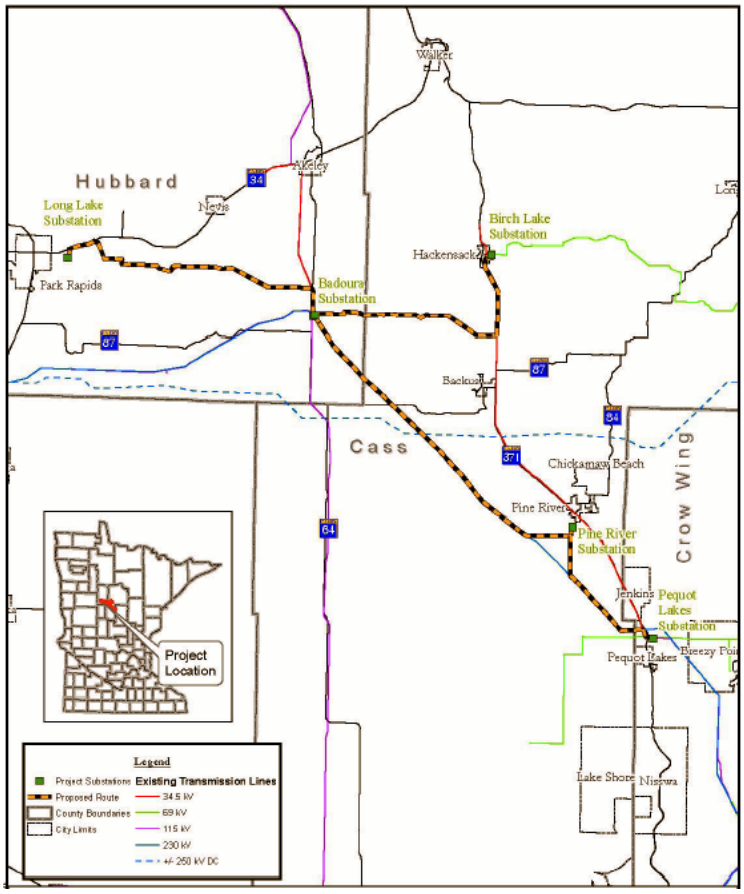
# ENVIRONMENTAL ASSESSMENT

## BADOURA TRANSMISSION PROJECT
## HIGH VOLTAGE TRANSMISSION LINE

## PUC DOCKET NO. ET2, E015/TL-07-76

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**JULY 2007**

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# Abstract

Minnesota Power (MP) and Great River Energy (GRE) have submitted a HVTL Route permit application for its proposed Badoura Transmission Project pursuant to the provisions of the Power Plant Siting Act (Minnesota Statutes Sections 116E.001 to 116E.18). MP would construct and own the new Pine River 115 kilovolt (kV) Substation and the new 115 kV transmission line between the Pequot Lakes, Pine River and Badoura substations (approximately 30 miles). GRE would construct and own the new 115 kV transmission line between the Badoura Substation and the Birch Lake Substation, and between the Badoura Substation and the Long Lake Substation (approximately 33 miles). Equipment modifications would be made at the Pequot Lakes, Badoura, Birch Lake and Long Lake substations to accommodate the new 115 kV transmission line.

The application is being reviewed under the Alternative Review Process (Minnesota Rules 4400.2010) of the Power Plant Siting Act (Minnesota Statutes 116E.001 to 116E.18). 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. 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=19051 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=19051. The final Route Permit issued to Minnesota Power and Great River Energy will also appear on this webpage.

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# 1.0 INTRODUCTION

Minnesota Power (MP) and Great River Energy (GRE) filed the High Voltage Transmission Line (HVTL) route permit application on January 12, 2007. On March 29, 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. Chapter 5 addresses the alternative route (Segment 9), and Chapter 6 describes the additional permits that may be required for this project.

## 1.1 Project Description

MP and GRE propose to construct approximately 63 miles of overhead 115 kV transmission line and associated substation modifications to meet the growing electrical load of the Badoura project area. The Proposed Route is located between the endpoints of Pequot Lakes, Pine River, Badoura, Hackensack and Park Rapids and traverses through Cass, Crow Wing and Hubbard counties.

**Figure 1-1** illustrates the proposed project area.

## 1.2 Project Location and Proposed Route

MP and GRE will each own specific segments of the proposed HVTL project. The segments are shown on **Figure 1-2** and are described below.

***Segment 1: Pequot Lakes Substation to Pine River Substation (Minnesota Power)***
The line will exit the Pequot Lakes Substation to the north and then will turn west and parallel existing MP 34.5 kV and GRE 69 kV lines for approximately 2300 feet. It will then turn northerly paralleling the MP 34.5 kV line for approximately 2200 feet to the intersection with an existing 230 kV line (identified as the 91 Line and owned by MP). It will then share right-of-way with the 91 Line to near the intersection with Cass County State Aid Highway (CSAH) 1. At this point the line will proceed due north on the east side of CSAH 1 to the Pine River Substation.

***Segment 2: Pine River Substation to Badoura Substation (Minnesota Power)***
The new line will exit the Pine River Substation and travel south along the east side of CSAH 1 (115 kV double circuit with Pequot to Pine River 115 kV Line) for approximately 0.5 mile. It will then turn west to the south side of County Road (CR) 171 to its intersection with the 91 Line. It then proceeds northwesterly and again shares right-of-way with the 91 Line to its termination at the Badoura 115 kV Substation.

MP owns the Pequot Lakes and Badoura substations and will own all the equipment additions. Crow Wing Power (CWP) owns the existing Pine River 34.5/12.5 kV Distribution Substation and 12.5 kV distribution and will own the 115/12.5 kV transformer addition. MP will own the 115 kV bus, 115/34.5 kV transformer addition, and 34.5 kV feeders and associated equipment additions. CWP will continue to own the Pine River 12.5 kV Distribution Substation and MP will either own the land its facilities are located on or have a permanent easement for its facilities to be located within the substation with CWP. Within the new substation, MP will own and operate all the high voltage (115 kV) facilities. MP and CWP will separately own and operate their respective low voltage distribution facilities.

***Segment 3 : Badoura Substation to TH 371 (Great River Energy)***
GRE will own this segment of the 115 kV transmission line east out of the Badoura Substation. It will follow and replace an existing MP 34.5 kV line to a point (referred to as the 507/516 tie switch) east of TH 371.

***Segment 4: TH 371 to Birch Lake Substation (Great River Energy)***
This segment precedes northerly paralleling TH 371 to its termination at the Birch Lake Substation in Hackensack.

The Birch Lake Substation and the common facilities (land, fence, etc.) are owned by GRE. GRE will own all of the 115 kV equipment and MP will operate all the 115 kV facilities in the Birch Lake Substation. GRE will operate the 69 kV facilities and MP will operate the 34.5 kV facilities in this substation.

***Segment 5: Badoura Substation to Long Lake Substation (Great River Energy)***
GRE will own this segment of the 115 kV transmission line north and west out of the Badoura Substation. It will follow and replace an existing MP 34.5 kV line to its termination at the Long Lake Substation near Park Rapids. In the immediate vicinity of Park Rapids, there will be approximately two miles of 115 kV transmission line with 34.5 kV distribution underbuild.

The Long Lake Substation and the common facilities (land, fence, etc.) are owned by GRE. MP will operate all of the high side equipment within this substation.

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 MP and GRE standards. Appropriate standards will be met for construction and installation, and all applicable safety procedures will be followed during and after installation.

***Pequot Lakes Substation***

Modifications to the Pequot Lakes Substation will include a new 115 kV line entrance and modification of the existing 115 kV bus to improve reliability. This will include the addition of two 115 kV line breakers, a 115 kV bus tie breaker and associated controls. No new land will be required for these additions; however, the fenced area will be expanded by less than one acre. See Section 5.3.2, Pequot Lakes Substation, for additional details.

***Pine River Substation***

Two sites are under consideration for the project's connections to the Pine River area 34.5 kV and 12.5 kV systems: an expansion at the existing Pine River Distribution Substation and relocation of the 34.5 kV facilities. The additional equipment required for the project is dependent on the final location of the 115/34.5 kV facilities.

Expansion at the existing Pine River distribution substation would involve a 115 kV bus to be added with 115 kV bays to accommodate two 115 kV line exits, a 115/34.5 kV transformer, a 115/12.5 kV transformer and associated protection. In addition, a new 34.5 kV bus and two 34.5 kV feeder exits and associated switchgear would be added, as well as a 12.5 kV bus to connect the low side of the 115/12.5 kV transformer to the existing CWP 12.5 kV bus. Lastly, a control house (approximately 20 x 24 feet) would be constructed inside the fence near the terminus of the access road. The upgraded access road would be aggregate surfaced with Class 5 material.

At the new substation site, only 115 kV and 34.5 kV additions would be needed. This would include a 115 kV bus with 115 kV bays to accommodate up to three 115 kV line exits, a 115/34.5 kV transformer, and associated protection. The 34.5 kV additions would include a 34.5 kV bus and two 34.5 kV feeder exits and associated switchgear. An access road would be constructed and surfaced with Class 5 material and a control house (approximately 20 x 24 feet) would be constructed inside the fence near the terminus of the access road.

In addition to the above facilities, the 34.5/12.5 kV transformer at the existing CWP Pine River Substation would be replaced with a 115/12.5 kV transformer. This would require development of a 115 kV bus, including a 115 kV line entrance and associated protection, as well as a 12.5 kV bus between the low side of the 115/12.5 kV transformer and the existing CWP 12.5 kV bus. A radial 115 kV transmission line would be constructed between the "new substation site" and the upgraded CWP distribution substation.

***Badoura Substation***

Additions at the existing Badoura 115 kV substation would include three new 115 kV line exists, associated bus work, circuit breakers and control facilities. In addition, existing line entrances would be reconfigured to improve area reliability and a 115 kV tie breaker will be added. No additional land would be required for the substation upgrades; however, the fenced area would be expanded by less than one acre.

***Birch Lake Substation***
Additions at the Birch Lake Substation include one 115 kV line exit and 115/69 kV, 60 MVA transformer and associated circuit breakers, protection and controls. To accommodate the new transformer addition and line entrance, a new 115 kV bus structure will be built and the existing transformer and 34.5 kV line exits will also have to be modified. The existing fenced-in area may be expanded by less than one acre to provide room for new 115 kV structure, transformer and 34.5 kV modifications.

***Long Lake Substation***
When GRE constructed the Long Lake Substation, it was designed to accommodate a second 115 kV line exit and transformer. Additions as part of this Project include bringing the proposed 115 kV line into the substation, and a second 115/34.5 kV, 50 MVA transformer and associated circuit breaker and controls. The Itasca-Mantrap Park Rapids Distribution Substation will also be relocated to the Long Lake Substation. These substation additions will not require additional land and the fenced area is not expected to be expanded.

## 1.3 Right of Way Requirements

The right-of-way (easement) width requirement for this 115 kV transmission HVTL project will range from 75 to 100 feet depending on structure design types. Single pole right-of-way requirements could be reduced in certain higher density, developed areas.

The required right-of-way width may also be less in areas where the new transmission line follows an existing linear corridor such as a road or trail. MP and 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. In some select areas, additional right-of-way may be needed to accommodate longer spans or other special design requirements identified during the final survey. Right-of-way width depends on conductor blowout and the recommended clearances to obstructions along the proposed route.

***Segment 1***
The HVTL line will exit the Pequot Lakes Substation to the north and then will turn west and share right-of-way with existing MP 34.5 kV and GRE 69 kV lines for approximately 2300 feet. It will then turn northerly paralleling the MP 34.5 kV line for approximately 2200 feet to the intersection with an existing 230 kV line (identified as the MP 91 Line). Up to 100 feet of additional right-of-way will be required for this section and existing easements will need to be amended.

The line will then turn northwest and share right-of-way with the MP 91 Line to an intersection with CSAH 1. The existing 215-foot MP 91 Line right-of-way allows for placement of a second circuit and will be adequate for the proposed 115 kV line design. The transmission structures will be placed on the north side of the existing right-of-way. Existing easements in this section will be reviewed and possibly amended. The line will then parallel CSAH 1 to its termination point at the Pine River Substation (approximately 2.8 miles). An easement of up to 100 feet will be required for this section.

***Segment 2***

The new line will exit the Pine River Substation and travel south paralleling CSAH 1 (as 115 kV double circuit with the Pequot to Pine River 115 kV Line) for approximately 0.5 mile. It will then turn west and parallel CR 171 on its south side to its intersection with the MP 91 Line (approximately 2.5 miles). An easement of up to 100 feet will be required for this section.

The line will then proceed northwesterly and again share right-of-way with the MP 91 Line to its termination at the Badoura 115 kV Substation. The existing 215-foot MP 91 Line right-of-way allows for placement of a second circuit and will be adequate for the proposed 115 kV line design. The transmission structures will be placed on the north side of the existing right-of-way. Existing easements in this section will be reviewed and possibly amended.

***Segment 3***

Segment 3 will make use of centerline easements for the existing MP 507 Line that will be replaced. This distribution line is located close to 140th Street in Hubbard County and 16th Street in Cass County. These existing easements will need to be revised to incorporate a right-of-way width of up to 100 feet.

***Segment 4***

Segment 4 precedes northerly paralleling TH 371 to its termination at the Birch Lake Substation in Hackensack. MP currently has relatively narrow (40-50 foot) easements for its 34.5 kV line along TH 371 in this segment; however, it is unknown at this time if there is sufficient room to accommodate the proposed 115 kV line within or parallel to this easement. In addition, MNDOT has long-term plans to widen this section of TH 371, which further complicates routing in this area. The Applicants are reviewing the alignment options within the 2000-foot corridor along this segment.

***Segment 5***

Segment 5 will replace an existing MP feeder and make use of existing right-of-way to the extent possible. This right-of-way parallels state and county roads for a large portion of its length. Existing easements will need to be revised and some new easements obtained. Depending on structure type, the easements will cover a right-of-way width of up to 100 feet.

***Land Acquisition***

Land rights acquisition will begin once approvals are received from the various state, federal and local agencies, and governmental units. Land rights include easement acquisition in the case of a transmission line, or acquisition of a fee interest for the proposed substation. As a general practice, landowners will be contacted to review project details and to discuss the initial phase of the transmission Project, including survey and soil investigation. Upon completion of the survey and preliminary design, landowners will be contacted again and easement/fee acquisition negotiations will commence.

During the acquisition phase of the Project, landowners are given a copy of the conveyance documents generally including easements, deeds, structure design or photos, offer sheets, and a

plan showing the proposed transmission line or facility relative to the landowner's property. Additional information may also be given to each landowner explaining power line safety, easement acquisition procedures, and damage settlement. In addition to permanent easements necessary for the construction of the line, temporary easements may be obtained from certain landowners for temporary construction, access, or staging areas for temporary storage of poles, vehicles, or other related items. Landowners will be notified in the event site access for soil boring is required to determine soil suitability in areas where certain soil characteristics may require special transmission structure design.

***Transmission Structures***

Three structure types are being considered for use in segments 1 and 2: wood H-Frame, wood single pole, and double circuit steel pole. **Figure 1-3** shows the cross section views of these 115 kV transmission line structures.

The MP two-pole H-Frame structure design will be used principally in the 91 Line (230 kV) corridor because it is suited for areas with rugged topography, soft soils, and where longer spans are required to avoid or minimize placement of structures in wetlands or waterways. This structure may also be used in areas where the line diverges from the 91 Line corridor where longer spans and shorter structure heights are appropriate. The average span would be 600 to 900 feet, with 1,000-foot spans achievable in certain topography. The structure height would average 60 to 90 feet, with taller structures required for exceptionally long spans and in circumstances requiring additional vertical clearance (i.e., railroad tracks) exceeding the NESC requirements.

The single pole steel double circuit pole design is used in areas where it is appropriate to support two high voltage circuits on the same structure. The advantage of this design is less right-of-way requirement; disadvantages of this design are poor performance in soft soils and a single failure mode can result in the loss of both high voltage circuits. Loss of both circuits would not have a significant impact on reliability if the two circuits serve different purposes; however, if the two circuits serve the same purpose it can have a significant impact on reliability of service. Due to reliability concerns, this structure type is planned to be used only in the immediate vicinity of the Pine River Substation.

The typical span would be 550 feet with slightly longer spans achievable with certain topography. The structure height would average 75 to 95 feet.

Single pole with davit arms construction (no underbuild) is being considered for the area exiting the Pequot Lakes Substation to the point it joins the MP 91 Line right-of-way. This structure type is also being considered as an alternative for the area where the line diverges from the MP 91 Line right-of-way to near the Pine River Substation if the final route is along CR 171 and CSAH 1.

The single pole design is suited for areas where available right-of-way is limited, such as where corridors are shared along roads in developed areas. Average structure height would be 65 to 80

feet to achieve average span lengths of 400 to 600 feet. Specific structure heights and span lengths may exceed the average due to land use requirements and topography.

H-Frame construction is also being considered for these same areas and structure selection will be dependent on actual alignment of the line. For example, for the area near Pine River, if the line is located behind the homes it may be more appropriate to use H-Frame structures to increase span length. As mentioned above, if the line is located adjacent to the road, it may be appropriate to use single pole construction to limit right-of-way width. Near Pequot Lakes the plan is to share right-of-way with existing MP 34.5 kV and GRE 69 kV circuits. If it is determined that longer spans are more appropriate for this area, H-Frame would be used. If new right-of-way needs to be limited, single pole would be the more appropriate structure.

Four structure types are being considered for use in segments 3 and 4: wood H-Frame, wood single pole-post (THP), wood single pole braced post (TBP), and wood single pole with distribution underbuild (THP-U). **Figure 1-4** shows the cross section views of these 115 kV transmission line structures.

The GRE two-pole structure H-Frame design will be used in areas with rugged topography and where longer spans are required to avoid or minimize placement of structures in wetlands or waterways. The average span would be 600 to 700 feet, with 1,000-foot spans achievable with certain topography. The structure height would average 60 to 80 feet, with taller structures required for exceptionally long spans and in circumstances requiring additional vertical clearance (i.e., railroad tracks) exceeding the NESC requirements.

Single pole (no underbuild) wood structures with horizontal post insulators (THP) will be used for the single circuit segment of the Project in areas where available right-of-way is limited, such as where corridors are shared along roads and in developed areas. Horizontal post insulators will be used unless design requires longer spans beyond the capability of the insulators, in which case a braced post design (TBP) will be utilized to accommodate the increased loadings. Angles in the line will require guying (the use of anchors and support cables) or specialty structures. Where guying is not practicable, laminated or other self-supporting steel poles will be used with drilled pier foundations.

The average span will be 300-400 feet and heights will range from 65 to 80 feet. Structures, pole heights and spans will vary depending upon topography and environmental constraints (such as highway crossings, stream crossings, and required angle structures).

Single pole (with underbuild, THP-U) 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 circuit, resulting in a taller pole that averages 75 to 90 feet in height. Specific areas may require taller poles due to topography and/or vertical conductor clearance requirements. The conductor used for the lower voltage circuit and other limiting factors result in shorter average spans, averaging 250 to 350

feet. The shorter average spans would require more poles per mile than the other two structure design options.

Four structure types are being considered for use in segment 5: wood H-Frame, wood single pole-post (THP), wood single pole braced post (TBP), and wood single pole with distribution underbuild (THP-U). **Figure 1-4** shows the cross section views of these 115 kV transmission line structures.

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***Transmission Capacity***

MP plans to construct Segments 1 and 2 of the new transmission line using 636 aluminum conductor steel reinforced (ACSR) Rook conductor that has an ampacity of 914 amps at 100 degrees C. This will limit maximum continuous electric power capacity of the line to 182 MVA, provided there is not a more restrictive limit associated with the line’s substation terminal equipment or transformation capacity. There would be three single conductors for the 115 kV circuit. The line will be shielded with a 64 mm 2/528 (24-fiber) overhead ground wire and

depending on structure type, a 3/8 inch H.S. (7- strand) steel or overhead ground wire will also be used.

In Segments 3 and 4 of the new transmission line, three single conductor phase wires and one or two shield wires would be utilized. GRE will construct these segments of the line using 795 MCM ACSS phase conductors with seven steel core strands and 26 outer aluminum strands. This conductor has an ampacity of 1586 amps at 200 degrees C. This will limit maximum continuous electric power capacity of the line to 316 MVA, provided there is not a more restrictive limit associated with the line's substation terminal equipment or transformation capacity. The line will be shielded with a 64 mm 2/528 (24-fiber) overhead ground wire and depending on structure type, a 3/8 inch H.S. (7-strand) steel or overhead ground wire will also be used.

GRE will construct Segment 5 of the new transmission line using 795 ACSR Tern conductor that has an ampacity of 982 amps at 100 degrees C. This will limit maximum continuous electric power capacity of the line to 195 MVA, provided there is not a more restrictive limit associated with the line's substation terminal equipment or transformation capacity. The line will be shielded with a 64 mm 2/528 (24-fiber) overhead ground wire and depending on structure type, a 3/8 inch H.S. (7-strand) steel or overhead ground wire will also be used.

***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 and GRE typically utilize outside contractors for construction activities on large transmission projects. The specifications used are developed by MP and 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.

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.

Construction at the substations will begin once the final design is complete and the property is acquired. 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 2.5 acres of land will be graded to construct the 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.

MP will utilize erosion control methods to minimize runoff during substation construction. MP construction crews or an MP contractor will comply with local, state, NESC and MP standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, rights-of-way widths, erection of power poles, and stringing of transmission line conductors.

Upon completion of construction activities, MP will 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.

The proposed project will include several substation upgrades (Pequot Lakes, Pine River, Badoura, Birch Lake and Long Lake). All construction will be completed in accordance with MP and GRE construction standards as well as the NESC.

***ROW Maintenance***

MP and 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 and 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.

## 1.4 Project Purpose

The proposed HVTL project would connect the Pequot Lakes Substation located northeast of Pequot Lakes, a new or expanded 115 kV Pine River Substation located southwest of Pine River, the Badoura Substation, the Birch Lake Substation located east of Hackensack, and the Long Lake Substation located east of Park Rapids. Substation improvements would include new transformer additions at the Long Lake and Birch Lake substations and conversion of the distribution service at the Tripp Lake Substation to 115 kV service. The existing Pine River Substation (owned by Crow Wing Power) and the Birch Lake Substation (owned by GRE) will be upgraded to 115 kV service.

Facilities proposed to maintain and improve the electric power service in the Pequot Lakes, Pine River, and Badoura area are:

- Build a Pequot Lakes to Pine River 115 kV line.
- Add 115 kV line exit and associated facilities at the Pequot Lakes Substation.
- Convert Pine River Distribution Substation to 115/34.5 and 115/12.5 kV service.
- Build a Pine River to Badoura 115 kV line.
- Add 115 kV line exits and associated facilities at the Badoura Substation.

Facilities proposed to maintain and improve the electric power service in the Birch Lake area are:

- Rebuild an existing 34.5 kV Badoura - Birch Lake Tap line to 115 kV.
- Build a Birch Lake Tap to Birch Lake Substation 115 kV line (with possible 34.5 kV distribution underbuild in some sections).
- Add 115 kV line exit and associated facilities at the Badoura Substation.
- Add 115/69 kV transformer and associated facilities at the Birch Lake Substation.
- Convert Tripp Lake Distribution Substation to 115 kV service.

Facilities proposed to maintain and improve the electric power service from the Badoura to Long Lake area are:

- Rebuild an existing Badoura (MP)-Long Lake (GRE) 34.5 kV line to 115 kV with some 34.5 kV underbuild in the Park Rapids area.
- Add 115 kV line exit and associated facilities at the Badoura Substation.
- Install a second 115 kV line exit and second 115/34.5 kV transformer and associated facilities at the Long Lake Substation.
- Move Itasca-Mantrap's Park Rapids Substation to the Long Lake Substation.

## 1.5 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)
- 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

This project requires two distinct processes for the Commission: one determining the need for the project and one determining the HVTL route to be selected.

## 2.1 PUC Certification Requirement

On November 11, 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 Badoura project would be approximately 63 miles of overhead 115 kV transmission line and associated substation modifications located between the endpoints of Pequot Lakes, Pine River, Badoura, Hackensack and Park Rapids and traverses through Cass, Crow Wing and Hubbard counties.

As part of the review of a Biennial Transmission Report requesting certification of a HVTL, the Department of Commerce (Department) is required to prepare a document called an Environmental Report (ER). Minn. Rules 4410.7030. The Department 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 Department 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 7, 2005, DOC EFP staff held a public meeting in the Backus City Hall 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 Department issued an Order outlining the content of the environmental report. The Department 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 Badoura 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, 216E.001 through 216E.68. 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 January 12, 2007, that the Company intended to utilize the Alternative Permitting Process for the proposed Badoura 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. 216E.04, subd. 2).

GRE filed the HVTL route permit application on March 16, 2007. On April 3, 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 216E.04). 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 an initial public information/scoping meeting, develops a scoping decision recommendation and prepares a document called an Environmental Assessment, and a public hearing is required. 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 Department Project Manager and maybe viewed at PUC web site ( http://energyfacilities.puc.state.mn.us/Docket.html?Id=19051).

On April 17, 2007, Department EFP staff held the initial public information/scoping meeting in the Backus City Hall. 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 this EA.

The comment period was held open until 5:00 pm May 1, 2007.

The Commissioner of the Department issued a Scoping Decision on May 14, 2007 (**Appendix B**).

# 3.0 AFFECTED ENVIRONMENT

The ecological land classification system (ECS) is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The ECS 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 transmission corridor is located within the Northern Minnesota Drift and Lake Plains section of the Ecological Classification System.[2] The corridor falls within the Pine Moraines and Outwash Plains subsection. This subsection is characterized by end moraines, outwash plains, till plains and drumlin fields. Sands and sandy loam soils overlay bedrock and vary in depth between 200 and 600 feet below ground surface.

The corridor, which starts in Crow Wing County, traverses through Cass County and ends in Hubbard County, passes through only the Pine Moraines and Outwash Plains subsection. This area is characterized by morainic soils, excessively drained sands and numerous wetlands. The corridor is within three major watersheds: the Pine River, Leech Lake River and Crow Wing River. Kettle lakes and lakes greater than 160 acres are common throughout. Elevations generally range between 1,250 and 1,500 feet across the project area. The lowest elevation is 1,232 feet near Pine River, and the highest elevation is 1,565 feet located between the Badoura Substation and TH 371.

This subsection is a mix of end moraines, outwash plains, till plains, and drumlin fields. White and red pine dominated the majority of forest communities on end moraines and till plains. Jack pine barrens and jack pine woodlands were found on well-drained sites on outwash plains. Black spruce, tamarack, white cedar, and black ash were prominent tree species in poorly to very poorly drained soils. Lakes are very common on the end moraines and some of the outwash plains. Current landuses include tourism, forestry, and some agriculture.

This subsection consists primarily of large outwash plains, narrow outwash channels, and end moraines (Hobbs and Goebel 1982). The moraines are relatively large and were formed from portions of several glacial lobes. Most of the glacial drift was sandy, but there is loamy drift to the north.

Thick glacial drift covers bedrock over most of the subsection. Thicknesses range from 200 to over 600 feet. The greatest depths are in the southwestern portion (0lsen and Mossler, 1982). A diversity of Precambrian rock underlies the glacial drift (Morey 1976; Morey et al. 1981). There are also iron formations at the southeastern edge of the subsection, along with argillite, siltstone,

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

quartzite, and graywacke. Cretaceous marine shale, sandstone, and variegated shale are localized in the southwest. (Albert 1993).

The morainic soils are predominantly coarse to moderately coarse in texture (sands and sandy loams), although calcareous loamy soils are present on the Itasca Moraine and the Fosston Till Plain. (Dept. of Soil Science, Univ. of Minnesota 1969, 1980). On outwash plains, excessively drained sands are prevalent, but they are interspersed with numerous wetlands. Over 10 percent of the soils are organic. The soils are classified as Psamments and Aquents on outwash plains (Anderson and Origal 1984). Boralfs are most common on moraines.

Total annual precipitation ranges from 23 inches in the northwest to 27 inches in the east, with about 40 percent occurring during the growing season. Only 12 to 16 percent of the annual precipitation falls during winter months (based on Midwest Climate Center 1992). Growing season length varies from 111 to 131 days.

Kettle lakes are common on pitted outwash plains and within stagnation moraines. There are hundreds of lakes within the subsection that have a surface area greater than 160 acres. The headwaters of the Mississippi River (Itasca Lake in Itasca State Park) are in this subsection. Other large rivers flowing through the outwash plains of the subsection include the Pine and Crow Wing rivers.

Jack pine, in a mix with northern pin oak, was the most common species on excessively drained portions of broad outwash plains. Large areas of the other landforms were dominated by aspen-birch and pine forests (mixed red and white pine). Red pine-white pine forests, occupied the rolling to irregularly sloped end moraines. Mixed hardwood and pine forests, dominated by a diverse mix of northern hardwoods and white pine, were found in the most fire-protected areas at the northern and eastern edges of the subsection. Fire protection was offered by irregular topography, broad wetlands, and relatively large lakes. Some of the hardwood-pine forests mapped by Marschner may have been dominated by northern red oak and basswood, without sugar maple (Albert 1993).

Forest management and tourism are the most important land uses. Agriculture is common in the west, where center pivot irrigation of corn and potatoes is common. Tourism is common where there are concentrations of lakes. Summertime swells the population of these areas significantly. Brainerd, a community of 14,000, absorbs more than ten times that number within a 30-mile radius during summer weekends.

Fire occurred on a 10 to 40 year rotation within much of the subsection, accounting for the dominance by upland conifers and quaking aspen-birch forests (Frissel 1973).

# 4.0 ASSESSMENT OF IMPACTS AND MITIGATIVE MEASURES

The Badoura project would be approximately 63 miles of overhead 115 kV transmission line and associated substation modifications to meet the growing electrical load of the Badoura project area. The proposed route is located between the endpoints of Pequot Lakes, Pine River, Badoura, Hackensack and Park Rapids and traverses through Cass, Crow Wing and Hubbard counties (**Figure 4-1**).

Since the alternative route lies 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 are 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.

***Crow Wing County***

The eastern end of the proposed corridor begins near the city of Pequot Lakes (2000 population 947; 479 occupied homes); the city has several technology and manufacturing employers (US Link, Hunt Technology, Pequot Tool), a public school system, and several small businesses including banks, restaurants, retail and grocery stores.

According to the 2000 U.S. Census, the county had a total population of 55,099.[3] The 2004 Crow Wing County Comprehensive Plan shows that between 1990 and 2000, the population grew by 25 percent, and is continuing to grow at a similar pace.[4] Within the proposed corridor area, the TH 371 corridor is showing the greatest amount of growth. General demographics for Crow Wing County show a 49.2 percent male and 50.8 percent female distribution of the predominantly (97.6 percent) white population. Approximately 17.1 percent of residents are 65 years old or older. Median household income for the county ($37,589) is approximately 20 percent lower than the statewide average of $47,111. Unemployment in Crow Wing County was 5.5 percent, slightly higher than the statewide average (4.7 percent) for the year 2004.[5] The county's 755 farms (144,743 acres) produced a total market value of agricultural products of

[3] http://www.lmic.state.mn.us/datanetweb/php/census2000/2000Glance.php
[4] http://www.co.crow-wing.mn.us/Planning/2004_COMPREHENSIVE_PLAN.pdf
[5] http://www.ers.usda.gov/Data/

more than $13.7 million in the year 2002, including $5 million in crops and $8.7 million in livestock, poultry and related products.[6] The 2004 Comprehensive Plan shows that major employers in the county include retail centers, resorts, medical centers, government services and schools. Construction, real estate, finance, insurance, transportation and public utilities experienced the largest amount of growth from 1990 to 2000.

***Cass County***

The proposed route crosses Loon Lake, Wilson, Walden, Bull Moose, Pine River, Deerfield, Powers and Birch Lake townships in Cass County; intersecting the cities of Pine River (2000 population 928; 438 occupied homes) and Hackensack (2000 population 285; 132 occupied homes), and passing along the eastern edge of Backus (2000 population 311; 123 occupied homes). There are several small businesses (restaurants and retail) in Hackensack. Employers in Pine River include the public schools, the Whispering Pines Good Samaritan Nursing Home, and several smaller businesses, including car dealers, grocery stores and banks. Employers in Backus include the Backus Elementary School, several small manufacturing companies, and smaller businesses, such as grocery stores.

According to the 2000 U.S. Census, the county had a total population of 27,150.[7] The 2002 Cass County Comprehensive Plan shows that between 1990 and 2000, the population grew by 25 percent and is continuing to grow at a similar pace.[8] General demographics for Cass County show a 50.5 percent male and 49.5 percent female distribution of the predominantly (86.5 percent) white population. Approximately 18 percent of residents are 65 years old or older. Median household income for the county ($34,332) is approximately 27 percent lower than the statewide average of $47,111. Unemployment in Cass County was 8.2 percent, higher than the statewide average (4.7 percent) for the year 2004.[9]

The county's 646 farms (197,153 acres) produced a total market value of agricultural products of more than $14.3 million in the year 2002, including $3.9 million in crops and $10.4 million in livestock, poultry and related products.[10] Major employers in the county include government services, leisure and hospitality services and trade, transportation and public utilities.

***Hubbard County***

The western terminus of the proposed corridor is approximately two miles east of the city of Park Rapids (2000 population 3,276; 1,476 occupied homes). Employers in Park Rapids include the public schools, health services, county government, frozen food manufacturing, medical equipment manufacturing, and several smaller businesses, including grocery stores, retail stores and banks.

[6] http://www.nass.usda.gov/Census_of_Agriculture/index.asp
[7] http://www.lmic.state.mn.us/datanetweb/php/census2000/2000Glance.php
[8] http://www.co.cass.mn.us/
[9] http://www.ers.usda.gov/Data/Unemployment/RDList2.asp?ST=MN
[10] http://www.nass.usda.gov/Census_of_Agriculture/index.asp

The proposed corridor lies within the southeast corner of Hubbard County. The county had a total population of 18,376 in 2000.[11] The 1990 U.S. Census Data show that between 1990 and 2000, the population grew by 23 percent, and is continuing to grow at a similar pace. General demographics for Hubbard County show a 50.0 percent male and 50.0 percent female distribution of the predominantly (96.3 percent) white population. Approximately 18 percent of residents are 65 years old or older. Median household income for the county ($35,321) is approximately 25 percent lower than the statewide average of $47,111. Unemployment in Hubbard County was 6.0 percent, slightly higher than the statewide average (4.7 percent) for the year 2004.[12]

The county's 535 farms (140,004 acres) produced a total market value of agricultural products of more than $22.9 million in the year 2002, including $17.3 million in crops and $5.6 million in livestock, poultry and related products.[13] Major employers in the county include government services, trade, transportation and public utilities, manufacturing, education and health services and leisure and hospitality services.

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 and 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.

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.

[11] http://www.lmic.state.mn.us/datanetweb/php/census2000/2000Glance.php
[12] http://www.ers.usda.gov/
[13] http://www.nass.usda.gov/Census_of_Agriculture/index.asp

## 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.[14]

**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 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, are shown in **Figures 4-2 and 4-3**. Under the worst-case scenario, the L5 noise level may approach a maximum of 48 dB(A) at the edge of the 91 Line right-of-way, which is below the most restrictive Minnesota noise control rules (see Table 6-2). For the right-of-ways without an existing 230 kV circuit, noise levels will be less than approximately 25 dB(A) directly under the conductors.

The Bonneville Power Administration (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

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

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 project's 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 would 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.[15]

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.

At the existing Pine River Substation, the existing transformers will be removed and a 115/34.5, 33 MVA transformer as well as a 115/12.5 kV, 10.5 MVA transformer will be added as part of the project. The substation will be designed to accommodate the addition of a second 115/34.5 kV and 115/12.5 kV transformer.

Noise calculations were completed to determine separation distance necessary to meet the 50 dB(A) limit imposed by the Minnesota NAC for Area 1. This analysis was based on purchase of the transformer with noise levels no greater than 90 percent of the National Electrical

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

Manufacturers Association (NEMA) standard for a 33 MVA 550 BIL 115/34.5 kV and 10.5 MVA 550 BIL 115/12.5 kV two winding transformers and assumed that a second set of transformers would be added in the future. Based on these assumptions, noise levels would be at or below 50 dB(A) at a distance of approximately 200 feet from the transformers (the closest home is 500 feet from the substation). The land to be purchased for the substation will be large enough to ensure the project will comply with Minnesota NAC Area 1 requirements.

If the substation is constructed at a site other than the existing site, noise levels would be at or below 50 dB(A) at a distance of slightly less than 200 feet from the transformers because there would be no 115/12.5 kV transformers at this site. The closest home to this site would be over 300 feet away. The land to be purchased for the substation will be large enough to ensure the project will comply with Minnesota NAC Area 1 requirements. If the 115/34.5 kV substation is constructed at another site, the existing 34.5/12.5 kV transformer at the existing Pine River Distribution Substation would be replaced with a 115/12.5 kV 10.5 MVA transformer. Noise calculations indicate that noise from the operation of the 115/12.5 kV transformer will be below the 50 dB(A) beyond approximately 75 feet from the substation (assumes two new transformers with noise level of no more than 90 percent of NEMA standard for two winding transformers). The results of this analysis show that there would be no adverse impacts associated with noise from the operation of the substation after the project or if a second transformer was added in the future.

No new transformers are planned as part of the project at the Badoura Substation; therefore, noise produced from the operation of the Badoura Substation will not change.

A second 115/34.5 kV 50 MVA transformer will be added at the Long Lake Substation. This will increase the noise level produced by the substation by approximately 3 dB(A). An increase of 3 dB(A) is at the threshold of the ability for humans to perceive a change in loudness. The planned additions at the Long Lake Substation will therefore not result in any significant impact to nearby residents.

A new 115/69 kV 60 MVA auto-transformer will be added at the Birch Lake Substation. Presently there is a 69/34.5 kV 20 MVA two winding transformer at this substation. The planned addition of second larger transformer will result in an increase in overall noise levels of approximately 4 dB(A) based on the NEMA standard audible noise level table (assumes the new 60 MVA auto-transformer will have a noise level no greater than 90 percent of the NEMA Standard for a 550 BIL two winding equivalent and the existing 69/34.5 kV 20 MVA two winding transformer having a noise level based on the 350 BIL NEMA Standard). Although this will result in a noticeable increase in audible noise, the noise levels will remain below the Minnesota NAC Area 1 standards at locations beyond approximately 225 feet from the transformers. The closest home is located over 300 feet from the substation, therefore no significant adverse impacts will be associated with the increase in audible noise from the substation.

***Mitigative Measures***

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

## 4.3 Aesthetics

The proposed route follows existing highways, county/township roads and transmission line corridors for the majority (91 percent) of its length. Most of the surrounding land use is forest or agricultural.

**Figure 4-4** shows a photograph of the existing 34.5 kV line along CASH 20 near Peysenske Lakeand and an edited rendition of how the proposed transmission line installation would appear. **Figure 4-5** shows photographs of how the installation of H-Frame structures parallel to the existing MP 91 Line would appear in the cross-country sections of Segments 1 and 2.

The proposed route would have limited impact on aesthetics in the project area because either the existing transmission line is being upgraded or the new line is being built parallel to an existing transmission line for the majority of the proposed route. An exception is the transmission line near the Pine River Substation in the vicinity of CSAH 1 and CR 171, where the proposed route will follow roadways or distribution lines (or possibly be located behind homes if that is the landowner preference and it is feasible from a construction standpoint).

There are three communities within one mile of the proposed route: Pequot Lakes, Pine River and Hackensack. Park Rapids is approximately a mile and a half from the western end of the Proposed Route; therefore, it will be difficult to view the transmission line from Park Rapids. The degree to which the structures are visible from Pequot Lakes, Pine River and Hackensack will vary depending on elevation and the proximity of the transmission line to each town.

The project is not expected to impact viewers within the Badoura and Foothills State Forests because the project would be built along existing rights-of-way through the forests, and the change to structures would be minimal. Review of field data and aerial photography indicates that approximately 168 homes are located within 500 feet of the proposed route alignment. However, due to the forested nature of the project area, many of these homes do not have a clear line of sight to the transmission line.

***Mitigative Measures***

Although the transmission line will be a contrast to surrounding land uses, the Applicants will work with landowners, as a condition of the HVTL Route Permit, to identify concerns related to the transmission line and aesthetics. In general, mitigation includes enhancing positive effects as well as minimizing or eliminating negative effects. Potential mitigation measures include:

- Location of structures, right-of-way and other disturbed areas will be determined by considering input from landowners or land management agencies to minimize visual impacts.
- Care will be used to preserve the natural landscape; construction and operation will be conducted to prevent any unnecessary destruction of the natural surroundings in the vicinity of the work.
- To the extent practicable, rivers and lakes will be crossed in the same location as existing transmission lines.
- To the extent practicable, existing transmission lines will be reconductored and/or double-circuited, to the extent that such actions do not violate sound engineering principles or system reliability criteria.
- To the extent practicable, new transmission lines will parallel existing transmission lines and other rights-of-way, to the extent that such actions do not violate sound engineering principles or system reliability criteria.
- Structures will be placed at the maximum feasible distance from highway and trail crossings, within limits of structure design.

## 4.4 Recreation

There are several large lakes in the project area (such as Long Lake, Pleasure Lake, Pine Mountain Lake, Peysenske Lake and Tenmile Lake) that are used for fishing and recreational boating (MDNR, 2006: *Lake Finder)*, where it would be possible for people to view the transmission line structures during these activities. There are resorts along the shores of some of the lakes that attract tourists throughout the year.

The project area also attracts thousands of hunters during deer season, as well as small game and waterfowl hunters. The project does not cross any WMAs, but the stateowned parcels of the Badoura and Foothills State Forests that are crossed by the proposed route are open to hunting (MDNR, 2005: *Recreation Compass*).

The Badoura and Foothills State Forests also offer opportunities for wildlife viewing, camping, canoeing, horseback riding, boating, hiking and snowmobiling, cross country skiing, and off-road All Terrain Vehicle and motorcycle driving.

The proposed route crosses seven snowmobile trails: one between the Pequot Lakes Substation and the Pine River Substation, two between the Pine River Substation and the Badoura Substation, three between the Badoura Substation and the Birch Lake Substation, and one between the Badoura Substation and the Long Lake Substation (MDNR, 2004: *Minnesota State Trails*). TH 34 is a state-designated scenic byway ("Lake Country Scenic Byway") through the project area. The scenic byway offers opportunities for birdwatching and wildlife viewing (Explore Minnesota, 2006).

The Paul Bunyan Trail, which runs along TH 371, and the Heartland Trail, which runs along TH 34, are tourist attractions for bicyclists (City of Brainerd, 2005). A&J's Up North Buffalo

Ranch, near Pequot Lakes, is an agri-tourism site that offers group tours of its operations and has a farm store on site (A&J Up North, 2006).

***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.

***Crow Wing County***

The 1996 Crow Wing County Current Land Use Map shows that the proposed route crosses areas of forest, grassland, rural residential uses, bare rock and wetlands (Crow Wing County, 1996). The 2006 Pequot Lakes Zoning Map shows that the proposed route crosses areas zoned for agriculture and forest management (City of Pequot Lakes, 2006).

***Cass County***

The proposed route crosses central Cass County in Loon Lake, Wilson, Walden, Pine River, Bull Moose, Deerfield, Powers and Birch Lake townships. According to the Cass County Land Use Map, the Proposed Route crosses forest, wetland, grassland and rural residential land uses (Cass County, 2005).

The proposed route also crosses the town of Hackensack and passes near the town of Pine River. In Hackensack, it crosses areas of commercial (primarily along TH 371) and residential land uses. According to the 1994 Pine River Zoning Map, the proposed route lies outside of the incorporated boundaries. Land use at the Pine River Substation area is generally rural residential (City of Pine River, 1994). The Pine River Municipal Airport is within a mile and a half of the Proposed Route in Section 32 of Barclay Township. The proposed route passes through areas within Airspace Obstruction Zoning (Sections 1 and 12 of Walden Township and Section 6 of

Barclay Township) and Land Use Safety Zoning (Section 6 of Barclay Township), as described in the Pine River Airport zoning ordinance (City of Pine River, 1980).

***Hubbard County***

The project is located in southeastern Hubbard County. Hubbard County does not maintain an official land use map. Field visits and aerial mapping show that the portion of the corridor within Hubbard County crosses primarily irrigated agricultural land with a mix of residential properties, cottages and woodlots.

The western end of the project area is approximately two miles east of the City of Park Rapids. A cursory field review showed new residences near this end of the corridor outside of the incorporated City of Park Rapids. The project is outside of the safety zoning associated with the Park Rapids Municipal Airport, which is approximately two miles southwest of the western project terminus.

***Mitigative Measures***

Impacts to land use as a result of the project are expected to be minimal. Because the proposed route follows existing transmission lines and roadways, construction within transmission and adjacent to roadway right-of-way will minimize placement of structures in other land uses. Some placement of structures outside of existing right-of-way may be necessary due to expanded right-of-way needs associated with the upgraded facility.

Construction of the facility will not change the possible land uses for any area. The project will not affect the uses of public lands and recreational areas because it will be built along existing transmission right-of-way through the state forests and at the snowmobile trail crossings. The transmission line will not affect the use of the Paul Bunyan or Heartland Trails.

In a letter dated August 25, 2006 (**Appendix C**), the MNDOT Office of Aeronautics indicated that it may not be necessary to submit a FAA Form 7460-1 (Notice of Proposed Construction or Alteration) for the project. However, when line design is complete, the Applicants will review the current airport zoning documents or ordinances to ensure that structures comply with airport safety zones and ordinances.

The Applicants will, as a condition of the HVTL Route Permit, coordinate with the MDNR to determine avoidance and minimization methods for the state land crossings.

## Agriculture

Approximately 18 percent of the proposed route is presently in agricultural uses (MDNR, Gap Analysis Program (GAP) Land Cover Data, 2002).

The project will result in permanent and temporary impacts to farmland. Permanent impacts will occur as a result of structure placement along the proposed route of the transmission line. The

Applicants estimate permanent impacts associated with structures to agricultural lands at approximately 0.05 acres. If the Pine River Substation is relocated, less than 1.5 acres of agricultural land could be permanently impacted. Approximately 84 percent of the permanent impacts to agricultural lands will occur on prime farmland soils, prime farmland when drained, or soils of statewide importance.

During construction, temporary impacts, such as soil compaction and crop damages within the right-of-way, are likely to occur.

The Applicants estimate that approximately 146 acres of agricultural land will be impacted temporarily due to transmission line construction. The Applicants' preferred methodology for setting up staging areas and stringing setup areas is to use previously disturbed sites, such as abandoned parking lots; therefore the Applicants are not anticipating temporary impacts to agricultural lands from staging or setup areas.

There are 10 central-pivot irrigation systems adjacent to the proposed route: five between the Badoura Substation and the Long Lake Substation, and five between the Badoura Substation and TH 371 (Farm Services Agency, 2003).

Because the portions of the proposed route that are adjacent to central pivot irrigation systems follow existing transmission corridors, no impacts to central pivot irrigation are expected along the proposed route.

Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. The NRCS has three levels for prime farmland, and each county NRCS department is responsible for assigning prime farmland designations to each of the soil series found in its county. The most important class is prime farmland, which produces high yields of crops. Prime farmland when drained includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance include soils that are nearly prime but are not as productive due to permeability, slope, erosion potential, or some other soil property.

***Cass County***

According to the 2002 Census of Agriculture, the average farm size in Cass County decreased by five percent between 1997 and 2002, while the number of full-time farms increased by 48 during that time period. Crop sales in 2002 for Cass County were $3,949,000 (28 percent of agricultural products sold) and livestock sales were $10,378,000 (72 percent). Crops in Cass County are primarily corn and forage and livestock is primarily cattle (USDA, 2002 and 2004).

No digital soil data are available for Cass County. The Cass County Soil Survey indicates that approximately three percent of the soils crossed by the proposed route are prime farmland, approximately one percent is prime farmland when drained, and approximately 15 percent is farmland of statewide importance (USDA, 1997).

In Cass County, approximately 200 square feet of prime farmland, approximately 65 square feet of prime farmland when drained, and approximately 980 square feet of farmland of statewide importance will be permanently impacted by the project. Additionally, if the Pine River Substation is relocated, approximately 9,800 square feet (0.23 acres) of farmland of statewide importance could be impacted.

***Crow Wing County***

The number of farms in Crow Wing County increased by 162, while the average farm size decreased by eight percent between 1997 and 2002. Crop sales in 2002 for Crow Wing County were $5,005,000 (36 percent of agricultural products sold) and livestock sales were $8,722,000 (64 percent). Crops in Crow Wing County are primarily corn and forage, and livestock is primarily cattle (USDA, 2002 and 2004).

No digital soil data are available for Crow Wing County. Updated Reconnaissance Maps provided by the Crow Wing County NRCS indicate that approximately 95 percent of the proposed route crosses farmland of statewide importance in Crow Wing County (USDA, 2006); approximately 195 square feet of farmland of statewide importance will be permanently impacted. No prime farmland (or prime farmland when drained) is crossed by the proposed route in this county (USDA, 2005).

***Hubbard County***

The number of farms in Hubbard County increased by 104, while the average farm size decreased by nine percent between 1997 and 2002. Crop sales in 2002 for Hubbard County were $17,309,000 (75 percent of agricultural products sold) and livestock sales were $5,649,000 (25 percent). Crops in Hubbard County are primarily corn, dry beans (excluding lima and soybean) and forage, and livestock is primarily cattle (USDA, 2002 and 2004).

Digital soil data are available for Hubbard County. Approximately 69.1 percent of the route is on farmland of statewide importance in Hubbard County. No prime farmland (or prime farmland when drained) is crossed by the Proposed Route in this county (USDA, 2003 and 2005).

In Hubbard County, approximately 3,510 square feet of farmland of statewide importance will be permanently impacted by the project.

The removal of this small amount of prime farmland will not affect the productivity of the three counties.

***Mitigative Measures***

The Applicants will compensate landowners for any crop damage or soil compaction that may occur during construction.

The Applicants, as a condition of the HVTL Route Permit, will work with landowners to minimize impacts to farming operations along the proposed route. Impacts can be minimized by aligning the transmission line along existing transmission and roadway corridors.

## Forestry

Northern Minnesota contains economically important forestry industries. The Badoura State Forest has a MDNR-managed 200-acre state nursery, where Norway pine, jack pine, white pine, white spruce, black spruce, black walnut, green ash, red oak, silver maple and wild plum are cultivated (Lake Country Scenic Byway Organization, 2006).

The nursery is located west of TH 64 at the intersection with TH 87 (MDNR, 2004: *State Forest Boundaries*). The proposed route also crosses Foothills State Forest, although no forestry production occurs within that state land.

The proposed route will not impact the Badoura Nursery. The proposed route will be built within existing right-of-way through the Badoura and Foothills State Forests. No privately-owned forest production industry will be affected by the Project. Impacts along the proposed route to forested areas and shelterbelts are estimated at 133 acres.

### *Mitigative Measures*

Construction staging areas, as a condition of the HVTL Route Permit, will be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. As stated above, the preferred locations are previously disturbed sites such as abandoned parking lots. Unless otherwise agreed upon by the landowner, all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris will be removed from the site once construction is complete.

The area will be graded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation and provide for proper drainage and prevent erosion.

Clearing for access will be limited to only those trees necessary to permit the passage of equipment, and will generally correspond to the transmission right-of-way corridors. If temporary access roads outside of the right-of-way corridors are necessary, they will be restored to native vegetation. Native shrubs that will not interfere with the safe operation of the transmission line will be allowed to reestablish in the right-of-way.

The Applicants will, as a condition of the HVTL Route Permit, coordinate with the MDNR to determine the best avoidance and minimization measures to use in state-owned forested parcels along the proposed route.

## Mining

Notable mining resources in the area include the quaternary sands and gravels present in glacial outwash deposits. There are several active gravel and aggregate mining operations in the project area. In Crow Wing County, there is a gravel pit in the southwest quarter of Section 11 in Sibley

Township, approximately one mile from the Pequot Lakes Substation (MNDOT, 2003: *General Highway Map: Crow Wing County*).

In Cass County there are eight mining operations within a mile of the proposed route: one MNDOT aggregate pit in the northwest quarter of Section 17 in Wilson Township, approximately one mile from the Proposed Route; a MNDOT aggregate pit and a gravel pit in the southeast quarter of Section 31 in Deerfield Township, approximately 1,500 feet from the Proposed Route; two commercial aggregate pits and one MNDOT aggregate pit in Section 5 of Powers Township; one MNDOT aggregate pit in the northeast quarter of Section 8 of Powers Township; and one gravel pit in the northwest quarter of Section 32 in Birch Township (MNDOT, 2002).

In Hubbard County, there is one gravel pit and one commercial aggregate pit adjacent to the proposed route in Section 14 of Henrietta Township (MNDOT, 2001).

Based on a review of existing information, the proposed route will not impact active mining or quarrying operations. Poles will be placed to avoid affecting entrances and exits to any operations adjacent to the proposed route.

***Mitigative Measures***

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

**Prohibitive Sites**

In accordance with Minn. Rule 4400.3450, no LEPGP may be located in sites deemed prohibitive. The proposed route does not contain any of the prohibitive sites listed in the rule, 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 proposed route is located within the Northern Minnesota Drift and Lake Plains section of the Ecological Classification System (MDNR, 2007). The area is generally flat to gently rolling. Kettle lakes and lakes greater than 160 acres are common throughout. Elevations generally range between 1,250 and 1,500 feet across the project area. The lowest elevation is 1,232 feet near Pine River, and the highest elevation is 1,565 feet between the Badoura Substation and TH 371 (United States Geological Survey (USGS), 2005).

The project lies within the Pine Moraines and Outwash Plains subsection of the Northern Minnesota Drift and Lake Plains section. This subsection is characterized by end moraines, outwash plains, till plains and drumlin fields. Sands and sandy loam soils overlay Quaternary drift materials that are approximately 200 to 600 feet thick. Precambrian bedrock is generally granite, gneiss and slate (USGS, 1968 and 1972).

The soils found in the project area are generally moderately well-drained to excessively well-drained sandy loams or loamy sands, with poorly-drained muck soils found in the large wetland depressions. USDA Natural Resource Conservation Service (NRCS) Soil Survey data were reviewed to describe the soil resources along the proposed route. Soils are generally grouped into categories known as associations. A soil association has a distinctive pattern of soils, relief and drainage, and is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils.

Soil disturbance will result from site clearing and excavation activities at structure locations, pulling and tensioning sites, substations, setup areas and during transport of crews, machinery, materials and equipment over access routes (primarily along transmission right-of-way). Construction of the transmission line is expected to result in approximately 552 acres of temporary impact and 11,700 square feet (0.27 acres) of permanent impact to soils. If the Pine River Substation is relocated, construction will result in less than 1.5 acres of permanent impact to soils.

***Mitigative Measures***

Disturbed areas will be graded to existing conditions. No impacts to regional topography will result from the Project.

The project will not impact the geology of the project area.

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 National Pollution Discharge Elimination System (NPDES) and Stormwater Pollution Prevention Plan (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.

The Minnesota Pollution Control Agency's (MPCA) Stormwater Program is designed to reduce the pollution and damage caused by stormwater runoff. MPCA has three stormwater programs for regulating stormwater runoff from three main sources: construction, industrial and municipal.

The MPCA issues combined NPDES/State Disposa System (SDS) permits for construction sites, industrial facilities and municipal separate storm sewer systems. Compliance with the MPCA stormwater program will be a condition of the HVTL Route Permit.

## 4.8 Flora and Fauna

The proposed route is located within the Northern Lakes and Forests Ecoregion, which is dominated by mature conifer and northern hardwood forests and interspersed with lake and wetland plant communities. Minnesota GAP land cover data show that approximately 44 percent of the land along the proposed route is woodland (including coniferous and deciduous forests), approximately 27 percent is grassland and shrubland, and 18 percent of the land is cropland.

A summary of the land cover types along the proposed route is shown in **Table 4-2**, and land cover types are shown in **Figure 4-6**.

The proposed route crosses the Badoura State Forest in Cass and Hubbard counties and crosses the Foothills State Forest in Cass County. The Badoura State Forest contains a state nursery, where Norway pine, jack pine, white pine, white spruce, black spruce, black walnut, green ash, red oak, silver maple and wild plum are cultivated.

State- and federal-listed plant species and MDNR-listed natural communities are discussed in Section 4.9.

Permanent impacts to vegetation may occur due to the placement of structures. The area around the structure may also be temporarily disturbed due to construction activities. Because the proposed route parallels existing 230 kV and 34.5 kV transmission lines and roadways, construction in previously undisturbed communities will be minimized. Some vegetation clearing may be necessary; however, due to expanded right-of-way needs associated with the upgraded facility.

If the Pine River Substation is relocated, it will result in less than 1.5 acres of impact. The Applicants will span areas containing natural communities wherever possible. Approximately 32

acres of tree clearing within existing easements will be required within Badoura State Forest, and approximately 28 acres of tree clearing within existing easements will be required within the Foothills State Forest. These clearings will be necessary to construct and operate the proposed transmission line parallel to the existing line, and will not require expansion of existing easements. Overall, approximately 133 acres of trees and hedgerows will be cleared.

Wildlife in the vicinity of the Proposed Route consists of birds, mammals, fish, reptiles, amphibians and insects, both resident and migratory, which use the area habitat for forage, shelter, breeding habitat and/or stopover during migration. Species likely to be found are those associated with forested and/or grassland habitats, including small mammals, such as voles, shrews, mice and rabbits; and larger mammals, such as beaver, bobcat, coyote, gray wolf, river otter, fox, white-tailed deer, black bear, waterfowl and songbirds (both forest and grassland species). Fish, reptiles and amphibians, such as snakes, turtles, toads and frogs would likely be found near the wetlands and open water along the Proposed Route (MDNR, 2005: Animap).

The Badoura and Foothills State Forests are managed for wildlife and likely provide habitat for many woodland species. There are no MDNR-managed Scientific and Natural Areas (SNA) or WMAs along the Proposed Route. The Crow Wing Chain WMA in Hubbard County, the Twin Heron WMA in Cass County, and the Lowell WMA in Crow Wing County are all within five miles of the Proposed Route (MDNR, 2004). These WMAs are managed for waterfowl, grouse and furbearers and also provide habitat for non-game species of wildlife. It is possible that wildlife found within these WMAs could also be found along the proposed route.

There is one colonial waterbird rookery within one mile of the proposed route in Hubbard County. The rookery contains great blue herons *(Ardea herodias)* (Minnesota Natural Heritage and Nongame Wildlife Program, 2006). Potential effects on this resource and state- and federal-listed wildlife species found in the vicinity of the proposed route are discussed in Section 4.9.

There is minimal potential for the displacement of wildlife and loss of habitat from construction of the transmission line. Wildlife that inhabit natural areas could be impacted in the short-term within the immediate area of construction. The distance that animals will be displaced will depend on the species; however, no population level effects are anticipated from the project.

Raptors, waterfowl and other bird species may also be affected by the construction and placement of the transmission lines. Avian collisions are a possibility after the completion of the transmission line. Waterfowl are typically more susceptible to transmission line collision, especially if the transmission line is placed between agricultural fields that serve as feeding areas, or between wetlands and open water, which serve as resting areas. The majority of the proposed route is along existing right-of-way; therefore impacts to waterfowl will be minimized. Additionally, electrocution of large birds, such as raptors, is a concern typically related to distribution lines. Electrocution occurs when birds with large wingspans come in contact with either two conductors or a conductor and a grounding device. The Applicants' transmission line design standards provide adequate spacing to eliminate the risk of raptor electrocution. As such, electrocution is not a concern related to the project.

***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 HVTL Route Permit will require the Applicants, to the extent practicable, minimize the impact to vegetation. 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.

**Table 4-3** lists the rare or unique resources identified within one mile of the proposed route.

The proposed route is within one mile of three recorded occurrences of bald eagles, a federally-threatened, state special status species; four recorded occurrences of Blanding's turtles, a state threatened species; and nine occurrences of greater prairie chickens, two occurrences of least darter minnows and one occurrence of a yellow rail, all state special status species. Additionally, two occurrences of non-ranked species for which the MDNR is currently gathering more data are within a mile of the proposed route. A great blue heron rookery is located within a mile of the proposed route, as is a Jack pine – (Yarrow) Woodland natural community.

No impacts to special status species are expected as a result of this project. The vast majority of the project is along or parallel to existing transmission line and/or roadway right-of-way;

therefore, impacts to previously undisturbed habitat (where the majority of rare species occur) will be avoided.

The minimal loss of Bald eagle habitat that could occur will not affect population levels. As stated above, the Applicants will use design standards that provide adequate spacing to eliminate the risk of raptor electrocution. Impacts to wetlands (Blanding's turtle and yellow rail habitat) are expected to be minimal and will not affect the species. Although there will be several structures placed in wetlands, they will be either adjacent to or a rebuild of existing structures and therefore will not impact undisturbed wetlands. The transmission line will not impede the turtles' movement between breeding and foraging habitat.

Although the proposed route will go relatively near prairie chicken nesting areas, it follows existing transmission line right-of-way and therefore should not increase opportunities for predation over existing levels.

The transmission lines will span all streams; therefore no impacts to the least darter will occur. The minimal amount of coniferous forests and dry grasslands that may be affected by the project will not result in population-level effects to the Northern goshawk or Eastern hognose snake, respectively.

The proposed alignment is approximately 800 feet from a great blue heron colony, which is known to be active as of 2006. Because of the high density of birds in such rookeries, any disturbance to the site has the potential to impact the reproductive success of large portions of a species' regional population. The transmission line will be built along existing transmission right-of-way and will not directly impact the colony. A conversation with the MDNR Non-Game Wildlife Specialist for the Northwest Region confirmed that because construction will remain within the existing easements and tree clearing will occur on the far side of the existing transmission line away from the colony, no impacts are expected (Haws, 2007).

The proposed route does not cross and will not impact the MDNR-listed Jack pine natural community.

***Mitigative Measures***

As a condition of the HVTL Route Permit the Applicants will maintain sound water and soil conservation practices during construction and operation of the project to protect topsoil and adjacent water resources and minimize soil erosion and sedimentation. Spans will be maximized through wetlands, minimizing the number of poles placed in the wetlands. These measures will avoid and minimize disturbance to terrestrial and aquatic habitats for special status species.

If construction of the transmission line requires access outside of the existing right of way, access will avoid the vicinity of the great blue heron colony.

## 4.10 Archaeological and Historic Features

The State Historic Preservation Office (SHPO) provided database search results of all known or reported archaeological sites and historic architectural structures in the sections that are within one-quarter mile of the proposed route. Within these sections, the database lists six archaeological sites and six historic architectural structures. Of these known resources, there are no archaeological sites or architectural structures listed on or currently considered eligible for listing in the National Register of Historic Places (NRHP). Most of the historic structures are within the corporate limits of the towns in the area, most notably Pine River and Pequot Lakes. Because the SHPO database is organized by county, the database search results of nearby historic and archaeological sites are similarly presented below. **Table 4-4** and **Table 4-5** show cultural resources within ¼ mile of the proposed route.

It is important to note that most of the sites shown have not been evaluated as to their historical significance and that there may be other resources within the sections along the proposed route that have not yet been identified. However, the existence of the sites and resources listed here demonstrates that the region was attractive to and used by people throughout history. The archaeological sites listed range from the Archaic Period (6,000 - 800 years B.C.) to the Historic Period, with most falling within the Woodland Period (1000 B.C – 1700 A.D). In general, historic properties or structures must be at least 50 years old to be significant. In the area, these include civic buildings, bridges and farmsteads.

Because the proposed route is in the right-of-way of existing lines and is adjacent to highways for the vast majority of its length, the likelihood that archaeological resources will be affected is relatively low because the corridor has already been disturbed by the previous construction of the roadway and the existing line. In areas not previously disturbed and where archaeological potential is assessed to be high, unrecorded archaeological sites may be affected during construction of transmission structures, substations and substation expansions, maintenance structures, staging areas or access roads. Historic buildings or other sites may be impacted as well; in that construction of modern transmission structures may compromise the integrity of a historic viewshed from or to aboveground archaeological and historic resources. However, because there are lines already in place, a significant visual change is not anticipated.

### *Mitigative Measures*

In a letter dated November 29, 2006 (**Appendix C**) and in previous correspondence related to the Certificate of Need Application, State Historic Preservation Office (SHPO) indicated that cultural resource surveys of the proposed project area would be needed. This requirement will be carried over as a condition of the HVTL Route Permit if granted by the PUC.

The Applicants will make every effort to avoid impacts to identified archaeological and historic resources. In the event that an impact would occur, the Applicants will consult with SHPO and invited consulting parties (particularly Native American Tribes and other state and federal permitting or land management agencies) on whether or not the resource is currently listed on or

eligible for listing in the National Register of Historic Places (NRHP). While avoidance of the resource would be a preferred action, mitigation for project-related impacts on NRHP eligible archaeological and historic resources may be required. In consultation with SHPO and other consulting parties, treatment plans will be developed that 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 (groundwater, surface water, wetlands)

Water resources along the proposed route are shown in the detailed route illustrated in **Figures 4-7 to 4-22**.

Groundwater resources in the project area include a buried Quaternary aquifer (comprised of glacial outwash deposits) and to a much lesser extent, Cretaceous and Precambrian bedrock aquifers that are scattered throughout. In general, groundwater quantity and/or accessibility is not a problem in the study area. Groundwater (water table, near surface) resources may be encountered during excavations for transmission line structures in low-lying and/or wet areas. Depth to water table varies throughout the project area, from less than five feet to over 50 feet, but generally is found within 25 feet of the surface. In general, groundwater in the project area is relatively good, with chemical levels similar or lower than those found in similar aquifers elsewhere in Minnesota (MPCA, 1998).

It is possible that project construction would require dewatering. If dewatering is necessary during construction (i.e., during pole embedding), the effects on water tables would be localized and short-term. The project will have no impact on either municipal or private water uses in the project area. No water storage, reprocessing or cooling is required for either the construction or operation of the transmission line or substations. Therefore, the project will not result in violations of groundwater quality standards.

The majority of the Proposed Route lies within the Pine River and Crow Wing River watersheds of the Upper Mississippi River Basin. A portion of the Proposed Route near Hackensack is in the Leech Lake River watershed of the Upper Mississippi River Basin. Within the portion of the corridor in Hubbard County and near Pequot Lake, surface water flows generally towards the Crow Wing River; within the middle portion of the project area the water generally flows towards the Pine River. At the northern terminus of the proposed route, surface water generally flows north, ultimately reaching Leech Lake (MPCA, 2005).

The proposed route crosses forested riparian areas associated with several creeks and streams, including Pine River, Crow Wing River, Behler Creek, Wallingford Creek and Wilson Creek (Farm Services Agency, 2003).

The portions of Hubbard, Cass and Crow Wing counties within the project area have not been mapped for floodplains by the Federal Emergency Management Agency. It is possible that the proposed route crosses the 100-year floodplains associated with the Crow Wing River, Pine River, and/or Hay Creek, as well any floodplains associated with the lakes in the vicinity.

Public Waters are water basins and watercourses of significant recreational or natural resource value in Minnesota as defined in Minnesota Statute 103G.005. The MDNR has regulatory jurisdiction over these waters. The proposed route crosses six Public Water Inventory (PWI) lakes (five in Cass County and one in Hubbard County), three PWI wetlands (all in Hubbard County) and nine PWI creeks and rivers (seven crossings in Cass County and two in Hubbard County). See **Figures 4-7 through 4-22**. **Table 4-6** lists the PWI resources along the proposed route.

No navigable water of the United States will be affected by the project; therefore no USACE Section 10 permit will be required.

Wetlands are defined by the United States Army Corps of Engineers (USACE) as "Waters of the U.S." and are subject to jurisdiction under Section 404 of the Clean Water Act (1973). Waters of the U.S. include both wetlands and non-wetlands that meet USACE criteria. In Minnesota, all wetlands are regulated under the Wetland Conservation Act (see Minnesota Statute §1036.222-.2373 requiring coordination with Minnesota Board of Water and Soil Resources (BWSR)) and by the USACE under Section 404 of the Clean Water Act.

Wetland resources for the proposed route were identified by reviewing United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping. NWI wetlands are shown on **Figures 4-7 to 4-23**. There are 74 NWI wetlands along the proposed route (primarily palustrine scrub/shrub and palustrine emergent wetlands), as listed on **Table 4-7**.

The USACE Section 404 approvals are not expected to be required for this project.

Some minor impacts to surface water resources could occur to wetlands or Public Waters due to construction of the project. However, the Applicants anticipate that most wetland areas and surface water features, such as rivers and streams, will be avoided by spanning the transmission line over the water bodies. There are 11 NWI basins (two of which are also PWI basins) that are wider than the maximum span along the proposed route where complete avoidance may not be feasible. It is estimated that approximately 23 structures will be placed in NWI wetlands, for a temporary impact of approximately 3,400 square feet (0.08 acres) and a permanent impact of approximately 560 square feet (0.01 acres). **Table 4-8** shows the PWI wetlands wider than the maximum span along the proposed route, the estimated number of structures that may be placed within each PWI, and the estimated temporary and permanent impacts per water body.

Rebuilding in-place or paralleling the existing transmission lines that currently skirt the majority of the hydrologic features will minimize any new impacts to wetlands and water bodies. Construction of the transmission line is not expected to alter existing water drainage patterns or floodplain elevations due to the small cross section per pole and their relatively wide spacing.

Although construction of the proposed substations will involve a small increase in impermeable surfaces (from the control houses and structure footings), the change to local surface drainage patterns from this and any necessary grading is expected to be negligible. The small area of impermeable surfaces created by the pole structures and substation outbuildings will not cause an increase in susceptibility of flooding in the region.

The MPCA lists several impaired waters in the project area on its 2006 Impaired Waters List. The proposed route crosses Crow Wing River and Mud Lake, which are both impaired for mercury and fecal coliform. Long Lake, Tamarack Lake and Birch Lake are within a mile of the proposed route. Long Lake and Tamarack Lake are impaired for mercury and fecal coliform, and Birch Lake is impaired for excess nutrients (MPCA, 2006).

Construction of the project will not cause loading of nutrients, mercury or fecal coliform into the impaired waters within the project area.

***Mitigative Measures***

If dewatering is necessary, dewatered groundwater will be properly stored and sediments will be settled out and removed before the water is discharged.

As a condition of the HVTL Route Permit, standard erosion control measures and best management practices (BMP) will be required to minimize potential impacts.[16]

Best Management Practices (BMPs) may include:

- Contain stockpiled material away from stream banks and lake shorelines.
- Stockpile and respread topsoil.
- Locate structures and disturbed areas away from rivers and lakes, whereprac tical.
- Use turbidity control methods prior to discharging wastewater from concretebatching or other construction operations to streams or other surface waters. Wastewaters discharged will be free of settleable material.

When it is not possible to span a wetland, the Applicants will draw on several options during construction to minimize impacts:

- Construction will be scheduled during frozen ground conditions wheneverpossible, and ice roads will be used to minimize impacts.
- Crews will attempt to access the wetland with the least amount of physical impact to the wetland (i.e., using the shortest route, or walking instead of driving).
- Structures will be assembled on upland areas before they are brought to the site for installation, when practical.
- Construction mats will be used where wetlands will be impacted when construction during winter is not possible.
- If it is determined that a WCA or Section 404 permit is necessary, the Applicants will work with the jurisdictional agencies (USACE, MDNR and/or BWSR) to determine the best ways to minimize the impacts and create appropriate mitigation measures.

If the Pine River Substation is relocated, proposed construction activities at the site would result in the disturbance of one acre or more of soils and a National Pollutant Discharge Elimination System (NPDES) stormwater permit would be required. A Stormwater Pollution Prevention Plan (SWPPP) would be prepared that would include erosion control plans and BMPs that would be implemented. To minimize contamination of water due to accidental spilling of fuels or other hazardous substances, all construction equipment would be equipped with spill cleanup kits.

## 4.13 Human Health and Safety

The proposed transmission line will be designed to meet or exceed the National Electric Safety Code.[17] Appropriate standards will be met for construction and installation, and all applicable

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

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.

### *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).[18] These standards are designed to minimize human health risks from electric and magnetic fields to industry 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 someone touches 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*

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

> *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).*
> *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.

Graphs of the electric field at one meter above the ground for all structure types being considered in Segments 1 and 2, and Segments 3, 4 and 5 are provided below in **Figures 4-23 and 4-24**. The maximum electric field is well below the 8 kV/m the EQB has imposed as a condition on other high voltage transmission line permits.

The magnetic field profiles around the proposed lines for each structure and conductor configuration being considered for the project are shown in **Appendix D**. Because the magnetic field is dependent on current flow, the expected magnetic field was calculated for each segment and two conditions; current flow at the conductor's thermal capacity and at expected normal peak current flow when the HVTL is placed into service. The magnetic field profile data show that magnetic field levels decrease rapidly (inverse square of the distance from source) from the centerline.

Because the magnetic field produced by the transmission line is dependent on the current flowing on its conductors, the actual magnetic field when the HVTL is placed into service will typically be less than shown in the graphs. This is because the graphs represent the magnetic field with current flow at the conductor's thermal limit and at expected normal peak current flow. Actual current flow on the line will vary as electric demand changes throughout the day and will be less than peak levels during most hours of the year.

As load growth occurs, the current flow on the line will increase, and because the magnetic field is directly related to current flow, the magnetic field will also increase. The graphs depicting the magnetic field at the conductor's thermal limits represent the maximum expected magnetic field because the current flow is at the conductor's capacity.

***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, however, should such interferences be identified, the Applicants would be required to resolve the problem as a condition of the HVTL Route Permit..

# 5.0 ALTERNATIVE ROUTES

In the Peysenske Lake area (western portion of proposed HVTL segment 5, a couple miles east of the Long Lake Substation in Henrietta Township), the Applicants are proposing to utilize MP's existing 34.5 line corridor along 178th Street and CSAH 20 for the new transmission line (**Figure 4-22**).

An approximately half mile portion of this proposed route segment, along with the existing 34.5 kV line, follows CSAH 20 along the western shore of Peysenske Lake (**Figure 5-1**).

Both during the Biennial Transmission Projects Report certification process and the public informational/scoping meeting for the current docket, opposition to this portion of the proposed HVTL route (segment 5) was raised and an alternative route was proposed for consideration.

The alternative route would turn north at 209th Avenue in Section 25, follow 209th Avenue north to TH 34, and follow TH 34 west to the intersection of CSAH 20 and TH 34, where it would once again utilize MP's existing 34.5 kV line corridor (**Figure 5-2**).

Due to the close geographic proximity and the fact the two routes follow existing road right-of-ways, both the proposed HVTL segment 5 (Peysenske Lake portion) and the alternative HVTL segment 9, entail similar impacts on the natural environment. A discussion of these impacts and mitigative measures can be found in the preceding sections of this document. The most significant difference between these options is the number of individual properties that would be crossed; a survey (**Appendix E**) conducted by Ulteig Engineering calculated the affected properties associated with the two options.

The alternative segment 9 would impact more homeowners, create a new right-of-way (along 209th Avenue), and would add additional length along the state designated Lake Country Scenic Byway.

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, March 2007*, 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 Badoura HVTL project. Compliance with the terms of all applicable and relevant regulatory permits and approvals would be a condition of any Site Permit issued by the PUC.

In any HVTL Route Permit the PUC issues, the PUC will describe with specificity the site or route approved. The approved site or route may or may not be the site or route preferred by the applicant. The PUC may impose other conditions in a permit that the PUC determines are reasonable and appropriate (Minn. Rules part 4400.3650). Permit conditions typically relate to construction practices and administrative issues like transfer of the permit and permit amendments. As an example, the recently issued HVTL Route Permit is contained in **Appendix F**.

# 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 |