ENVIRONMENTAL ASSESSMENT

TOWER TRANSMISSION PROJECT
HIGH VOLTAGE TRANSMISSION LINE

PUC DOCKET NO. ET2, E015/TL-06-1624

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Abstract

Minnesota Power (MP) and Great River Energy (GRE) have submitted a HVTL Route permit application for its proposed Tower Transmission Project pursuant to the provisions of the Power Plant Siting Act (Minnesota Statutes Sections 116C.51 to 116C.69). The facility (i.e., Tower Transmission Project) for which the permit is requested is approximately 15 miles of new transmission lines, a new Embarrass switching station, and a new Tower substation located in Saint Louis County in northeastern Minnesota.

The application will be reviewed under the Alternative Review Process (Minnesota Rules 4400.2010) of the Power Plant Siting Act (Minnesota Statutes 116C.51 to 116C.69). Under the Alternative Review Process, an applicant is not required to propose any alternative sites or routes. The Department of Commerce Energy Facility Permitting Staff prepares a document called an Environmental Assessment, and a public hearing is required but it need not be a contested case hearing. The PUC has six months to reach a decision under the Alternative Process from the time the application is accepted.

Persons interested in receiving additional information regarding this matter can register their names on the Project Docket webpage at http://energyfacilities.puc.state.mn.us/Docket.html?Id=18926 or by contacting Bill Storm, Energy Facilities Permitting, 85 7th Place East, Suite 500, St. Paul, Minnesota 55101, phone (651) 296-9535, e-mail: bill.storm@state.mn.us.

Many of the documents of interest regarding this matter, including this Environmental Assessment, are available online at: http://energyfacilities.puc.state.mn.us/Docket.html?Id=18926. The final Route Permit issued to Minnesota Power and Great River Energy will also appear on this webpage

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TABLE OF CONTENTS

ABSTRACT

1.0	Introduction		1
	1.1	Project Description	1
	1.2	Project Location	5
	1.3	Project Purpose	10
	1.4	Sources of Information	11
2.0	Regulatory Requirements		12
3.0	Affected Environment		14
4.0	Assessment of Impacts and Mitigative Measures		17
	4.1	Socioeconomic	17
	4.2	Noise	19
	4.3	Aesthetics	21
	4.4	Recreation	22
	4.5	Transportation	22
	4.6	Land Use	23
	4.7	Topography, Soils and Geology	25
	4.8	Flora and Fauna	26
	4.9	Rare & Unique Natural Resources	28
	4.10	Archaeological and Historic Features	30
	4.11	Air Quality	37
	4.12	Water Resources	37
	4.13	Human Health and Safety	38
	4.14	Radio and TV Reception	41
5.0	Alternative Route - Citizens “Public Lands” Route		43
6.0	Other Permits and Approvals		45
7.0	Acronyms, Abbreviations and Definitions		46

TABLES

Table 4-1 Noise Standards by Noise Area Classification
Table 5-1 Alternative Routes Comparison
Table 6-1 Potential Required Permits

FIGURES

Figure 1-1 Site Location Map
Figure 1-2 115 kV H-Frame Structure
Figure 1-3 115 kV/115 kV Single Pole Structure
Figure 1-4 115 kV/115 kV Single Pole THP-B Structure
Figure 1-5 ROW Clearing

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Figure 1-6 Proposed HVTL Route Area 1 and Tower Substation
Figure 1-7 Proposed HVTL Route Area 2
Figure 1-8 Proposed HVTL Route Area 2 – Church @ East Taylor Road
Figure 1-9 Proposed HVTL Route Area 2 – Residences on Bergstedt Road
Figure 1-10 Proposed HVTL Route Area 3
Figure 1-11 Proposed HVTL Route Area 4
Figure 1-12 Tower Substation Location/Layout
Figure 1-13 Embarrass Substation Location/Layout
Figure 4-1 Expected Audible Noise
Figure 4-2 Land use/Land Cover
Figure 4-3 Fuller Creek & Two West Rivers
Figure 4-4 Sensitive Natural Resources
Figure 4-5 Electric Field
Figure 4-6 Magnetic Field 115 kV Single Pole THP & THP-B
Figure 4-7 Magnetic Field 115 kV H-Frame
Figure 5-1 Citizens' Public Lands Alternative Route
Figure 5-2 Citizens' Public Lands Alternative North
Figure 5-3 Citizens' Public Lands Alternative South

APPENDICES

Appendix A MPUC Certification Order
Appendix B Scoping Decision
Appendix C Agency Correspondence

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1.0 INTRODUCTION

Minnesota Power (MP) and Great River Energy (GRE) filed the HVTL route permit application on December 22, 2006. On January 17, 2007, the PUC issued an Order accepting the MP/GRE Tower HVTL Route Permit Application as complete.

The Minnesota Department of Commerce (DOC or Department) is required to perform environmental review on applications for HVTL Route Permits to inform the Minnesota Public Utilities Commission (PUC or Commission), which is the final decision making body in these matters. This EA document covers the environmental review requirements for the HVTL Route Permit.

Chapter 1 provides specific information about the proposed project. Chapter 2 provides information on the regulatory procedure for the HVTL Route Permit processes. Chapter 3 provides information on the environmental setting of the project area. Chapters 4 through 6 provide the analysis required for route permit applications under Minnesota Rule 4400.2750. Chapter 4 addresses the human and environmental impacts of the proposed transmission line and route, the unavoidable impacts of the proposed route and specific mitigative measures. Due to the close geographic proximity, all three HVTL routes (i.e., MP/GRE's proposed route, Public Lands Route East, and the Public Lands Route West) entail similar impacts on the human and natural environment. Chapter 5 addresses the alternative route, and Chapter 6 describes the additional permits that may be required for this project.

1.1 Project Description

The Tower project would consists of approximately 15 miles of 115 kilovolt (kV) transmission line, a 115/69/46 kV substation located near the City of Tower and a 115 kV switching station located at the junction of MP's existing (115 kV) 34 Line and (115 kV) 34 Line Tap (located in White Township, Section 7, Township 59N, Range 15W).

Figure 1-1 illustrates the proposed project area.

The proposed transmission line will be designed to meet or surpass all relevant local and state codes, and North American Electric Reliability Council (NERC) and Xcel Energy standards. Appropriate standards will be met for construction and installation, and all applicable safety procedures will be followed during and after installation.

Right of Way

The right-of-way (easement area) width requirement for the 115 kV transmission project would be 100 feet for both structure design types, understanding that the width of the right-of-way cleared for the single pole designs could be reduced in certain higher density, developed areas.

The width of the right-of-way cleared may also be less in areas where the new transmission line follows an existing linear corridor, such as a road or trail. The MP & GRE would seek a

permanent easement, providing the right to construct, operate and maintain the transmission line, for the full width and length of the right-of-way. Additional right-of-way may be required for longer spans or special design requirements based on final survey. Right-of-way width depends on conductor blowout and the recommended clearances to obstructions along the route.

Upon completion of construction activities, landowners will be contacted to determine whether or not construction damages have occurred. Areas that sustain construction damage will be restored to their pre-construction condition to the extent possible. Landowners will be notified of the completion of the Project, and asked to report any outstanding construction damage that has not been remedied or any other issue related to the construction of the transmission line.

Once transmission line construction cleanup is complete and construction damages have been successfully mitigated, landowners will be sent a final contact letter signaling the close of the project and requesting notification of any outstanding issues related to the project.

Transmission Structures

Two structure types are being considered for the Tower HVTL project: wood H-frame and wood single pole. Dependent upon land use type, topography, right-of-way constraints and other design-dependent features, each of these transmission line structure designs would be appropriate in certain areas.

The two pole wood H-frame structure design is suited for areas with rugged topography and/or for areas requiring longer spans to avoid or minimize placement of structures in wetlands or waterways. The average span would be 600–700 feet, with 1,000-foot spans achievable with certain topography. The structure height would average 60–80 feet with taller structures required for the exceptionally long spans and in circumstances requiring additional vertical clearance.

Figure 1-2 shows a cross section drawing of a typical GRE 115 kV H-Frame structure being considered for this project.
The single pole design (GRE-THP or THP-B) is suited for areas where available right-of-way is limited, such as where rights-of-way are shared along roads in developed areas. Two insulator types could be used depending on requirements: a standard post insulator (THP design) and a braced post insulator (THP-B design). The advantage of the THP-B braced post insulator design is that longer span lengths can be achieved, however structure cost in increased. Average structure height would be 65–90 feet to achieve average span lengths of 300–400 feet. Specific structure heights and span lengths may exceed the average due to land use requirements and topography.

Figures 1-3 and 1-4 show the cross section drawings of a typical GRE 115 kV single pole THP and a THP-B structure being considered for this project.

In addition to the two main structures under consideration for the project, there may be limited use of a single pole structure with low voltage single phase or three phase distribution underbuild that directly supplies area electric customers. This single pole design is used in areas where

existing land use development restricts the placement of two separate power line circuits; a high voltage circuit and a lower voltage (distribution line) circuit. The advantage of this design is less right-of-way requirement; however, there are significant operating, maintenance, and cost factors to consider. The higher voltage circuit is "stacked" on top of the lower voltage distribution circuit, resulting in a taller pole (averaging 75–90 feet in height) and shorter spans (250–350 feet).

Another alternative would be to place the distribution line underground in specific areas.

Transmission Capacity

The transmission line would utilize 795 aluminum conductor steel reinforced (ACSR) Drake conductors, which have an ampacity of 982 amps at 100 degrees C. This will limit maximum continuous electric power capacity of the line to 196 (MVA), provided there is not a more restrictive limit associated with the substation terminal equipment or transformation capacity.

The line would use three single conductors (not bundled). Depending on structure type (single pole or H-frame), there would also be one or two shield wires (3/8″ high strength 7-strand steel) to protect the conductors from lightning. It is likely that one shield wire would be an optical shield wire (64mm2/528 OPGW 24 fiber), to be used for communications.

Construction Procedures

After land rights have been secured, landowners would be contacted to discuss the initial construction phase of the project, including schedules, ingress and egress to and from the planned facility, tree and vegetation removal, damage mitigation, and other related construction activities.

The first phase of construction activities would involve surveying and staking the centerline and right-of-way limits of the new transmission line, followed by removal of trees and other vegetation from the right-of-way. As a general practice, brush or low-growing 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 are 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 will remain in the easement area.

The NESC states that "trees that may interfere with ungrounded supply conductors should be trimmed or removed." Standard practices per specifications from the RUS indicate total removal of trees within the easement area, with additional trees and danger trees removed or trimmed beyond the easement area if they could fall into the energized transmission line as shown in **Figure 1-5**. Special tree trimming agreements are possible to minimize tree removal based on negotiations with individual landowners

The proposed 115 kV transmission line would be constructed at existing grade elevations. Therefore, pole locations would generally not require grading, unless it is necessary to provide a level area for construction access and activities.

MP & GRE typically utilize outside contractors for construction activities on large transmission projects. The specifications used are developed by MP & GRE's Engineering Services Departments. GRE utilizes RUS contract documents and standards for transmission lines. A copy of the project's easement restriction list, construction permit conditions, and any required local permits are given to the awarded contractor prior to construction.

Typical tangent (in-line) structures will be solid wood. Laminated wood, steel direct-embedded or steel poles with concrete foundations would be used in certain locations (such as the station termination sites). Each structure will require a 10 to 15 feet deep hole that is 3 to 4 feet in diameter. Excavated soil will be leveled at the pole site. The poles may be backfilled with native soils, crushed rock or concrete depending on design conditions. In lowland areas, a galvanized steel culvert may be also inserted for pole stability if soil capacity is poor. Large angle structures will typically be three-pole guyed wood structures or self-supporting steel poles that will require a concrete foundation. The concrete pier foundations will typically have diameters of 4 to 8 feet. The hole may require a typical depth of 15 to 30 feet depending on design requirements. The piers will be filled with concrete delivered to the site via trucks from a local batch plant.

Poles may be delivered directly to the installation location or to a designated marshalling storage yard, depending on delivery and contractor availability. If the poles are delivered to an installation site, they are placed on the right-of-way out of the clear zone of any adjacent highways or designed pathways. The poles are typically framed with insulators and hardware on the ground and then lifted and placed in the hole via a bucket truck or a crane, depending on the weight of the structure.

Once the structures have been erected, conductors are installed by establishing stringing setup areas within the right-of-way. These stringing setup areas are typically located every two miles along the right-of-way. The conductors are pulled with a rope lead that connects to every structure through a dolly attached at the insulator location. After any necessary notifications are made or permit requirements met to mitigate any concerns with traffic flow or operations of other utilities, temporary guard or clearance poles are installed at crossings to provide adequate clearance over other utilities, streets, roads, highways, railroads, or other obstructions.

In lowland areas, construction activities generally occur during the winter season to minimize damage to wetland areas, facilitate construction, and/or to comply with required wetland crossing permits. A pre-construction conference will outline any special requirements for the contractor prior to the start of any construction activities.

During construction when temporary removal or relocation of fences may occur, installation of temporary or permanent gates may be required. The Applicants land rights agents would

coordinate with affected landowners regarding replacement of fences and gates. The contractor would work around cultivated areas until harvest has occurred.

As a RUS borrower, GRE adheres to RUS standards regarding clearances to ground, clearance to crossing utilities, clearance to buildings, right-of-way widths, erecting power poles, and stringing of transmission line conductors. RUS requires borrowers to submit an environmental report prior to any construction activities.

Construction of the new Tower substation will begin once the property is acquired, the final design is complete and the materials are received. A detailed construction schedule will be developed based upon availability of crews, outage restrictions for any transmission lines that may be affected, weather conditions, spring load restrictions on roads, and any restrictions placed on certain areas for minimizing impacts from construction.

Approximately one acre of land (200' x 200' fenced area plus adjacent construction area and parking) will be graded to construct the new Tower substation. The concrete foundations will be poured to support the substation equipment and control house. Once the site is graded, a perimeter fence will be installed to secure the site and substation erection will commence.

Erosion control methods will be implemented to minimize runoff during substation construction. An MP contractor will comply with local, state, NESC and MP standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, erection of power poles, and stringing of transmission line conductors to the substation.

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

MP will perform periodic inspections, maintain equipment, and make repairs over the life of the substation. MP would also conduct routine maintenance as required to remove undesired vegetation that may interfere with the safe and reliable operation of the substation.
The design, construction and restoration practices defined above for the Tower Substation would also be employed for the Embarrass Switching Station. All construction will be completed in accordance with MP construction standards as well as the NESC. These standards include clearances to ground, clearance to crossing utilities, clearance to buildings, erecting power poles, and stringing of transmission line conductors to the switching station.

Approximately one acre would be graded for construction of the Embarrass switching station. The dimensions of the station are planned to be 180' x 180', located adjacent to the existing cleared right-of-way for 115 kV Line #34 and #34 Tap.

ROW Maintenance

MP & GRE will periodically use their respective transmission line right-of-way crews 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. Periodic inspections will be done by foot, snowmobile, All-Terrain Vehicles, pickup truck, or by aerial means. These inspections will be limited to the acquired right-of-way and areas where obstructions or terrain require access off the easement.

MP & GRE will conduct vegetation surveys and remove undesired vegetation that will interfere with the operation of the transmission line. Frequency of vegetation maintenance is on a two to five year cycle. Right-of-way clearing practices include a combination of mechanical and hand clearing, along with an application of herbicides where allowed.

1.2 Project Location and Proposed Route

The project area includes the cities and towns of Ely, Babbitt, Embarrass, Tower and the Lake Vermilion area. The Proposed Route is located within the townships of Kugler, Embarrass and White as shown on **Figure 1-1**. The two single circuit 46 kV interconnections (one 46 kV circuit would be installed on structures capable of adding a future 69 kV circuit) from the new Tower Substation to the existing 46 kV Line #32 are located in Breitung (W) Township.

MP & GRE analyzed the project area using various geographic data (aerial photos, topographic maps, etc.), public input and field investigations. Preliminary route options were then identified based on opportunities to:

- share rights-of-way with existing transmission lines by double circuiting where practical or paralleling an existing line;
- minimize impacts to reliability (i.e., consider if existing lines can be taken out of service for re-construction);
- parallel utility rights-of-way, roads and trails to help decrease the amount of new clearing required;
- parallel field lines and property lines, where access is adequate and the transmission line would cause minimal conflicts; and
- minimize the length of the transmission line to reduce the impact area and costs for the proposed Project.

The route was further refined by avoiding, to the extent possible, areas where an HVTL could create significant impacts. These areas include:

- existing and planned high density residential areas;
- cultivated agricultural areas;
- areas where clearances are limited because of airports and commercial/industrial structures; and

- environmentally sensitive sites, such as wetlands, archaeologically significant sites, areas with threatened, endangered and species of special concern, areas of significant biological or cultural significance, and federal lands.

Routes following existing right-of-way corridors are generally preferred to new cross-country routes. However, roads may not provide optimal transmission line route opportunities if populated with homes. Native and planted tree screens between the homes and the road or highway would require removal for construction and safe operation of the transmission line.

For new cross-country routes, the preference is to follow survey or property lines provided the Project termini are oriented in a north to south or east to west alignment

MP & GRE have, for descriptive purposes within the Tower HVTL Route Permit Application, divided the proposed HVTL route into four areas:

Area One
In area one (Tower Substation to County Highway 26) the proposed HVTL route follows the former Duluth Missabe & Iron Range Railroad (DM&IR) grade, now called the Iron Ore Trail, for 4.2 miles. The intended centerline follows the east side of the grade from the proposed Tower Substation site south to County Highway 26. At that point, the intended centerline crosses to the west side to avoid removing a planted tree screen between the Iron Ore Trail and a home located east of the trail (**Figure 1-6**).

Area Two
In area two (County Highway 26 to East Taylor road) the proposed HVTL route follows the Iron Ore Trail for approximately 1.3 miles, follows a survey line for approximately 1.3 miles, and follows gravel roads for 2.2 miles (total distance of 4.8 miles). The intended centerline follows the west side of the Iron Ore Trail immediately south of County Highway 26 and crosses and remains on the northeast side of the trail until departing the trail and heading south to follow a survey line in Section 32 (T61N, R15W). The intended centerline for planning purposes follows the west side of the survey/property line. The intended centerline creates a near 90 degree angle to follow the single phase distribution line located on the north side of the east-west gravel road extending from County Road 364/Bergstedt Road (**Figure 1-7**)

The intent is to remove and underground the single phase distribution line and utilize the cleared right-of-way for a portion of the proposed transmission line right-of-way. The proposed HVTL route angles 90 degrees to the south, with the intended right-of-way located on the west side of Bergstedt Road to the East Taylor Road. The intent is to remove and underground the single phase distribution and use the existing cleared right-of-way for a portion of the proposed transmission line right-of-way. At East Taylor Road the intended centerline would move to the east to afford an increased separation between the proposed transmission line and the existing three-phase distribution line and the church. (**Figure 1-8**)

At the church, the determination of the final right-of-way location would incorporate the interests of the church and the practical design, construction and operational alternatives of the existing distribution line and the proposed transmission line.

There are three homes and a church located within the 300' wide proposed route. Two homes are located nearly opposite each other on the Bergstedt Road, making it impractical to avoid both homes by switching back and forth across the road with the intended centerline. The home on the west side and nearest the intended centerline is presently unoccupied (**Figure 1-9**).

The proposed HVTL route crosses two streams: one in a common corridor with the Iron Ore Trail and the other with the three phase distribution line south of East Taylor Road.

Area Three

Area three (East Taylor Road to County Highway 21) begins with a short north/south segment that crosses Highway 135 and connects RS 22 and 32. An angle structure would be required at the interface with RS 32 near the intersection of Highway 135 and the Levander Road. The proposed HVTL route than continues as a new cross-country route that includes a 0.3 mile diagonal and a 1.2 mile section that parallels a survey/property line. The intended centerline is located on the west side of the survey/property line (**Figure 1-10**).

Area Four

Area four (County Highway 21 to Embarrass Switching Station) has four segments; the first is a 1.3 mile route segment that would be a new cross-country path located on the survey/property line in Sections 29 and 30 (T60N, R15W). The intended centerline is located on the west side of the 1/16 line. The landscape is primarily wetland interspersed with wooded upland. The 40-acre parcels east of the proposed HVTL route in Section 32 are privately owned and the parcels crossed by the proposed HVTL route are tax forfeit property. Next is a 1.8 mile long route segment that continues through the large wetland area in White Township. The intended centerline is located on the west side of the 1/16 line in Sections 5 and 8 following the survey/property line. The intended centerline continues on the south side of the existing MP 115 kV transmission line for 0.25 miles. Section 5 is tax forfeit and corporate (RGGS) ownership and Section 8 is in private ownership. The last two segments in area four are a total 0.6 miles in length and follow the MP 115 kV transmission line on the south side through a predominantly wetland landscape. RS 47 travels through a wooded upland area for 0.15 miles and terminates at the proposed Embarrass Switching Station site in Section 7. The existing 115 kV right-of-way would need to be widened by approximately 60 feet to provide for safe and reliable construction and operation of the proposed transmission line (**Figure 1-11**)

Tower Substation/Embarrass Switching Station

MP & GRE applied the following criteria to select sites for the Tower Substation and Embarrass Switching Station:

- Locate near load-serving areas to minimize construction/length of distribution lines. The preferred Tower Substation site is located near the existing distribution lines that serve Tower and the adjacent Lake Vermilion area.

- Locate near existing high side (transmission – 115 kV) and low side (feeder lines – 46 kV) lines to reduce impacts associated with line construction. The Tower Substation site is located adjacent to the proposed transmission line route and is located less than a mile from the existing 46 kV line serving the area. The Embarrass Switching Station site is located adjacent to the two 115 kV transmission lines (Line #34 and Line #34 tap) that will be connected to the new switching station.
- Avoid sensitive areas such as low areas, wetlands, waterways and wildlife areas. Locating facilities in these areas increases the likelihood of conflicts with environmental resources and poses problems both for construction and operation of a substation (i.e., poor soil conditions). The sites under consideration are not located in low areas, wetlands or wildlife areas, and are not adjacent to waterways.
- Evaluate opportunities for screening the stations from points of view such as trails, roads and homes. The Proposed Tower Substation site is located near Highway 135; however, a vegetative screen of mature trees will remain between the road and the substation. The Embarrass Switching Station site is located in a forested area totally screened from the nearest road (CSAH 138). No homes are in close proximity to either the Tower or Embarrass sites.
- Locate near an access road(s) to minimize length and to make entrance to the substation convenient for security and outage purposes. The proposed Tower Substation site is located adjacent to Highway 135 and the Embarrass site can be accessed from CSAH 138 (Giant's Ridge Road) via an existing gravel road. This gravel road and bridge over the Embarrass River would need to be upgraded to allow safe entrance of construction vehicles and substation materials.
- Locate away from residences. A primary impact associated with substations is noise. The Proposed Tower Substation site is located approximately 1,300 feet from the nearest residence and is situated in an area zoned Forest Agricultural Management-3. The Proposed Embarrass site is located more than 1/2 mile from any residence and is zoned Multiple Use Non-Shoreland-2.
- Ability to secure a suitably-sized parcel. A sufficiently-sized parcel to construct the substation, provide for future expansion (if necessary), provide for a buffer from residences, and allow access to a mobile substation is necessary. The sites under consideration are large enough to meet the Project's needs.
- Locate on marginally productive land to minimize impact to high-yield agricultural and/or forested lands. The proposed Tower site is a grass field adjacent to a periodically used gravel pit. The site meets this requirement, as there is no crop or forested land at the site. The Embarrass site is located in a forested area, adjacent to two cleared transmission line rights-of-way.

The proposed Tower Substation site is located 0.6 miles south of Tower and east of Highway 135. The site is privately owned and located in the northeast corner of the NW/SE, Section 5, Township 61 North, Range 15 West. Access to the site would be from an existing gravel access off of Highway 135. The site is fairly level and adjacent to an active gravel pit located to the south.

The new Embarrass switching station would be constructed at the location of the existing 115 kV Line tap off of 115 kV Line #34 (Virginia to Laskin). The proposed 115 kV line would enter from the northeast, creating an interconnection point of four 115 kV transmission lines. The switching station would look similar to a 115 kV substation, except there would be no transformers. The entire switching station site (approximately 180' x 180') would be graded and fenced. Major equipment within and adjacent to the switching station would include four 115 kV circuit breakers, line termination structures, and a control house. An improved access road and a small parking lot would also need to be constructed.

The proposed locations and layouts for the Tower Substation and the Embarrass Switching station are shown in **Figures 1-12 and 1-13**, respectively.

1.3 Project Purpose

The 46 kV loop inadequacies and alternatives being considered were discussed during the 2003, 2004 and 2005 State Transmission Plan meetings, and in the 2003 Minnesota Biennial Transmission Projects Report (Minnesota Transmission Owners, 2003). The Applicants' held additional public meetings in the project area during 2005 and 2006 to explain the need to upgrade the areas electric system and explain the planned Project. The Project was also included in the 2005 Minnesota Biennial Transmission Projects Report (Minnesota Transmission Owners, 2005) in which the Applicants requested and received certification of the project. Alternatives that were considered include increasing the operating voltage of existing lines serving the area, new 46 kV or 115 kV transmission, local area diesel generation, and energy storage devices.

Continuing economic growth in the part of northeastern Minnesota from Babbitt to Virginia to Hibbing/Chisholm has caused a considerable increase in electrical use in the region. The addition of new electrical services and the increase in demand from existing services are causing electricity delivery concerns in the area. The existing electrical system, consisting of transmission lines and substations, is approaching its physical limit. Loss of a facility may result in potential long-term outages. This situation has become a growing concern for winter peak periods, but with continued growth, the number of critical hours during the year will continue to increase.

The North American Electric Reliability Council, which develops standards for implementing secure and safe electrical delivery, mandates that certain levels of service be maintained to insure that the transmission grid operates efficiently and reliably. In severe cases the transmission grid serving the project area could collapse, which could result in blackouts throughout the project area.

The standards are designed to minimize the possibility that a blackout could occur by insuring that the interconnected transmission system is planned, designed, and operated to withstand probable forced maintenance outages and other service interruptions. Electric utilities must also maintain power quality at a level that prevents damage to all customers' electrical loads. Based on these mandates, transmission improvements are necessary for this region

1.4 Sources of Information

Much of the information contained within this document was provided by the applicant or the applicant's representatives in the form of the Application for a HVTL Route Permit and correspondence.

Additional sources of information are listed below:

- Minnesota Pollution Control Agency (http://www.pca.state.mn.us/)
- Minnesota Department of Natural Resources (http://www.dnr.state.mn.us/index.html)
- Minnesota Department of Health (http://www.health.state.mn.us/)
- U. S. Environmental Protection Agency (http://www.epa.gov/)
- Electric Power Research Institute (http://www.epri.com/default.asp)
- City of Shakopee (http://www.ci.shakopee.mn.us/)
- U. S. Department of Agriculture Natural Resources Conservation (http://soils.usda.gov/about/)
- Minnesota Geological Survey (http://www.geo.umn.edu/mgs/)
- Department of Administration, State Demographic Center (http://www.demography.state.mn.us/)
- Federal Emergency Management Agency (http://www.fema.gov/)
- U. S. Department of Energy, Energy Information Administration (http://eia.doe.gov/)

2.0 REGULATORY PROCESS AND REQUIREMENTS

2.1 PUC Certification Requirement

On November 29, 2005, Minnesota Power (MP) and Great River Energy (GRE) made a joint application to the Minnesota Public Utilities Commission (PUC) for Certification of two High-Voltage Transmission Line (HVTL) projects pursuant to the provisions of Minnesota Statutes 216B.2425 and Minnesota Rules, Chapter 7848, through the Biennial Transmission Projects Report proceeding. The two projects are referred to as "Tower" and "Badoura." The Tower project would be approximately 15 miles of new transmission lines, a new Embarrass switching station, and a new Tower substation located in Saint Louis County in northeastern Minnesota.

As part of its review of a Biennial Transmission Report requesting certification of a HVTL, the PUC is required to prepare a document called an Environmental Report (ER). Minn. Rules 4410.7030. On behave of the PUC; the DOC Energy Facility Permitting (EFP) staff prepared an ER based on its analyses of the information and data supplied in the two Biennial Projects Reports and several other relevant sources. In the ER the DOC evaluated the general potential impacts from construction, operation, and maintenance of the proposed HVTL along the broad corridor(s) proposed by the applicant and discussed ways to mitigate these potential impacts.

On December 8, 2005, DOC EFP staff held a public meeting in the Tower area to provide the public with information about the project, afford the public an opportunity to ask questions and present comments, and to solicit input on the content of the ER. The comment period was held open until 5:00 pm January 10, 2006. On January 11, 2006, after consideration of the public comments, the Commissioner of the DOC issued an Order outlining the content of the environmental report. The DOC prepared and distributed an Environmental Report for the two projects on February 14, 2006.

On March 29, 2006, a Public Hearing was held on this matter. The public hearing was presided over by Administrative Law Judge Richard Luis from the Minnesota Office of Administrative Hearings. The purpose of the hearings was to receive public comment on the need for the proposed projects. Judge Luis provided a summary report of comments received at the public hearing to the Public Utilities Commission to assist the Commission in making a final determination on the need for the proposed transmission lines.

On May 25, 2006, the PUC issued an Order certifying that the Tower Project is needed and designating the project as a priority electric transmission project (**Appendix A**).

2.2 HVTL Route Permit Requirement

In accordance with the Power Plant Siting Act a route permit is required before a HVTL can be constructed. The power plant siting act requirement became law in 1973 in Minnesota Statutes, 116C.51 through 116C.69. The rules to implement the permitting requirement for a HVTL are in Minnesota Rules Chapter 4400. A HVTL is defined as a conductor of electric energy and

associated facilities designed for and capable of operating at a nominal voltage of 100 kilovolts or more either immediately or without significant modification.

GRE notified the PUC by letter dated November 29, 2006, that the Company intended to utilize the Alternative Permitting Process for the proposed Tower HVTL project. This complies with the requirement of Minn. R. 4400.2000, subp. 2, to notify the PUC at least 10 days prior to submitting an application (The Power Plant Siting Act identifies the projects that qualify for review under the Alternative Review Process. Minn. Stat. 116C.575, subd. 20.

GRE filed the HVTL route permit application on December 22, 2006. On January 17, 2007, the PUC issued an Order accepting the MP/GRE Tower HVTL Route Permit Application as complete.

The application is being reviewed under the Alternative Review Process (Minnesota Rules 4400.2010) of the Power Plant Siting Act (Minnesota Statutes 116C.51 to 116C.69). Under the Alternative Review Process, an applicant is not required to propose any alternative sites or routes. The Department of Commerce Energy Facility Permitting Staff holds initial public information/scoping meeting, develops a scoping decision recommendation, prepares a document called an Environmental Assessment, and a public hearing is required but it need not be a contested case hearing. The PUC has six months to reach a decision under the Alternative Process from the time the application is accepted. Copies of the application, along with other pertinent documents can be obtained through the DOC Project Manager and maybe viewed at PUC web site (http://energyfacilities.puc.state.mn.us/Docket.html?Id=18926).

On February 13, 2007, DOC EFP staff held the initial public information/scoping meeting in Embarrass. The purpose of the public meeting was to provide the public with information about the project, afford the public an opportunity to ask questions and present comments, and to solicit input on the content of the EA.

The comment period was held open until 5:00 pm March 9, 2007.

The Commissioner of the DOC issued a Scoping Order on March 15, 2007 (**Appendix B**).

3.0 AFFECTED ENVIRONMENT

Ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The system uses associations of biotic and environmental factors, including climate, geology, topography, soils, hydrology, and vegetation. ECS mapping enables resource managers to consider ecological patterns for areas as large as North America or as small as a single timber stand and identify areas with similar management opportunities or constraints relative to that scale. There are eight levels of ECS units in the United States. Map units for six of these levels occur in Minnesota: Provinces, Sections, Subsections, Land Type Associations, Land Types, and Land Type Phases.[1]

The proposed and alternatives HVTL routes are located in the Laurentian Mixed Forest (LMF) Province traverses northern Minnesota, Wisconsin, and Michigan, southern Ontario, and the less mountainous portions of New England. In Minnesota, the LMF Province covers a little more than 23 million acres (9.3 million ha) of the northeastern part of the state. In Minnesota, the 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. Precipitation ranges from about 21 inches (53 cm) annually along the western border of the Province to about 32 inches (81 cm) at its eastern edge in Minnesota. Normal annual temperatures are about 34°F (1°C) along the northern part of the Province in Minnesota, rising to 40°F (4°C) at its southern extreme. Under influence of climate, the overall pattern of vegetation change across the Province in Minnesota is from warm and dry habitats in the southwest to cooler and moister ones in the northeast. Linked to climate are several other factors with southwest to northeast gradients that have important influence on vegetation and species ranges. Most notable are growing-degree days, evapotranspiration, and the depth and duration of snow cover.[2]

The Northern Superior Uplands Section (NSU) largely coincides with the extent of the Canadian Shield in Minnesota. The NSU is characterized by glacially scoured bedrock terrain with thin and discontinuous deposits of coarse loamy till and numerous lakes. The section has high relief, reflecting the rugged topography of the underlying bedrock. The NSU receives more of its precipitation as snow than any section in the state, has the longest period of snow cover, and the shortest growing season. The upland vegetation is remarkably uniform relative to that of other sections in the LMF Province, consisting mostly of fire-dependent forests and woodlands. Forests with red and white pine were widespread in the past, mixed with aspen, paper birch, spruce, and balsam fir; much of the pine was cut in the late 1800s and early 1900s, leaving forests dominated mostly by aspen and paper birch. Jack pine forests are present on droughty ridges and bedrock exposures, as well as on local sandy outwash deposits. The highlands along Lake Superior have a local climate moderated by the lake that favors forests dominated by sugar maple with some white pine, yellow birch and white cedar. Peatlands and wet forests are present across the section as inclusions within broader upland forest areas; sparsely vegetated cliffs and

[1] http://www.dnr.state.mn.us/ecs/index.html
[2] ibid

bedrock outcrops are common in the rugged terrain along Lake Superior and in the border lakes region of the northern part of the section.[3]

The Nashwauk Uplands Subsection is formed by Giant's Range, a prominent feature on the land. The western and part of the northern boundary is formed by the limit of the Nashwauk Moraine. The Nashwauk Uplands Subsection covers 810,000 acres (1,265 square miles) in northeast Minnesota. Brown glacial sediments form the parent material for much of this subsection. Landforms include end moraines, outwash plains, and lake plains. Soils are varied and range from medium to coarse textures. One unique aspect of this region is the Giants Range, where the majority of iron mining in Minnesota takes place. It is a high narrow ridge trending northeast to southwest and caused by bedrock. This region consisted of forest communities dominated by white pine, red pine, balsam fir, white spruce, and aspen-birch. Forestry and mining are the most important land uses presently.[4]

The Landform in this subsection includes rolling till plains and moraines and flat outwash plains formed by the Rainy Lobe glacier. Most striking is the Giants Range, a narrow bedrock ridge towering 200 to 400 feet above the surrounding area. It trends southwest to northeast. Bedrock is locally exposed in the end moraines. Small bogs and potholes are common.[5]

The thickness of glacial drift is quite variable across the subsection. On moraines, till plains and outwash plains drift is commonly greater than 100 feet over Precambrian (Late Archean and Early Proterozoic) bedrock that includes gneiss, undifferentiated granite, and metamorphosed mafic to intermediate volcanic and sedimentary rocks. Giants Range has a thin blanket of drift over granite. Immediately to the south is the iron-formation of the Iron Range, which has been heavily mined, first for "soft" iron ore and later for taconite. Soils are formed in sandy to fine-loamy glacial till and outwash sand. S oils on the Nashwauk Moraine have a loamy cap with dense basal till below at depths of 20 to 40 inches. They are classified as boralfs (cold, well-drained soils developed under forest vegetation). Other areas north of Giants Range have coarse-loamy to sandy soils classified as boralfs, orthents, and ochrepts.

There are over 63 lakes greater than 100 acres in size in this subsection. Many are found on the Nashwauk Moraine. The Continental Divide follows the summit of Giant's Range. Water flowing north eventually goes into Hudson Bay. On the west side, waters flow into the Mississippi River watershed. To the south, water flows into Lake Superior.

Pre-settlement vegetation was a mixture of deciduous and coniferous trees. White pine-red pine forest and jack pine barrens were common on outwash plains. Aspen-birch forest and mixed hardwood-pine forest were present on moraines and till plains. Wetland vegetation included conifer bogs and swamps.

Land ownership is roughly equal between public and private in St. Louis County and mostly public or forest industry in Itasca County. Quaking aspen is the dominant tree species presently.

[3] http://www.dnr.state.mn.us/ecs/212L/index.html
[4] http://www.dnr.state.mn.us/ecs/212Lc/index.html
[5] ibid

Forest management and recreation are the most important land use in this subsection. Mining is also an important land use.

Today, forestry and mining are the most abundant land uses in this subsection. The predominant tree species used by industry is quaking aspen. Present and past mining activities can affect water quality. A few mining companies are proposing expansions of current facilities or the development of new ones. Outdoor recreation, including motorized recreation, is also an important land use.

4.0 ASSESSMENT OF IMPACTS AND MITIGATIVE MEASURES

The Tower project would be approximately 15 miles of new transmission lines, a new Embarrass switching station, and a new Tower substation located in St. Louis County in northeastern Minnesota. Since the alternative routes lie within the same geographic area, it is anticipated that much of the potential impacts on the human and natural environment will be similar; areas of potential differences will be discussed in Section 5.0.

4.1 Socioeconomic

Human settlement patterns, in particular European settlement, were historically influenced by the natural resources in the region. Timber resources and the fur trade were the initial attractions for the earliest settlers to the region in the early and mid 1800s.

In the early 1900s, an attempt was made by settlers to develop a farm-based economy on clear-cut timber lands that eventually failed due to poor soils and climate. During the early 1900s, some of the first iron ore pit operations evolved and expanded as technologies advanced. By the mid-20th century, mining surpassed timber as the primary employer in the project area. Timber production regained a dominant economic and settlement influence as mine operations declined during the latter half of the 20th century.

The city of Tower has historically been a mining town and has more recently become a municipality that supports tourism and development related to Lake Vermilion. The density of residential developments is highest within Tower and around Lake Vermilion to the north and west. The township of Embarrass has the next highest density of settlement within the proposed HVTL route. Settlement throughout the proposed HVTL route is concentrated near roads and likely influenced by land uses including timber production.

The population of the city of Tower was 479 in 2000 with a 5.71 percent decrease in population from 1990 to 2000. St. Louis County had a population of 200,528 in 2000 with a 1.17 percent increase in population from 1990 to 2000. There has been no measurable increase in housing density within Tower or the project area during this period. The housing occupancy rate in 2000 included 48.64 percent owner-occupied in Tower and 41.2 percent owner-occupied in St. Louis County.[6]

The minority population of St. Louis County includes individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (Presidential Executive Order 12898).

In the 2000 data, the city of Tower had 95.74 percent in the White population group, 1.49 percent in the American Indian group, 1.92 percent in the Hispanic group, and 0.85 percent classified as other race. In 2000, 48.43 percent of the population was male and 51.57 percent

[6] Minnesota Planning Agency, State Demographic Center (http://www.mnplan.state.mn.us/demography/index.html)

was female. The age group composition in 2000 was 78.5 percent for the 19 and over age group, and 21.5 percent for the under 19 age group[7].

In the 2000 data, the St. Louis County population had 94.86 percent in the White population group, 0.85 percent in the Black (not of Hispanic origin) group, 2.03 percent in the American Indian Group, 0.69 percent in the Asian group, 0.80% in the Hispanic group, 0.22 percent categorized as other race, and 1.35 percent in more than one race group. Males comprised 49.18 percent and females 50.82 percent of the county population in 2000. The age group composition was 73.73 percent for the 19 and over group, and 26.27 percent for the under 19 age group.[8]

Historically, timber production and mining were the economic mainstays of the project area. While timber production remains, mining has declined as a primary employer. Many residents commute, sometimes great distances, to employment opportunities located outside of the project area. Some local industries and employment are available, and the expanding recreational home industry, gaming facilities, and other tourism-based economies have increased and provided opportunities for project area residents. Seasonal residents are relatively few within the project area compared to neighboring areas where lakeshore parcels are present. In summary, the socioeconomics of project area are rural and primarily residential. Commercial and retail operations are uncommon within the project area.

Business patterns for Tower and St. Louis County are based upon the most recent information available (U.S. Bureau of the Census, 2000). In the 2000 data, Tower had a work force of approximately 242 employees with a median household income of $26,429. No specific industries were identified in the data. St. Louis County had a work force of approximately 100,974 employees with an average median household income of $36,306. Again, no specific industries or employers were identified in the data.

Construction of the project should result in short-term positive economic impacts in the form of increased spending on lodging, meals and other consumer goods and services. It is not anticipated that the project will create new permanent jobs, but it will create temporary construction jobs that will provide a one-time influx of income to the area.

Wages and salaries paid to local and regional contractors will contribute to the total personal income of the region. Additional personal income will be generated for residents in the region and the state by circulation and recirculation of dollars paid out by the MP & GRE as business expenditures and state and local taxes.

Expenditures made for equipment, energy, fuel, operating supplies and other products and services benefit businesses in the area where the project is located. Indirect impacts may occur through the increased capability of the electric system to supply energy to commercial and industrial users, which will contribute to the economic growth of the region.

[7] ibid
[8] Minnesota Planning Agency, State Demographic Center (http://www.mnplan.state.mn.us/demography/index.html)

There will also be some long-term beneficial impacts from the new transmission facilities. These benefits include an increase to the county's tax base resulting from the incremental increase in revenue from utility property taxes. The availability of reliable power in the area will have a positive effect on local businesses and the quality of services provided to the general public.

Socioeconomic impacts resulting from the Project will be primarily positive, with increased tax revenue and an influx of wages and expenditures made at local businesses during construction.

4.2 Noise

Noise is comprised of a variety of sounds, of different intensities, across the entire frequency spectrum. Humans perceive sound when sound pressure waves encounter the auditory components in the ear. These components convert the pressure waves into perceivable sound. Noise is measured in decibels (dB).

Noise standards have been established by the MPCA, Minnesota Rules part 7030.0040, subp. 2. The MPCA is the regulatory agency responsible for the enforcement of these standards. The standards are consistent with speech (hearing and conversation), annoyance, and sleep requirements for receivers within areas classified according to land use activities.

The MPCA has established various noise area classifications (NAC) and has established noise standards for each classification. The NAC area classification is based on the land use activity at the location of the receiver, and the NAC determines the applicable noise standard. Lower noise levels are required in residential areas, for example, than in industrial zones.

The four noise area classifications are: NAC-1, NAC-2, NAC-3, and NAC-4. Some of the land use activities under NAC-1 include household units, hospitals, religious services, correctional institutions, and entertainment assemblies. NAC-2 land use activities include mass transit terminals, retail trade, and automobile parking. Some NAC-3 land uses include manufacturing facilities, utilities, and highway and street ROW. NAC-4, which has no noise limits, consists of undeveloped and under construction land use areas.[9]

Table 4-1 sets forth the Minnesota Noise Standards for the appropriate land use.

Distance is a main criterion for measuring the strength of noise. For every doubling of distance from the noise source, a decrease of 6dB occurs from isolated sources.

The proposed 115 kV line is expected to be essentially inaudible at the edge of the right-of-way during fair weather conditions. Anticipated levels for L5 wet conductor condition for the proposed 115 kV line, based on the results from the Electric Power Research Institute's EMWORKSTATION: ENVIRO Software Version 3.0 using the Bonneville Power Administration (BPA) noise calculation method are shown in **Figure 4-1**. Under the worst-case

[9] http://www.pca.state.mn.us/programs/noise.html

scenario, the L5 noise level may approach 15 dB(A) at the edge of the right-of-way, which is well below the most restrictive Minnesota noise control rules.

The BPA has developed a general guideline based upon public response to alternating current (AC) transmission line audible noise. The guideline indicates that numerous complaints can be expected if the line noise exceeds approximately 58.5 dB(A) and that few complaints should be expected if audible noise is limited to 52.5 dB(A). The calculated values for the project are well below the guidelines mentioned above and audible noise will be barely perceptible during fair weather. In addition, the Applicants are unaware of any complaints related to audible noise, radio or TV interference resulting from the operation of the existing 115 kV transmission lines located near the project area (Virginia, Hoyt Lakes and Babbit, for example) and do not expect that audible noise or radio TV interference will be an issue along the projects' 115 kV line route.

Noise will be generated by the construction of the HVTL; the construction noise will be predominantly intermittent sources originating from diesel engine driven construction equipment. Potential noise impacts will be mitigated by proper muffling equipment fitted to construction equipment and restricting activities conducted during nighttime hours.

Corona Noise

Corona can be defined as a type of localized discharge that results from high, non-uniform electric fields. At high voltages, corona produces visible light, and audible noise. The level of noise or its loudness depends on conductor conditions, voltage level, and weather conditions. Generally, noise levels during operation and maintenance of transmission lines is minimal.[10]

Noise emission from a transmission line occurs during heavy rain and wet conductor conditions. In foggy, damp, or rainy weather conditions, power lines can create a subtle crackling sound due to the small amount of the electricity ionizing the moist air near the wires. During heavy rain the general background noise level, rain falling and wind blowing, is usually greater than the noise from the transmission line.

In these conditions, very few people are out near the transmission line. For these reasons audible noise is not noticeable during heavy rain. During light rain, dense fog, snow, and other times when there is moisture in the air, the proposed transmission lines will produce audible noise higher than rural background levels but similar to household background levels. During dry weather, audible noise from transmission lines is a barely perceptible, sporadic crackling sound.

Substation Noise

The main source of audible noise in a substation is the transformers. Transformers will produce noise whenever they are energized and the level of noise, or its loudness, depends on transformer size, operating condition (cooling fans on or off, etc.), voltage level, and weather conditions. Generally, noise levels during operation and maintenance of substations are minimal. The Tower Substation and its transformers would be designed and constructed to comply with state noise standards. This substation is surrounded by commercial (gravel pit) and rural land uses and should not have significant noise impacts on nearby receptors.

[10] http://www.clarkson.edu/~mcgrath/web.html

No transformers are planned as part of the project at the Embarrass Switching Station, therefore noise produced from the operation of the switching station under normal conditions will be inaudible beyond the fence line.

Mitigative Measures

No mitigative measures are necessary since there will be nominal corona or noise impacts from the project.

4.3 Aesthetics

The transmission line constructed on the proposed HVTL route would be visible at several points from Highway 135. The transmission line would also be visible along the Bergstedt Road parallel, and at the crossings of Sherman Road, County Highway 26, East Taylor Road and County Highway 21. At these locations there would be low visual sensitivity to motorists. There would be moderate visual sensitivity to users (snowmobilers) of the Iron Ore Trail at the north end of the proposed HVTL route. The three homes within 500 feet of the proposed HVTL route will be the most likely to have their viewshed affected by the transmission line, and are therefore considered potentially high visual sensitivity resources.

Mitigative Measures

Although the transmission line will be a contrast to surrounding land uses, MP & GRE 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:

- Determine location of structures, right-of-way and other disturbed areas by considering input from landowners and land management agencies to minimize visual impacts.
- Preserve the natural landscape to the extent practicable. During construction and operation, prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of the work.
- Cross waterways in the same location as existing bridges to the extent practicable.
- To the extent practicable, locate new transmission lines parallel to existing rights-of-way and property lines (to the extent that such actions do not violate sound engineering principles or system reliability criteria).

Place structures at the maximum feasible distance from highway and trail crossings, within limits of structure design

4.4 Recreation

The Tower area includes Lake Vermilion and is a growing tourist destination due to the highly valued natural resources in the area. Other attractions include the Fortune Bay Casino, the Tower-Soudan Mine State Park, the Iron Ore Trail, the City of Tower Cross Country Ski Trails, the Superior National Forest (SNF), and various state forest lands in the region.

The proposed HVTL route and the proposed Tower Substation site are located adjacent to the Tower Cross Country Ski Trails, but will not transect through, disrupt or affect the trail system. All of the linear alignments in the vicinity of the trails are proposed to be located within existing corridors.

The Iron Ore Trail would be co-located with the proposed HVTL route from near the Tower Substation south to a point approximately one mile southeast of County Highway 26. Recreational trails (i.e., Mesabi Bike Trail) in the area have been located adjacent to transmission lines (between the cities of Eveleth and Gilbert and from Mount Iron to Kinney) and are considered a compatible use.

Boundaries of two units of the SNF occur approximately four miles to the east and three miles to the southwest of the proposed route. The eastern unit boundary axis parallels the entire proposed HVTL route and the southwesterly unit is located near and west of the southern terminus of the proposed route. There are no SNF lands within or immediately adjacent to the proposed route. No other federal public lands occur in the area, including military bases, national wildlife refuges, or national parks.

State forest parcels comprise the majority of state public lands in the Tower and Embarrass areas. Several units of the Bear Island State Forest occur in the area surrounding the proposed route. The nearest unit is located in Kugler Township south of County Road 400, approximately one half mile to the east of the proposed route segment along the Iron Ore Trail. Another unit is located approximately one mile east of the junction of Highway 135 and County Road 303 in Embarrass Township. Other units in the region are three or more miles from the proposed route.

The proposed HVTL route will not affect or transect any MDNR State Forest units.

Mitigative Measures

No mitigation is necessary.

4.5 Transportation

Traffic near the proposed facility will increase during construction. Local motorists may be temporarily inconvenienced by the increase in large construction vehicles on the roadways and possible delays in traffic. Traffic due to the construction workers could be expected to produce local impacts over a 30-minute period at the beginning and end of the day and each time a change in shift occurs.

Mitigative Measures

Because traffic levels may only be slightly, but insignificantly, impacted during construction with no impacts anticipated during facility operation, no mitigation will be required. The operation of the transmission line will have no impact on traffic patterns or usage.

4.6 Land Use

Land uses along the proposed HVTL route are predominantly forest, rural residential, and wetlands as shown on **Figure 4-2**. The northern portion of the proposed route and the substation site is relatively rural with scattered houses and extensive timber production tracts. Wetlands are widespread in this area and bog habitat is common within many wetlands.

The scattered agricultural parcels present are mostly pastures and hay production fields. Timber production tracts and wetlands are the most abundant land use.

Land use along the proposed route does not include any municipal land use areas.

According to the St. Louis County Comprehensive Plan (SLCCP) and related zoning ordinances, the proposed HVTL route is located within two Land Use Districts. The Forestry Agricultural Management District is the primary classification and the Multiple Use Non-Shoreland is the secondary classification land use affected by the proposed project. Uses defined under both classifications state that utilities and electric generating facilities are authorized by Conditional Use permits.

Significant portions of northern Minnesota are comprised of state and federal land, and, to a lesser degree, municipal and county public lands. The majority of these public lands are natural resource-based, providing renewable sources of timber, recreation, and management and protection of natural resources. The majority of the public lands in northern Minnesota is comprised of National Forests, State Forests, and tax forfeiture or school trust parcels.

Within and adjacent to the proposed HVTL route, there are numerous tax forfeiture tracts that are vacant lands often leased for timber production. These parcels are also typically accessible by the public for recreational purposes unless otherwise posted. Whereas the proposed transmission line may transect or abut some of these tax forfeiture parcels, no negative project impacts are anticipated on these vacant lands.

The proposed project is expected to have minimal effects on or changes to land uses, especially in portions of the proposed HVTL route that will be co-located with existing roads and trail rights-of-way. The proposed project is compliant with the conditions set forth for utility lines and electric transmission facilities in the SLCCP and related ordinances.

Mitigative Measures

No mitigative measures are proposed since no impacts are anticipated.

Agriculture

Agriculture is not a primary land use or occupation source in the region. Historically, the region experienced a peak in agricultural land uses around the turn of the twentieth century, after the region was clear cut of forest cover. The experiment failed due to climate and soil conditions, and farming was widely abandoned within a generation.
Despite this trend, there are farms scattered throughout the region. Today, farms in the region produce primarily cattle and hay, with corn (primary livestock forage) produced occasionally
No project effects are anticipated on farms or agriculturally-based economies in the project area. No cultivated fields will be triangulated, severed, or affected by the proposed route or substation/switching station sites.

The draft Soil Survey of St. Louis County was reviewed for potential effects of the proposed project on soils and on Prime, Unique or Farmlands of Statewide Importance (FSI). The NRCS farmland classification database was reviewed to identify soil map units with designated farmland classifications that are transected by the proposed HVTL route and substation/switching station sites. According to the NRCS, there are no soils designated as Prime or Unique affected by the proposed route.

The terms "when treated and managed to acceptable farming methods" clarifies that although soil units may be mapped as FSI, many are not actively farmed or have been improved to produce agricultural products. Typically mitigation is only necessary when FSI units are actively farmed and are designated for agriculture through state legislative mandate. The listed FSI map unit transected by the proposed route or substation/switching station sites is not actively farmed or under any special agricultural designations.

Mitigative Measures

Due to the lack of Prime or Unique farmland in the area, the lack of actively farmed FSI map units, or special agricultural designations, a Farmland Conversion Rating analysis will not be requested from the NRCS and no mitigation for farmland effects will be necessary.

Forestry

Forestry is the predominant land use throughout the region and along the proposed route and substation/switching station sites. Public and private forest lands are managed for timber production and growth management practices. Clear-cutting and selective timber management practices are common. Forested wetlands are often harvested in the winter when access is most optimal. The proposed route and substation/switching station sites transect or are adjacent to timber production tracts throughout the entire project area.

New right-of-way required for the proposed HVTL would result in permanent conversion of forested land uses (including forested and shrub-dominated wetlands) to a linear cleared and maintained right-of-way. The nature of this impact is anticipated to be minimal and no effects on timber production, management, or harvesting are anticipated. Timber harvesting and

production are expected to continue uninterrupted during and after construction of the right-of-way and no economic impacts on timber harvesting or measurable timber losses are anticipated as a result of the project.

Mitigative Measures

No mitigative measures will be required.

Mining

Although there are aggregate mines in the region, there are currently no mines of economic importance in the immediate area of the proposed route or substation/switching station sites. Active iron ore mines are located well south of the project on the Mesabi Iron Range. The once active mine near the City of Tower on the Vermilion Iron Range has been converted into the Tower-Soudan State Park, a showcase of mining history for the region. None of the facilities are in close proximity to the proposed HVTL.

Mitigative Measures

No mitigative measures are necessary because the project will not impact any mining operations.

Prohibitive Sites

The proposed route does not contain prohibitive sites, including:
- National Parks;
- National historic sites and landmarks;
- National historic districts;
- National wildlife refuges;
- National monuments;
- National wild, scenic, and recreational river ways;
- State wild, scenic, and recreational rivers and their land use districts;
- State parks;
- Nature conservancy preserves;
- State Scientific and Natural Areas; and,
- State and national wilderness areas.

4.7 Topography, Soils and Geology

The Vermilion Range formation dominates the northern end of the proposed HVTL route and substation site near the City of Tower and provides more relief in the immediate area. South of Tower, the topography is lower with small gently rolling hills and flat large wetland basins (peat deposits).

The Quaternary glacial geology of the region has influenced the physiography of the project area. A relatively thin layer (<40 feet) of glacial till is overlain on Precambrian bedrock, portions of which are exposed at the surface.

Soils in the project area are comprised of peat, muck, and clay-based hydric soils in the wetlands and a relatively thin layer of glacial till over bedrock in the uplands. The Soil Survey of St. Louis County is still in draft form, has not been published to date, and is not expected to be published within the next three to four years. A draft copy of the soil survey was provided by the St. Louis County NRCS office and is used for this discussion.

According to NRCS data in the draft Soil Survey, the proposed route transects several soil map units classified as Highly Erodible or Potentially Highly Erodible. These soils may be more unstable, subject to water and wind erosion, and may require additional soil BMPs when disturbed. These NRCS classifications apply primarily to agricultural programs implemented by the NRCS.

All of the soil units within wetlands are classified as hydric soils by the NRCS.

An NPDES stormwater permit will be obtained for the larger scale soil disturbances (> one acre) at the substation and switching station sites. Appropriate erosion control BMPs will be applied when soils are disturbed during construction, including implementation of erosion control plans outlined in the SWPPP.

Mitigative Measures

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 the substation and switching station, and these impacts will be short term. There should be no long-term impacts resulting from the project.

Soils will naturally revegetate following construction disturbance. In certain erodible areas, seeding/mulching of the right-of-way may be required to minimize erosion. Areas of larger disturbance (one acre or more), in particular at the substation and switching station sites, will be addressed in the NPDES and SWPPP prepared for the project. Mitigation under the NPDES includes implementation of the SWPPP with the appropriate erosion control methods developed specifically for the site.

4.8 Flora and Fauna

Vegetative communities within and surrounding the proposed HVTL route and substation sites are primarily comprised of forested uplands, forested wetlands, and herbaceous wetland communities common to northeastern Minnesota. Nearly all of the forest cover is second growth and much of it is subject to timber management including clear-cutting, plantings, and growth management practices. Scattered cleared upland tracts are also present mostly in the form of pastures, hayfields, or building sites. Mature older growth mixed conifer forest is present along

the west side of the proposed route within the city of Tower Cross Country Ski Trails area along the west side of the Iron Ore Trail. Mature older growth upland mixed conifer forest is also present in the vicinity of the southern terminus of the proposed route in White Township.

No significant impacts to the older growth forest parcels or to the forest communities are anticipated; the co-location of the proposed HVTL along existing linear corridors is expected to result in little to no impacts on the forest communities or other natural vegetative communities.

Native vegetation that is compatible with the operation and maintenance of the transmission line will be maintained within the transmission line right-of-way. If necessary, native species would be seeded to revegetate areas disturbed during construction.

The proposed HVTL route and substation/switching station sites do not affect, transect, or potentially impact any publicly managed fish and wildlife habitats including WMAs, SNAs, Shallow Game Management Lakes, federal Wildlife Refuges, National Preserves, or other state, federal, or locally managed and designated fish and wildlife resources.

Fuller Creek is a tributary to a designated trout stream, the West Two Rivers (**Figure 4-3**). The West Two River flows east to west and Fuller's Creek enters it from the south and north.

A culvert is located within the West Two River where the railroad (former Duluth Missabe & Iron Range Railroad/Iron Ore Trail) grade crosses. The potential impacts posed by the proposed HVTL aerial crossing will be mitgated by BMPs during construction, minimal removal of vegetation, require no stream fording (due to presence/location of the railroad grade), and no work preformed on the stream banks.

Minimal impacts to fish and wildlife resources are expected as a result of the project. No mass land-clearing activities are proposed that would cause significant potential impacts to nesting birds protected under the Migratory Bird Treaty Act.

Large birds such as raptors are sometimes impacted by power lines through electrocution. This is primarily an electric distribution line issue, as electrocution occurs when birds with large wingspans come in contact with either two conductors, or a conductor and ground (e.g., structure support arms). Transmission line designs used by MP and GRE for this project will not create electrocution hazards; design standards provide adequate spacing to eliminate the risk of raptor electrocution, so there are no concerns about avian electrocution as a result of the proposed project.. Additionally, the proposed HVTL route or substation/switching station sites are not proximal to unique habitats, concentrations, or flight path corridors of migratory birds. Although incidental bird collision with poles or wires after construction is possible, it is unlikely due to the lack of known bird concentrations in the immediate area.

There is a potential for temporary displacement of wildlife during construction and the loss of small amounts of habitat from the project site. Wildlife that inhabits trees that will be removed for the project and organisms that inhabit agricultural areas will likely be displaced. Comparable

habitat is adjacent to the route for both habitat types, and it is likely that these organisms would only be displaced a short distance.

Mitigative Measures

To minimize impacts to trees in the proposed HVTL route, MP and GRE will only remove trees located in the right-of-way for the transmission lines, or that would impact the safe operation of the facility.

Displacement of fauna is anticipated to be temporary in nature. No long term population-level effects are anticipated; therefore, no mitigation is proposed.

The following measures can be used to help avoid or minimize impacts to area vegetation and wildlife resources during and after the completion of the proposed transmission line:

- 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.
- Minimize tree felling and shrub removal that are important to area wildlife.
- Implement raptor protection measures, possibly including placement of bird flight diverters on the line at primary water crossings after consultation with local MDNR staff.
- Revegetate disturbed areas with native species and wildlife conservation species where applicable**.**

4.9 Rare & Unique Natural Resources

The MDNR Natural Heritage Information System (NHIS) was reviewed for potential occurrences of state-listed rare, threatened, or endangered species and sensitive natural resources within the proposed HVTL route and substation sites (**Figure 4-4**). The NHIS was initially reviewed in 2005 for the Certificate of Need process. The NHIS was updated after the 2005 review, resulting in a renumbering of the occurrences to a new code system and some new additional occurrences in the region. The MDNR requested that the nature and location of the NHIS occurrences be kept confidential to protect the species or features from harm or destruction.

State-Listed Species
The 2006 NHIS database included several occurrences in close proximity to or within the proposed HVTL route.

There are a total of nine NHIS occurrences within a half mile radius of the proposed route and substation sites. Descriptions of each occurrence, starting from the north terminus southward, are provided below:

The first two occurrences are located in downtown Tower (Occurrences EO ID #4226 and #3904). Occurrence #4226 is a state-listed Species of Special Concern (SSC) plant species located in a woodlot in town outside of the proposed HVTL route and substation sites. Occurrence #3904 is a state-listed endangered plant occurring in a wetland basin north of the proposed route and substation sites.

Progressing southward, one NHIS occurrence is located in Kugler Township on the east side of Highway 135 and west of the proposed route (Occurrence EO ID #14832). This occurrence was previously identified in the 2005 Certificate of Need Application and is a marsh bird species that is not listed under the Minnesota Endangered Species statutes. The species, the American bittern (*Botaurus lentiginosus*) was heard vocalizing from a wetland during the 2005 field reconnaissance in a nearby wetland.

A cluster of four NHIS occurrences are present further to the south in Kugler Township north of the County Highway 26 crossing (Occurrences EO ID #5451, #5750, #4594, and #19011). All of these occurrences are SSC or unlisted plant species occurring in a publicly-owned wetland (local government-owned) known as the Wahlsten Bog Peatland. The occurrences date back to the 1950s and there is no recent information or updates on the status and specific locations of these occurrences.

The last two NHIS occurrences are located near the southern terminus of the proposed route in White Township. Occurrences #22895 and #22997 are both SSC *Botrychium* fern species that prefer disturbed soils. These were growing in an abandoned logging road when they were documented in 1997

Federal-Listed Species

St. Louis County is within the breeding range of the bald eagle (*Haliaeetus leucocephalus* – federal status, delisted Threatened) and the distributional ranges of the gray wolf (*Canis lupus* – federal status, Threatened) and the Canada lynx (*Lynx canadensis* – federal status, Threatened). The MDNR NHIS also shows federally-listed species occurrences; however, review of the 2006 records shows no designated bald eagle nesting areas within a one-mile radius of the proposed HVTL route or substation/switching station sites.

There are numerous occurrences of the Canada lynx, including breeding records, throughout St. Louis County and northeastern Minnesota. The majority of these occurrences are in or around the SNF. The nearest cluster of records occurs northeast of Tower in Breitung Township, several miles from the proposed route. Occasional records are known and scattered in the vicinity of the project outside of the SNF. No breeding records, known breeding habitats or dens, or observations of lynx are known to be present within the proposed route or substation/switching station sites.

The gray wolf is widely distributed and common throughout the project area and northeastern Minnesota. The gray wolf is a candidate for proposed delisting due to the successful recovery of this animal since it was listed under the federal Endangered Species Act in the mid 1970s.

Mitigative Measures

Because of the nature of the Project, no impacts on the Canada lynx or the gray wolf are anticipated. The co-location of the Proposed Route along existing linear corridors is expected to result in minimal or negligible amounts of habitat losses for these species.

4.10 Archaeological and Historic Features

The proposed project (GRE's funding portion) would receive federal funding from the Rural Utility Service (RUS), a division of the U.S. Department of Agriculture, and may require permitting from the United States Army Corps of Engineers (USACE). Therefore, the applicants must comply with all applicable federal mandates, in particular Section 106 of the National Historic Preservation Act of 1966, as amended. The proposed project also requires permitting from the PUC, and therefore needs to comply with applicable state mandates governing cultural resources. Because there is federal involvement in this project, consultation with RUS, the USACE (if federal permitting is required), the Minnesota State Historic Preservation Office (SHPO), and the federally recognized Native American Tribes is required.

An initial review of the proposed HVTL route by the SHPO determined that "no properties eligible for or listed on the National Register of Historic Places will be affected". Subsequently, in September 2006, a letter from a concerned landowner sent to MP and the SHPO indicated that the proposed project might potentially impact the NRHP-listed Height of Land Portage historic district. Therefore, the SHPO is re-examining the Project. In addition, the federally recognized Bois Forte Tribe and the 1854 Treaty Authority (an inter-tribal natural resource management agency that manages the off-reservation hunting, fishing and gathering rights of the Grand Portage and the Bois Forte Tribe of the Lake Superior Chippewa), have indicated an interest in the proposed project.

The project area for the cultural resources review includes all areas where construction or other ground-disturbing activities might take place. It includes the 300-foot wide route for the proposed 115 kV transmission line, a five-acre area around the proposed substation and switching station located at either end of the proposed HVTL route, and a 300-foot wide route for the two proposed 46 kV circuits that extend from the proposed Tower Substation site at the northern end of the proposed route to the existing 46 kV Line #32.

If the Commission issues the requested HVTL Route Permit, MP/GRE would construct the 115 kV transmission line within a 100-foot wide right-of-way (i.e., alignment) located within the 300-foot wide approved route.

The purpose of the cultural resources assessment is to assess the project area's potential for containing previously unidentified archaeological resources, as well as conduct background research to identify whether any recorded properties present within the proposed project area are listed on or eligible for the NRHP.

Research indicated that two cultural resource studies had been conducted within the project area. Both studies were associated with the Height of Land Portage (also known as *Hauteur de Terre Portage* and Portage of Twelve Poses), which is an NRHP-listed historic district (Lamppa and Lamppa n.d.; Vogel and Stanley 1991). The exact date of the initial study is not known; however, it was prior to 1991, which is the date of the NRHP nomination form for the district. Marvin and Gary Lamppa of the Iron Range Historical Society and Iron Range Railroad and Railway nominated an area known as the Sabin Lake Historic Area. This area contains portions of the Height of Land Portage leading from Sabin Lake, passing the Embarrass River Falls, to a segment of the river that is more navigable (Lamppa and Lamppa n.d.). Although the NRHP nomination was prepared for the Sabin Lake Historic District, it was not listed on the NRHP.

A second study, completed by David G. Stanley and Robert C. Vogel in 1991, field checked the Height of Land Portage from the northern terminus at the Pike River to the southern terminus at Sabin Lake (Vogel and Stanley 1991). Using archival data, they were able to follow the portage, mapping the route on a United States Geological Survey (USGS) topographic map and identifying the integrity of the portage. They determined that segments of the portage still contained high integrity and were even visible from the ground, while other portions, specifically within Section 31 in T60N, R15W, and Sections 25 and 36 in T60N, R16W, have been highly disturbed due to development and logging. Additionally, Vogel and Stanley demonstrated the historical association of the portage to pre-contact and post-contact exploration, fur trade, and settlement to such groups as the Eastern Dakota, Ojibwe, French, British, Initial United States Occupation (1630s–1837), and to Indian Communities and Reservations (1837–1930s). Thus, the Height of Land Portage was nominated to the NRHP in 1991 and was listed in 1992 under NRHP Criteria A and D.

Although it has not been thoroughly investigated archaeologically and it is not officially designated as an archaeological site, the Height of Land Portage historic district (SL-WHT-002, SL-EMB-160, and SL-PIK-039), which transects the current project area near the southern terminus, has the potential for containing as yet unidentified archaeological resources associated with the portage, such as the remains of bivouacs and caches. For this reason, the historic district was listed on the NRHP under Criterion D for its potential to contain archaeological resources that may significantly contribute to the knowledge of this historic district. A brief explanation of the portage's use and significance is provided above. No other sites have been recorded (confirmed) or reported (not field checked) within the current project area.

One site has been recorded outside of the current project area, but within the one-mile study area. Site 21SL836 is considered a Euro-American occupation consisting of moderately disturbed structural ruins and artifact scatters, representing a homestead dating to the post-contact Railroads and Agricultural Development Period (1870s-1940). This site is located approximately 0.7 mile southwest of the proposed Embarrass Switching Station site.

One NRHP-listed architectural history property has been recorded within the current project area. The Height of Land Portage historic district (SL-WHT-002, SL-EMB-160, and SL-PIK-039) transects the current project area near the southern terminus of the proposed HVTL route. A brief explanation of its use and significance is provided above. A second NRHP- listed

architectural history property, the Tower Fire Hall, is located outside of the project area but within the 0.25 mile APE.

The project area is transected by 5.5 miles of the former DM&IR, which is currently being used as a recreational trail (Iron Ore Trail). The project area along this railway was likely previously disturbed during its construction and is therefore considered to have low potential for intact pre-contact archaeological resources.
The project area transects 7.6 miles of nationally inventoried wetlands, portions of which are located adjacent to the former DM&IR. The areas within and immediately surrounding these wetlands are therefore considered to have low potential for pre-contact archaeological resources.

The remaining portions of the project area consist of forested areas that appear to be largely undisturbed, are in proximity to Sabin Lake, Lake Vermilion, Embarrass, Pike, Two, and East Rivers and associated wetlands, and are topographically prominent. These remaining portions of the project area are considered to have moderate to high potential for intact pre-contact archaeological sites.

Based on the locations of the Height of Land Portage historic district and the DM&IR, there are a number of areas that have moderate and high potential for post-contact archaeological sites. Although the exact nature of the archaeological deposits along the Height of Land Portage is unknown, the portions of the project area that come in close proximity to the portage (Embarrass Switching Station) were treated as having high potential for intact archaeological resources. This is largely due to its NRHP listing and the potential to glean new information from archaeological sites along the portage, which may significantly contribute to knowledge of this historic district.

A Phase I archaeological survey, consisting of pedestrian survey in areas with good surface visibility and shovel testing in areas with poor surface visibility, was conducted (in November 2006) within and immediately adjacent to the proposed footprint of the Embarrass Switching Station. The intent was to locate any unknown archaeological resources, especially those associated with the Height of Land Portage. In addition, a visual reconnaissance was completed within the vicinity of the proposed switching station in the area of the historically documented portage route, to attempt to identify and/or relocate the portage route and any other above ground archaeological features.

At the time of the archaeological survey, mixed deciduous and coniferous forest with dense underbrush and leaf litter produced surface visibility near 0 percent. As a result, archaeological investigations in the vicinity of the proposed switching station utilized subsurface testing at 15-meter (m) (49 ft.) intervals within an area of approximately 4.6 acres (149 m by 132 m). A total of 55 shovel tests were placed within this area and were excavated into sterile subsoil. All sediments were screened through 1/4-inch screen and examined for pre-contact and post-contact period artifacts. No artifacts were identified within the shovel tests in the vicinity of the proposed switching station.

Based on a visual reconnaissance and field check of historical documentation for the portage route with a global positioning system, the vicinity of the proposed Embarrass Switching Station no longer exhibits any visual indicators of the existence of the portage.

Shovel tests within the proposed switching station footprint in the vicinity of the portage revealed no soil disturbances in this area. It is possible that this segment of the portage fell out of use due to environmental factors related to the Embarrass River, or possibly it was not accurately illustrated on historic documentation. Previous investigations along the portage south of the proposed switching station site identified segments of the portage that coincided with portage surveys by Stanley and Vogel (1991) and Birk (1976). Both Stanley and Vogel (1991), and Birk (1976), acknowledge that the segment of the portage that transects the proposed switching station site is likely part of the portage as documented by land surveys in the 1820s. However, Birk (1976) also provides an alternate route that parallels the Embarrass River and connects with the river in the vicinity of the present 115 kV power line corridor. This segment, which exists in present day, may have been utilized more extensively due to its shorter length, and may have replaced the longer overland route that is documented in the 1820s surveys.

The negative results of the current survey, the lack of soil disturbance, and the presence of an alternative trail, indicate no archaeological evidence for the portage in the vicinity of the proposed Embarrass Switching Station.

There is potential for undisturbed archaeological deposits associated with the DM&IR, as well as its predecessor, the Duluth and Iron Range Railroad (D&IR). The D&IR between Tower and Embarrass was constructed between 1886 and 1888 (Prosser 1966); however, it is illustrated on an 1882 composite map for Townships 59N and 60N, Range 15W (Trygg 1964), as well as the 1916 St. Louis County plat map (Hixson 1916) and USDA-ASCS 1936–1939 aerial photographs. The location of the railroad remained the same on the 1981 USGS Biwabik NE Quadrangle; however, the name had changed to the Duluth Missabe and Iron Range Railway, which took place in 1937 (Prosser 1966).

The DM&IR is currently being used as a recreational trail (Iron Ore Trail). However, gauging from current aerial photographs (2003–2004), the former railroad grade appears to be intact and is overgrown with vegetation in areas. Thus, the DM&IR has the potential to contain post-contact archaeological deposits greater than 45 years of age associated with the transportation of logging and mining products. Specifically, these locations would include railroad service buildings and switching areas, where there would be higher potential to recover artifacts associated with railroad and logging activities. One such switching area was observed within the project area on the USDA-ASCS 1936–1939 aerial photographs, south of the Town of Kugler in Section 8, T61N, R15W. Such a location may contain surficial and buried archaeological deposits associated with 75 years of railway activities.

Lastly, post-contact archaeological deposits associated with the logging industry must be taken into consideration. Because much of St. Louis County is covered by dense forest, archaeologically sensitive areas for logging activity can be established through the use of historical maps and aerial photographs. These may provide visual signs of roads or trails within

the project area. Because the logging industry was based on the removal and movement of timber, historic roads would be the best source for locating various types of timber-related archaeological sites. Such archaeological properties would include habitation (various types of logging camps), transportation (roads, railroads, dams, bridges), and complex sites (large combinations of the two). Random find spots associated with timber cutting or removal are less likely and more difficult to locate; however, the likelihood for locating such sites is higher within proximity to logging roads and trails (Birk 1998).

Other inventoried and unidentified properties within the 0.25 mile APE, including the DM&IR, have unknown historical values and may be considered eligible for listing on the NRHP.

Properties over 50 years of age within the APE, specifically the former DM&IR, were evaluated to determine their eligibility for listing on the NRHP. Three properties over the age of 50 years are located within the recommended APE:

The DM&IR is located within an approximately five-mile stretch of the project's APE. This rail line has been considered eligible for listing on the NRHP in previous studies conducted by the MNDOT (E. Abel to D. Gimmestad, letter, December 5, 2004. On file at the Minnesota Department of Transportation [S.P. No. 38-090-01].)

A house at 7976 County Road 364 includes a circa-1950 dwelling and a modern garage. This property is recommended as having low potential to be eligible for listing on the NRHP.

A small complex at 7965 County Road 364 includes a circa-1920 dwelling, a small barn, a shed, and a garage. The removal of the front entry, replacement of windows, and application of vinyl siding have significantly altered the house. This property is also recommended as having low potential to be eligible for listing on the NRHP.

The DM&IR Railroad line from Two Harbors to Tower is considered to be eligible for listing on the NRHP. This line was built as the main line of the D&IR Railroad in 1883–1884. The D&IR line was crucial as the shipping port for iron ore and to the development of the Vermilion Range, and to the continued economic viability of both these areas (E. Abel to D. Gimmestad, letter, December 5, 2004. On file at the Minnesota Department of Transportation [S.P. No. 38-090-01].) It is eligible for the NRHP under Criterion A for its significance in the areas of Commerce and Transportation and within Minnesota's Iron Range historic context. Within the project area, the DM&IR line is surrounded by new-growth pine and other trees and has been converted into a recreational snowmobile trail. Its continued use as a linear transportation corridor enhances its historical integrity and the segment is recommended as a contributing segment to the overall line.

Significant under NRHP Criterion A for its associations with the iron extraction industry, the key historical characteristic that defines this historic resource and its historic associations is its route, which conveyed iron ore from the Soudan Mine to the port of Two Harbors. Within the project area, the DM&IR line tracks have been removed and the bed is now used as a gravel snowmobile trail. New growth trees are planted close to the railroad bed, creating a change from its historic appearance, where the line would likely have had a wider right-of-way and have

included a landscape more recently cleared of timber. Despite the changes to the setting and materials, the rail line retains its sense of direction and route. Subject to Route Permit approval and final engineering design, the proposed transmission line alignment would be placed on the east side of the railroad bed, approximately 50 feet from the centerline. Utility lines running parallel with railroads are not out of character for these resources and the removal of vegetation near the railroad would not be uncharacteristic of the historic setting. Because the proposed transmission line would have no impact on the primary characteristic of the line—its route—The 106 Group recommends a finding of no adverse effect to this historic resource.

The project area lies within the "1854 Treaty Area," otherwise known as the Ceded Territory. As part of the 1854 Treaty Agreement, the Chippewa Indians of Lake Superior and the Mississippi ceded this area to the United States Government. The treaty protected the Bands' right to hunt and fish in the Ceded Territory. In 1988, the Fond du Lac, the Bois Forte, and the Grand Portage Bands of the Lake Superior Chippewa negotiated an agreement, which was ratified by the Minnesota State Legislature, stating the Bands would exercise limited treaty rights within the Ceded Territory in exchange for a yearly monetary payment. Today, those treaty rights are implemented by the 1854 Treaty Authority, an inter-tribal natural resource management agency that manages the off-reservation hunting, fishing, and gathering rights of the Grand Portage and the Bois Forte Tribe of the Lake Superior Chippewa (Chippewa Treaty 1854). Both the Bois Forte Tribe and the 1854 Treaty Authority have indicated an interest in the proposed Project and informal consultation with them is ongoing. Also, RUS is in the process of initiating formal consultation with all of the appropriate federally-recognized tribes.

On October 11, 2006, MP/GRE and The 106 Group met with Rose Berens, the Bois Forte Tribal Historic Preservation Officer (THPO) and Director of the Bois Forte Heritage Center and Cultural Museum; Bill Latady, Curator at the Bois Forte Heritage Center and Cultural Museum; and Dave Woodward, the 1854 Treaty Authority Cultural Resources Specialist, to discuss the preliminary results of the cultural resources assessment and attempt to identify areas of cultural significance within the Project that may need to be investigated during future stages of survey work. Rose Berens and David Woodward agreed with The 106 Group's methodology for determining areas of high and moderate archaeological potential, but recommended that the Phase I survey to be conducted within the project area include a systematic pedestrian survey of the entire project area (excluding areas inundated with water), to attempt to locate any above ground features that may not be depicted on historical maps or aerial photographs. Rose Berens also invited The 106 Group ethnographer and archaeologists to meet with elders and spiritual leaders for the Bois Forte Tribe in an attempt to identify other areas of traditional cultural significance that may be located within the project area. The 106 Group also extended an open invitation to any member of the Bois Forte Tribe and 1854 Treaty Authority to visit the project area during any archaeological fieldwork scheduled in 2006 and spring 2007.

On October 17, 2006, MP and The 106 Group met with Dennis Gimmestad, the SHPO Review and Compliance Officer; David Mather, the SHPO National Register Archaeologist; and Brad Johnson, the USACE St. Paul District Archaeologist, to discuss the preliminary results of the cultural resources assessment, the recommendations made by the Bois Forte Tribe and the 1854 Treaty Authority in the October 11 meeting, and determine the appropriate level of survey effort

for this project. Concerning archaeology, David Mather also agreed with The 106 Group's recommendations of areas that have high or moderate archaeological potential, and agreed with the recommendation of the Bois Forte Tribe and 1854 Treaty Authority that a systematic pedestrian survey of the project area be conducted. In addition, Mather suggested that the Phase I survey of the proposed Embarrass Switching Station site, which is in proximity to the NRHP-listed Height of Land Portage, and a visual reconnaissance survey of the area surrounding the proposed switching station be conducted (completed November 2006).

Regarding architectural resources, Dennis Gimmestad recommended that the proposed 0.25-mile APE be re-examined and narrowed, if possible. Once completed, the structures located within the revised APE should be examined to determine if a Phase I architectural history survey is needed. Gimmestad also recommended that the former DM&IR be evaluated to determine its eligibility for listing on the NRHP. If eligible, the potential effects to the property should be analyzed. In addition, Gimmestad recommended an analysis of potential effects the proposed project may have on the cultural landscape of the Height of Land Portage.

A Phase I archaeological survey of the project area will be conducted in spring 2007. This survey will include a pedestrian survey of the entire corridor (excluding areas inundated with water). Subsurface testing will be conducted in areas identified during the pedestrian survey as having high potential to contain archaeological sites, and that will or may be impacted by construction activities.

Mitigative Measures

As discussed above, the proposed Embarrass Switching Station site is located in the vicinity of the Height of Land Portage. A Phase I survey conducted in November 2006 (at and around the switching station footprint) indicated no archaeological findings, therefore no impacts to cultural resources sites in the proposed switching station site area are anticipated.

An additional Phase I survey will be conducted in spring 2007 along the proposed HVTL route to determine whether any cultural resources are present within the proposed transmission line construction area. If any archaeological sites are identified during the spring survey, the particular site will be avoided and the poles placed outside the specified buffer zone.

The MP and GRE will make every effort to avoid impacts to identified archaeological and historic resources. In the event that an impact would occur, the Applicants will consult with SHPO and invited consulting parties (particularly the Bois Forte and other state and federal permitting or land management agencies). While avoidance of the resource would be the preferred action, mitigation for project-related impacts on NRHP-eligible archaeological and historic resources may include an effort to minimize project impacts on the resource and/or additional documentation through data recovery.

4.11 Air Quality

The only potential air emissions from a 115 kV transmission line result from corona and are limited. Corona consists of the breakdown or ionization of air in a few centimeters or less immediately surrounding conductors, and can produce ozone and oxides of nitrogen in the air surrounding the conductor. For a 115 kV transmission line, the conductor gradient surface is usually below the air breakdown level. Typically, some imperfection such as a scratch on the conductor or a water droplet is necessary to cause corona. Ozone is not only produced by corona, but also 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, humidity (or moisture), the same factor that increases corona discharges from transmission lines, inhibits the production of ozone. Ozone is a very reactive form of oxygen and combines readily with other elements and compounds in the atmosphere. Because of its reactivity, it is relatively short-lived. The project area presently meets all federal air quality standards.

Currently, both state and federal governments have regulations regarding permissible concentrations of ozone and oxides of nitrogen. The national standard is 0.08 ppm on an 8-hour averaging period. The state standard is 0.08 ppm based upon the fourth-highest 8-hour daily maximum average in one year.

During construction there will be emissions from vehicles and other construction equipment and fugitive dust from ROW excavation and clearing activities. Temporary air quality impacts caused by the proposed construction-related emissions are expected to occur during this phase of activity.

Mitigative Measures

There will be no significant adverse air quality impacts to the surrounding environment because of the short and intermittent nature of the emission and dust-producing construction phases. No mitigation measures are necessary for the construction of the transmission lines.

4.12 Water Resources (surface water/wetlands)

There are no large lakes (>60 acres) within the proposed HVTL route or substation sites. The north end of the proposed route near the city of Tower is within the watershed of a small creek system comprised of West Two Rivers creek and Fullers creek, which merge and flow north to Lake Vermilion. The middle section of the proposed route encompasses the upper reaches and watershed of the Pike river, which flows west. The main channel and two branches of the Embarrass river are located within the south end of the proposed route and flow in a southwesterly direction within the area.

According to the designated floodplain maps of the Federal Emergency Management Agency, 100-year floodplains are present along the channels of all three of the above-mentioned rivers

including the Fullers Creek and West Two Rivers creek system, Pike River and its upper tributaries, and the Embarrass River in the proximity of the proposed HVTL route.

The proposed route will transversely cross Fullers creek twice, transversely cross the Pike river, and transversely cross the Embarrass river. No longitudinal crossings are proposed.

Given the nature of the HVTL projects, minimum to no floodplain fill or disturbance is anticipated and the effects of the installment of any poles within the floodplain are expected to be negligible.

The wetlands within the proposed HVTL route are mapped on the National Wetland Inventory (NWI) (United States Fish and Wildlife Service (USFWS) 1979, 1983) and were confirmed in a 2005 and 2006 field reconnaissance. Wetlands are common and widespread throughout northern Minnesota, and the project area is no exception.

Wetlands within the proposed route are typically large, influenced and defined by topography, and often interconnected. The larger wetlands trend on an east-west axis but are also highly-configured shaped polygons. Small, isolated depressions are also present, but less common. These small isolated basins typically occur within forest settings or former forest that has been converted

No permanent impacts to water bodies or wetlands are anticipated.

Mitigative Measures

Standard erosion control measures and best management practices (BMP) will be utilized to minimize potential impacts.[11] An NPDES permit and SWPPP will be prepared for the project.

No additional mitigation is necessary.

4.13 Human Health and Safety

The proposed transmission line will be designed to meet or exceed the National Electric Safety Code.[12] Appropriate standards will be met for construction and installation, and all applicable safety procedures will be followed after installation. The proposed transmission line would be equipped with protective devices to safeguard the public from the transmission line if an accident occurs and a structure or conductor falls to the ground. The protective equipment would de-energize the line when an event occurred. In addition, the substation facilities will be fenced, and access will be limited to authorized personnel.

[11] http://www.pca.state.mn.us/publications/wq-strm2-05.pdf
[12] http://www.ieee.org/portal/index.jsp

Electric and Magnetic Fields

The HVTL will be constructed to comply with Rural Utilities Service (RUS) as well as the National Electric Safety Code (NESC).[13] These standards are designed to minimize human health risks from electric and magnetic fields to nationally acceptable standards.

Electric and magnetic fields (EMF) arise from the flow of electricity and the voltage of a line. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors. There is no state or federal standard for transmission line electric fields. However, in previous cases, the Minnesota Environmental Quality Board (EQB) has imposed, in its transmission line permits, a maximum electric field limit of 8 kV/meter measured one meter above the ground.

The restriction was designed to prevent serious hazard from shocks when touching large objects like a bus or combine parked under high voltage transmission lines, usually 345 kV or greater. The electric field of this project will not exceed 8 kV/meter. Many years of research on the biological effects of electric fields have been conducted on animals and humans. No association has been found between exposure to electric fields and human disease. The possible effect of EMF exposure on human health has been a matter of public concern over the past few years. While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields can cause biological responses or even health effects continues to be the subject of research and debate.

The most current and exhaustive reviews of the health effects from power-frequency fields conclude the evidence of health risk is weak and do not support the allegation of a major public-health danger. The National Institute of Environmental Health Sciences (NIEHS) issued its final report on June 15, 1999, following six years of intensive research. It concluded that the scientific evidence that extra low frequency EMF exposures pose any health risk is weak. The NIEHS was the lead government agency in directing and carrying out a congressionally mandated research program on EMF.

The Minnesota Department of Health (MDH) issued "An Assessment of Health Effects Research on Electric and Magnetic Fields" in January of 2000. The MDH concluded the following:

> *"…the current body of evidence does not show that exposure to these fields is a health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer or any other adverse human health effect.*
>
> *The current body of research lacks fundamental evidence to support a cause and effect relationship between magnetic fields and childhood leukemia. This conclusion is based on laboratory studies, which have failed to demonstrate adverse health effects or a plausible biological mechanism of causation (in vivo and in vitro).*

[13] http://www.usda.gov/rus/electric/

> *As with many other environmental health issues, the possibility of a health risk from EMF cannot be entirely dismissed. The MDH considers it prudent public health policy to continue to monitor the EMF research and to support prudent avoidance measures, such as providing information to the public regarding EMF sources and exposure."*

Electric utilities monitor and review research on the EMF issue and where possible, incorporate these conclusions in its planning and operation of power lines and substations.

There are currently no Minnesota regulations pertaining to magnetic field exposure. Electric utilities provide information to the public, interested customers and employees so they can make informed decisions about EMF. This includes measurements for customers and employees who request them.

Past decisions have reflected that the scientific data does not show any significant risk of health effects due to exposure to magnetic fields. Policy decisions have continued to support the construction of electric infrastructure, taking into consideration the most recent information available on the issue.

The proposed 115 kV single circuit transmission line will have a maximum electric field density of approximately 1.5 kV per meter, at centerline, one meter above ground. This is significantly less than the maximum limit of 8 kV per meter that has been a permit condition imposed by the EQB in other HVTL applications. The EQB standard was designed to prevent serious hazard from shocks when touching large objects, such as tractors, parked under extra high voltage transmission lines of 500 kV or greater.

Figure 4-5 provides the electric fields at maximum conductor voltage for the proposed 115 kV transmission line. Maximum conductor voltage is defined as the nominal voltage plus five percent.

Figures 4-6 and 4-7 provide the estimated magnetic fields based on the proposed line and structure design. The expected magnetic field for the proposed structure type and phase current has been calculated at various distances from the center of the pole in milligauss.

Stray Voltage

Stray voltage is defined as a natural phenomenon that can be found at low levels between two contact points in any animal confinement area where electricity is grounded. Electrical systems, including farm systems and utility distribution systems, must be grounded to the earth by code to ensure continuous safety and reliability. Inevitably, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops. This voltage is called neutral-to-earth voltage (NEV). When a portion of this NEV is measured between two objects that may be simultaneously contacted by an animal, it is frequently called stray voltage.

Stray voltage is not electrocution, ground currents, EMFs, or earth currents.

Stray voltage has been raised as a concern on some dairy farms because it can impact operations and milk production. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm affecting farm animals that are confined in areas of electrical use. In those instances when transmission lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was directly under and parallel to the transmission line. These circumstances are considered in installing transmission lines and can be readily mitigated.

No stray voltage issues are anticipated with this project.

Mitigative Measures

There are no mitigative measures necessary to address human health and safety.

4.14 Radio and TV Interference

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

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

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

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

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

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel tower) may experience interference because of signal blocking effects. Movement of either mobile unit so that the metallic structure is not immediately between the two units should restore communications. This would generally require a movement of less than 50 feet by the mobile unit adjacent to a metallic tower. Because no steel towers are anticipated for the proposed 115 kV line, this will not be a problem. Noise in the frequency range of cellular

type phones is almost non-existent and the technology used by these devices is superior to that used in two-way mobile radio.

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

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

TV picture reception interference can also be the result of a transmission structure blocking the signal to homes in close proximity to a structure. Because the structures proposed for this Project would be wood, this is unlikely to occur. However, measurements can be made to verify whether a structure is the cause of reception

Mitigative Measures

No interference issues are anticipated with this project.

5.0 ALTERNATIVE ROUTES

During the initial public information/scoping meeting much concern was raised about those portions of the proposed HVTL route (approximately 6 miles) that shared the corridor along the Iron Ore Trail. The Iron Ore Trail consists of former Duluth Missabe & Iron Range Railroad (DM&IR) grade that has been deeded back to the current land owners. The landowners, in an agreement with a local snowmobile club (i.e., Penguin Snowmobile Club), have granted limited access to the former railroad grade to be used as a snowmobile trail.

Additionally, a desire to maximize the use of public lands, especially those in tax forfeiture, rather than privately owned property was strongly expressed.

Another meeting was held in Tower on February 21, 2007; this meeting was moderated by DOC EFP staff and participates included affected landowners, snowmobile club members, MP & GRE staff, and representatives from the MDNR and St. Louis County. The purpose of the meeting was to facilitate the group of concerned citizens in the development of a viable alternative route that maximized the use of public owned lands and moved the proposed HVTL route away from the Iron Ore Trail. As a result of this meeting two alternative routes were put forth for consideration: the "Citizens' Public Lands Route East" (Alternative Route B) and the "Citizens Public Lands Route West" (Alternative Route C). **Figure 5-1** shows the general location of the two alternative routes.

Due to the close geographic proximity, all three HVTL routes (i.e., MP/GRE's proposed route, Public Lands Route East, and the Public Lands Route West) entail similar impacts on the human and natural environment. A discussion of these impacts and mitigative measures can be found in the preceding sections of this document. There are, however, some notable differences concerning the alternative routes.

The two alternative routes move the HVTL away from developed areas to more undeveloped areas (i.e., "greenfield"), resulting in an increase in the required acreage cleared. A "greenfield" route segment would require a 100' wide clearing; route segments following a road or former railroad grade would require a 65' to 75' wide clearing.

The alternative routes would avoid the recreational trail (i.e., Iron Ore Trail).

The alternative routes avoid the paralleling and the three crossings of Fuller Creek (a designated trout stream tributary) that currently exist along the former railroad grade. The alternatives routes do include a new crossing of the West Two Rivers (a designated trout stream); as discussed in Section 4.12, the direct impacts of construction and operation of HVTLs on lotic (flowing water) systems can be successfully mitigated with the application of BMPs.

The alternative routes utilize public lands (i.e., tax forfeited) to a greater degree, thereby avoiding bisecting private holding and resulting in less impact to private landowners.

Figures 5-2 and 5-3 overlay the HVTL routes onto aerial photographs so that land features can be readily seen.

Table 5-1 provides a comparison of the preferred and alternative routes on selected characteristics of the human and natural environments.

Minnesota Rules 4400.2100 requires an applicant for a HVTL to identify any routes that were considered and the reasons for rejecting them. See the *Minnesota Power and Great River Energy Application to the Minnesota Public Utilities Commission for a Route Permit, December 2006*, for a discussion on rejected routes.

6.0 OTHER PERMITS AND APPROVALS REQUIRED

Table 6-1 contains a list of the anticipated permits and associated environmental approvals required for the Tower HVTL project. Compliance with the terms of all applicable and relevant regulatory permits and approvals will be a condition of any Site Permit issued by the PUC.

7.0 ACRONYMS, ABBREVIATIONS and DEFINITIONS

ACRONYMS	
AC	Alternating Current
ACSR	Aluminum Conductor Steel Reinforced
APE	Area of Potential Effect
BMPs	Best Management Practices
BPA	Bonneville Power Administration
Commission	Minnesota Public Utilities Commission
CSAH	County State Aid Highway
dB(A)	Decibel (A-weighted)
D&IR	Duluth & Iron Range Railroad
DM&IR	Duluth Missabe & Iron Range Railroad
EMF	Electromagnetic Fields
EPA	Environmental Protection Agency
EQB	Minnesota Environmental Quality Board
FAA	Federal Aviation Administration
FACW	Facultative Wet
FEMA	Federal Emergency Management Agency
FSI	Farmlands of Statewide Importance
GRE	Great River Energy
HVTL	High Voltage Transmission Line
ICD	Implantable Cardioverter/Defibrillator
IRR	Iron Range Resources
kV	Kilovolt
kV/m	Kilovolt per meter
LCP	Lake Country Power
MBTA	Migratory Bird Treaty Act
MDNR	Minnesota Department of Natural Resources
MNDOT	Minnesota Department of Transportation
ma	Milliampere
mG	Milligauss
MHz	Megahertz
MISO	Midwest Independent Transmission System Operator
MP	Minnesota Power
MPCA	Minnesota Pollution Control Agency
MVA	Megavolt-ampere
MW	Megawatt
NAC	Noise Area Classifications
NESC	National Electric Safety Code
NIEHS	National Institute of Environmental Health Sciences
NHIS	Natural Heritage Information System

ACRONYMS	
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Properties
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OBL	Obligate
ppm	parts per million
RS	Route Segment
RUS	Rural Utilities Service
SHPO	Minnesota State Historic Preservation Office
SLCCP	St. Louis County Comprehensive Plan
SNAs	Scientific and Natural Areas
SNF	Superior National Forest
SSC	Species of Special Concern
SWPPP	Stormwater Pollution Prevention Plan
THPO	Tribal Historic Preservation Officer
USACE	United States Army Corps of Engineers
USDOE	United States Department of Energy
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WMAs	Wildlife Management Areas
WPAs	Waterfowl Production Areas

TABLES

FIGURES

APPENDIX A

APPENDIX B

APPENDIX C