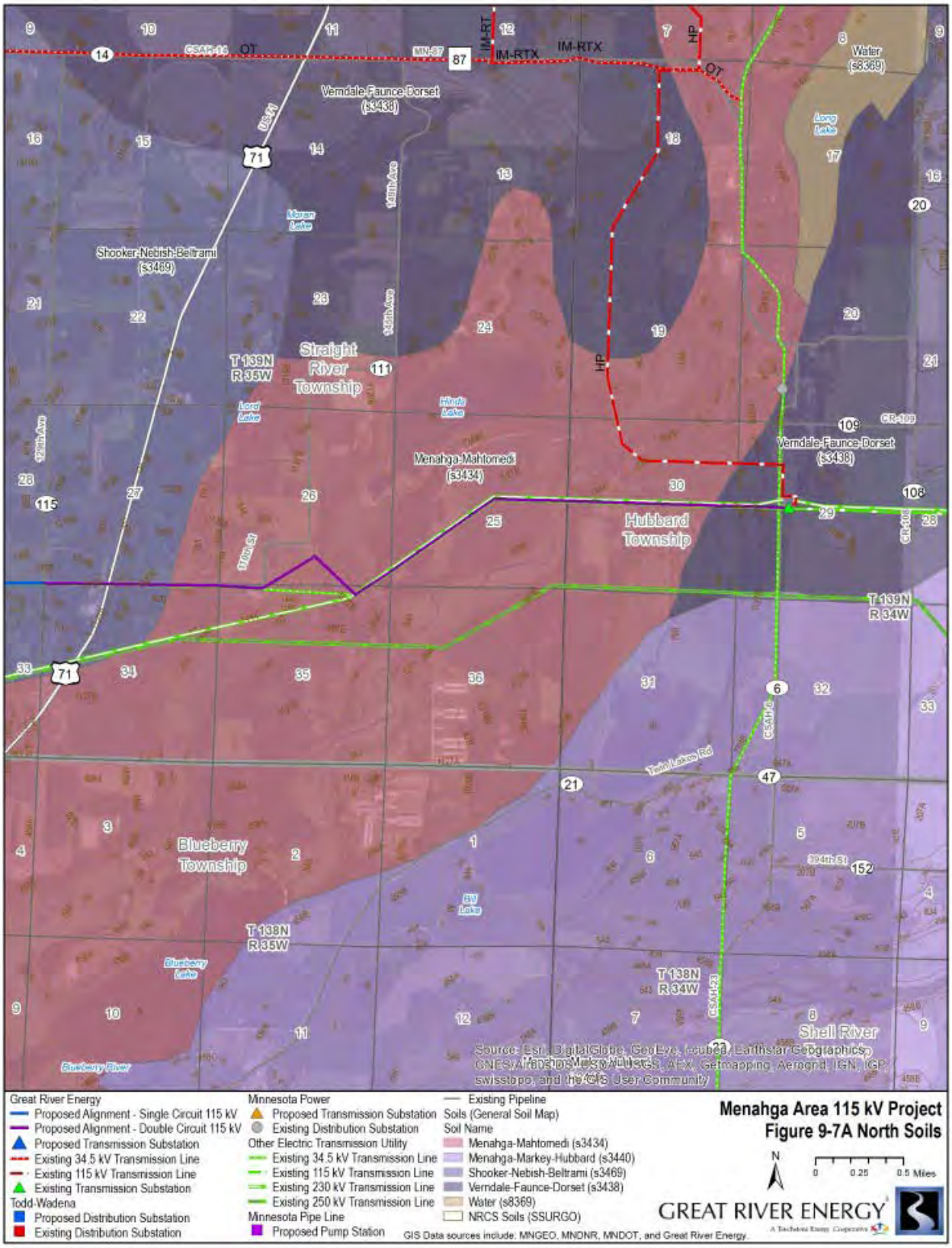


Figure 9-7B. Soils-Central

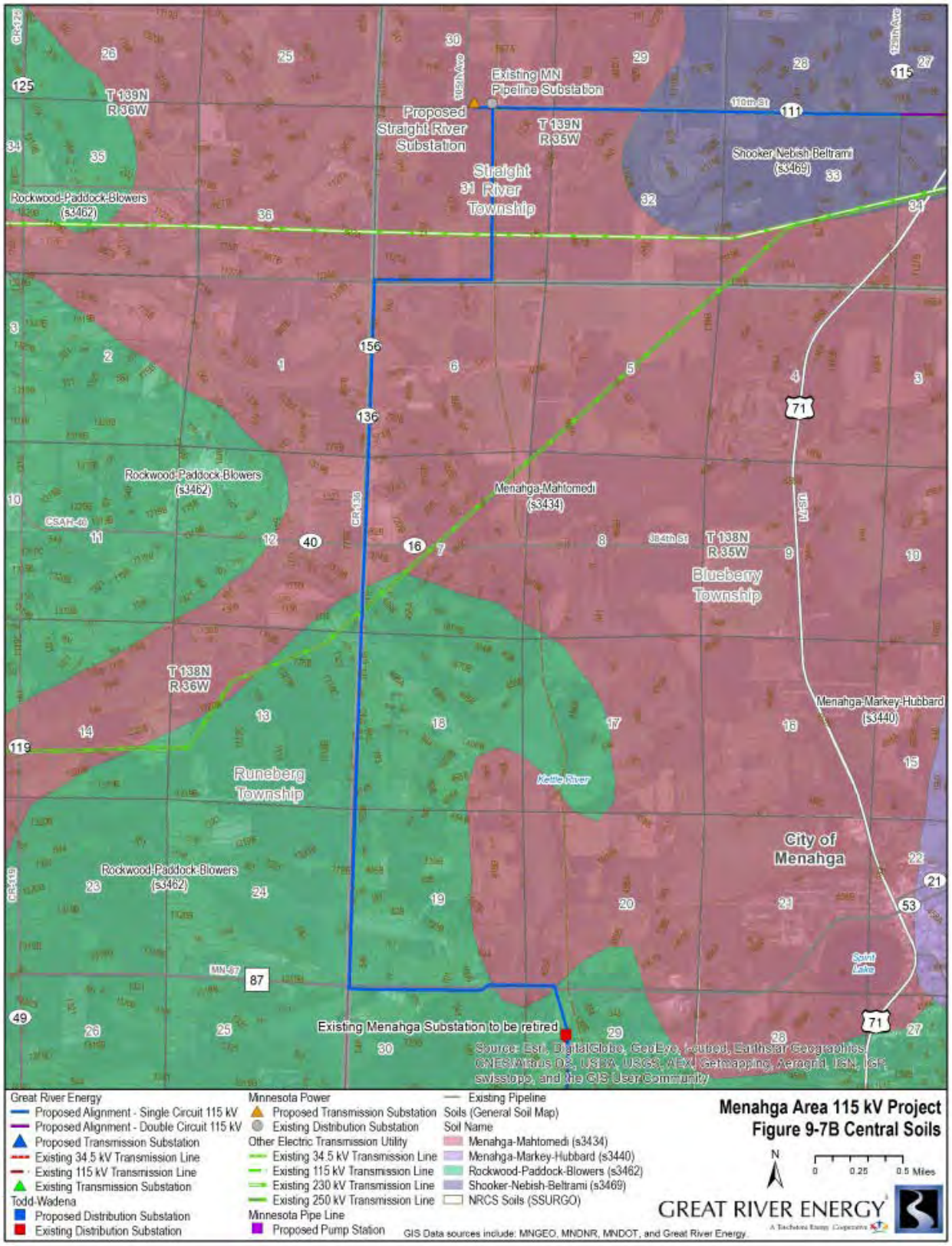
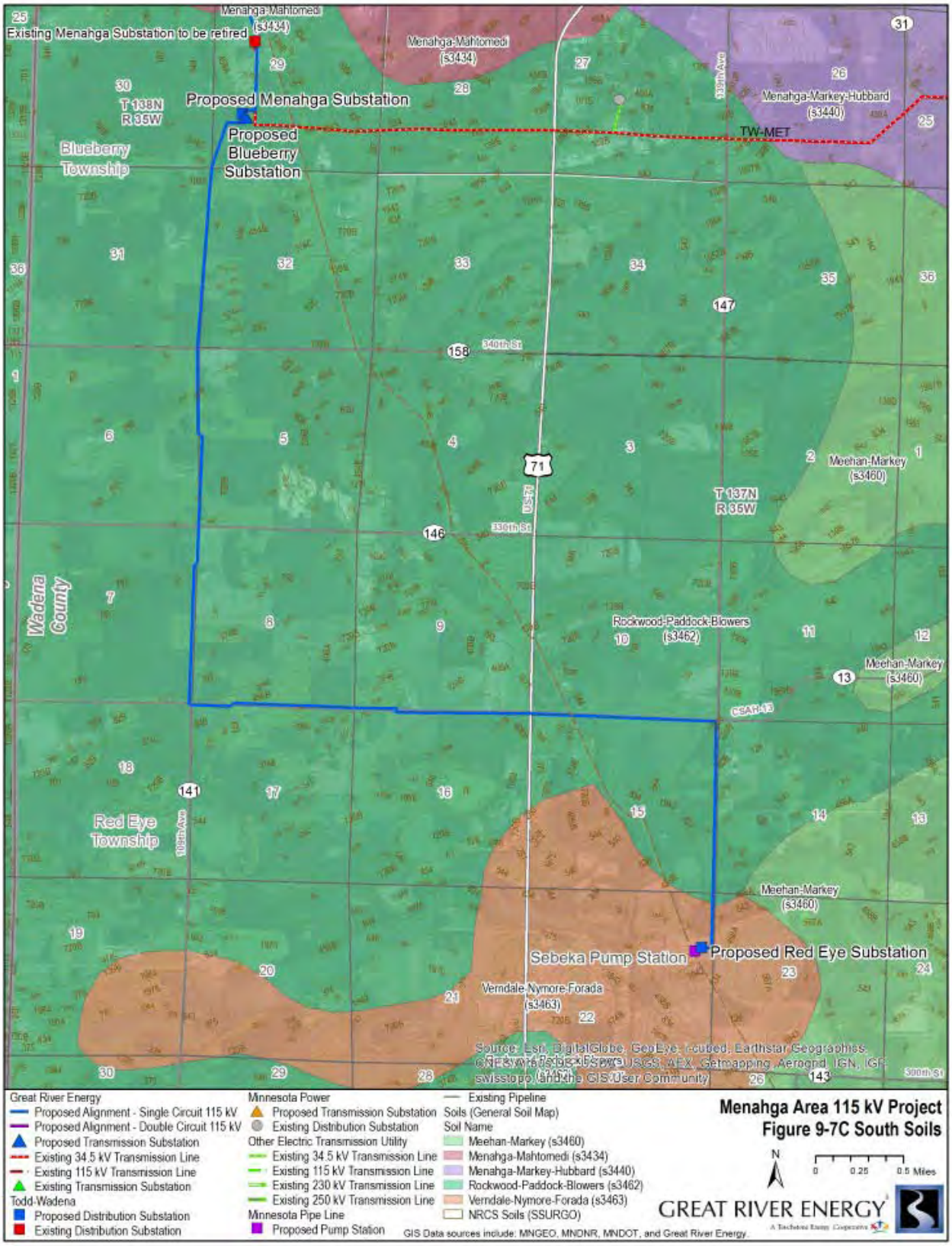


Figure 9-7C. Soils-South



Impacts and Mitigation

Potential impacts of construction are soil compaction and exposing the soils to wind and water erosion. Impacts to physiographic features should be minimal during and after installation of the transmission line structures, and these impacts will be short term. There should be no long-term impacts resulting from this Project.

Soils will be revegetated as soon as possible to minimize erosion or some other method used during construction to prevent soil erosion.

If over an acre of soil will be disturbed during the construction of the transmission line, Great River Energy will obtain a NPDES construction stormwater permit from the MPCA and will prepare a SWPPP. Erosion control methods and BMPs will be utilized to minimize runoff during line construction.

9.9 Unavoidable Impacts

Construction of the Menahga Area 115 kV Project will have nominal unavoidable impacts.

The significant ROW sharing (utility and road) associated with the Project would mitigate the direct impacts associated with the new line construction.

The Project will require only minimal commitments of resources that are irreversible and irretrievable. 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 commitments of resources are those that result from the use or destruction of a specific resource that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments are those that result from the loss in value of a resource that cannot be restored after the action.

Those commitments that do exist are primarily related to construction. Construction resources include aggregate resources, concrete, steel, and hydrocarbon fuel. During construction, vehicles necessary for these activities would be deployed on site and would need to travel to and from the construction area, consuming hydrocarbon fuels. Other resources would be used in pole construction, pole placement, and other construction activities.

10 APPLICATION OF RULE CRITERIA

10.1 Certificate of Need

The Commission has established in its rules (Minn. R. 7849.0120) the criteria that it will apply to determine whether an applicant has established that a new proposed large energy facility is needed. Great River Energy and Minnesota Power have described in this Application the reasons why a CON should be granted to build the Menahga Area 115 kV Project. Those reasons are summarized below.

10.1.1 Denial Would Adversely Affect the Energy Supply

The proposed Project is required to serve the proposed new MPL Sebeka pump station (10 MW load) and to address system overloads in the affected load area near Menahga, Minnesota.

MPL Pump Station

The existing Hubbard-Verndale 34.5 kV system does not have the capacity to serve 10 MW of new electrical demand. Although transition of Great River Energy's Menahga load from the 34.5 kV system to a new 115 kV system creates capacity on the Hubbard-Verndale 34.5 kV system, it is not nearly enough capacity to serve the proposed MPL pump station load; therefore, a larger voltage source (115 kV) is needed to provide reliable electric service to the pump station.

The Project as proposed will provide a reliable source of electricity to the proposed MPL Sebeka pump station. Denial of the Project would prevent MPL from meeting the objective of their MPL Reliability Project, which is to increase the pumping capacity on MPL Line 4 to maintain reliable crude oil supplies to Minnesota refineries.

System Overloads

System overload concerns in the Menahga area are due to the growth of the peak electrical demand that has surpassed the level that can be served, and the age of the 34.5 kV transmission lines combined with the overall length of the 34.5 kV network. The load area served from the Hubbard-Verndale 34.5 kV system has shown growth rate in the past five years. As discussed in **Section 5.6**, the load area is growing at a weighted annual average rate of about 1.0 percent.

Transmission line and transformer overloads concerns relate to the amount of current operating through the conductor. Electrical equipment requires sufficient current to function properly. Conductors are rated to allow a certain amount of current to be carried. As electrical demand grows or when additional equipment is connected to the system, the conductor continues to supply the required current until the conductor reaches its maximum rating. An overload situation occurs when the conductor transfers current above its rating. In an overload situation, a conductor can heat up and begin to sag. Similarly, a transformer or regulator can overload and

cause loss of life and/or fail catastrophically. If the overload condition is great enough or prolonged enough, the conductor can break. A break in a conductor can cause service interruption, equipment damage, or other system concerns.

Load growth is occurring in the affected load area, and this growth is not the result of promotional activities by Applicants. Forecasts modeled by Applicants are reasonable and supported by both the historic data and load forecasts; there is a demonstrated need for improved service in the area.

The proposed Project is designed to address these line overload concerns, and denial of the Project would adversely affect the reliable electric service to the affected load area.

10.1.2 There is No Reasonable and Prudent Alternative

Applicants have proposed the most efficient and cost effective way to provide electrical service for a new pump station load and to address transmission system overloads in the affected load area. As discussed in this application, the 34.5 kV system is not a robust enough voltage to serve the existing native load along with the 10 MW pump station. A complete rebuild of the Hubbard-Verndale 34.5 kV system still would not achieve the end goal of serving the pump station; therefore, the proposed Project is the most cost effective way to serve both the native load growth and the large industrial MPL pump station.

Applicants considered a number of alternatives to the Project, including various generation options, different transmission scenarios, and a no-build alternative focusing on reactive power supply improvements and conservation/demand side management. Applicants deemed all of these alternatives inferior to the proposed Project as discussed in **Chapter 6**.

10.1.3 The Project will Protect the Environment and Provide Benefits

Approximately one-third of the proposed Project replaces an existing line, and the remaining two-thirds of the Project follow existing road or utility ROWs. The Project is located in a rural setting and impacts to the environment and to human settlement should be minimal. Applicants are working with the DNR, USFWS, Corps and other agencies to ensure that natural resources are protected.

The Project will be a reliable solution for the pump station and the affected load area because the line will operate nearly continuously for decades. There can be no doubt that the Project will benefit customers in the service area by ensuring an adequate power supply for years to come.

10.1.4 The Project will Comply with All Applicable Requirements

Applicants have identified other permits and approvals that may be required for the Project in **Section 2.5**. Applicants have demonstrated that they will comply with all applicable requirements and obtain all necessary permits.

10.2 Route Permit

According to Minnesota Statutes Section 216E.02, subd. 1, it is the policy of the state of Minnesota to locate high voltage transmission lines in an orderly manner that minimizes adverse human and environmental impacts and ensures continuing electric power system reliability and integrity. The Commission has promulgated standards and criteria for issuing route permits (Minn. R. 7850.4000). That rule provides that the Commission shall issue route permits for high voltage transmission lines that are consistent with state goals to conserve resources, minimize environmental impacts and impacts to human settlement, minimize land use conflicts, and ensure the state's electric energy security through efficient, cost-effective transmission infrastructure.

The 115 kV transmission proposed for the Menahga Area 115 kV Project satisfies all the criteria that are applied in evaluating a new transmission line project. Following an existing transmission line route for approximately one-third of the Project conserves resources and minimizes environmental impacts and other impacts. The remaining two-thirds of the Project follow road or utility corridors. Constructing the line at 115 kV capability helps ensure a reliable and secure power source in the area served by the line.

For all the reasons described in this Application, and summarized in **Section 10.1** regarding the reasons why a CON should be issued, the Commission should also issue a Route Permit.

10.3 Conclusion

Great River Energy and Minnesota Power respectfully request that the Commission issue a Certificate of Need authorizing construction of approximately 22.5 total miles of 115 kV transmission line between the existing Hubbard Substation and the proposed new Red Eye Substation, construction of the proposed new Straight River, Blueberry and Red Eye substations, relocation of the Todd-Wadena Menahga Substation to the Blueberry Substation site and conversion of the voltage from 34.5 kV to 115 kV, and modifications to the existing Hubbard and Pipeline substations.

In addition, Great River Energy and Minnesota Power request that the Commission issue a Route Permit at the same time that designates the route for the 115 kV transmission line and sites for the proposed new Straight River, Blueberry and Red Eye substations. Applicants request that the Commission designate a route wider than the necessary ROW for the Project, to allow flexibility in determining the precise location of the transmission centerline and structures.

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