office of energy security

85 7th Place East, Suite 500, St. Paul, MN 55101-2198
main: 651.296.4026 tty: 651.296.2860 fax: 651.297.7891
www.commerce.state.mn.us

ENVIRONMENTAL ASSESSMENT

Northstar Transmission, LLC

161 Kilovolt Transmission Line and Associated Facilities in Jackson County, Minnesota

PUC Docket No. IP-6686/TL-08-1120
PUC Docket No. IP-6686/CN-08-944
May 2009

RESPONSIBLE GOVERNMENT UNIT

Department of Commerce	Scott Ek, Project Manager
Office of Energy Security	Energy Facility Permitting
85 7th Place East, Suite 500	651.296.8813
St. Paul, Minnesota 55101-2198	scott.ek@state.mn.us

PROJECT OWNERS

Northstar Transmission, LLC	Alan Blum, Chairman
418 Central Avenue	712.362.7272
Esterville, IA 51334	alan.blum@blumandleonard.com

ABSTRACT

Pursuant to the provisions of Minnesota Statutes Chapter 216E, Northstar Transmission, LLC (Northstar) filed a route permit application with the Minnesota Public Utilities Commission (the Commission) on October 28, 2008, under the alternative permitting process for a 161 kilovolt (kV) transmission line to capture energy generated by the 200 megawatt Northstar Wind Farm in Iowa.

The proposed project is considered a large energy facility under Minnesota Statute 216B.2421, subd. 2(3), as it would have a capacity of 100 kV or more and exceed 10 miles in length. Therefore a certificate of need from the Commission is required for the project. The applicant filed a certificate of need application with the Commission for the Northstar 161 kV transmission line project on October 28, 2008.

Northstar is proposing to construct a new 161 kV transmission line between a newly proposed substation in Petersburg Township, Minnesota, near the Iowa border, and two alternative points of interconnection. The first point of interconnection (Option #1) would connect at the Jackson substation that is currently under construction for a total route length of up to 10 miles. The second point of interconnection (Option #2) would connect to the existing switching station pole #114 owned by Xcel Energy for a total route length of 9 miles. The proposed project also involves the construction of a new substation near Petersburg, Minnesota, just north of the Minnesota-Iowa border, east of County State Aid Highway 25.

The certificate of need and route permit applications are being reviewed jointly and the Office of Energy Security is preparing an environmental assessment on the transmission line project to cover the environmental review requirements for the certificate of need and route permit pursuant to Minnesota Rules 7849.7100, subp. 1.

Persons interested in these matters can register their names on the project docket webpage at: http://energyfacilities.puc.state.mn.us/Docket.html?Id=19789 or by contacting: Scott Ek, Office of Energy Security, Energy Facilities Permitting, 85 7th Place East, Suite 500, St. Paul, Minnesota 55101, 651.296.8813, scott.ek@state.mn.us.

Additional documents pertaining to this project can be found at the above website or by going to the following: https://www.edockets.state.mn.us/EFiling/search.jsp and entering docket number "08-1120" under search criteria.

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 REGULATORY FRAMEWORK 2
2.1 Certificate of Need 2
2.2 Route Permit 2
2.3 Scoping and Environmental Assessment 3
3.0 PROJECT DESCRIPTION 4
3.1 Project Location 4
3.2 Route Description 4
3.3 Route Width 5
3.4 Rights-of-Way 5
3.5 Property/Right-of-Way Acquisition 5
3.6 Estimated Project Costs 6
4.0 ENGINEERING AND OPERATION DESIGN 7
4.1 Size and Type of Transmission Line and Structures 7
4.1.1 Conductors 7
4.1.2 Poles 7
4.2 Associated Facilities 8
5.0 CONSTRUCTION 10
5.1 Transmission Line 10
5.2 Substation and Switching Station 12
5.3 Cleanup and Restoration 12
5.4 Maintenance Procedures 13
6.0 POTENTIAL IMPACTS AND MITIGATION MEASURES 14
6.1 Environmental Setting 14
6.2 Socioeconomic Setting 15
6.3 Human Settlement 16
6.3.1 Displacement 16
6.3.2 Noise 16
6.3.3 Aesthetics - Visual Impacts 18
6.4 Public Health and Safety 20
6.4.1 Electric and Magnetic Fields 21
6.4.2 Pacemakers 27
6.4.3 Stray Voltage 28
6.5 Recreation 28
6.6 Transportation and Public Services 29
6.7 Land-Based Economies 30
6.8 Archaeological and Historic Features 32
6.9 Air Quality Resources 33
6.10 Surface Water and Wetlands 34
6.11 Flora and Fauna 36
6.12 Rare and Unique Natural Resources 37
6.13 Radio, Television, and Cellular Phone Interference 38
7.0 ROUTING AND SITING ALTERNATIVES 39
7.1 Withers/Ascherman Alternative 39
7.2 W. Ascherman Alignment Alternatives 40
8.0 ALTERNATIVES TO PROPOSED PROJECT 41

9.0 PERMITS AND APPROVALS REQUIRED 44
10.0 REFERENCES 45

TABLES

Table 1: Project Location Data 4
Table 2: Transmission Line Structure Design 8
Table 3: Scoioeconomic Characteristics within the Project Area 15
Table 4: Estimated Decibel Levels of Common Noise Sources 17
Table 5: Noise Area Classifications (Minnesota Rule 7030.0040) 17
Table 6: Summary of Electric and Magnetic Field Properties 21
Table 7: Typical Electric Fields (V/m) from Common Home and Business Appliances 22
Table 8: Calculated Electric Fields (kV/m) for Proposed 161 kV Transmission Line 23
Table 9: Calculated Magnetic Flux Density (mG) for Proposed 161 kV Transmission Line 24
Table 10: Typical Magnetic Fields (mG) from Common Appliances 25
Table 11: Voluntary Exposure Guidelines for EMF ICNIRP Guidelines for 60 Hz EMF Exposure 26
Table 12: Potentially Required Permits 44

FIGURES

Figure 1: Proposed Route and Alternative
Figure 2: Proposed Route and Alternative
Figure 3: Proposed Route and Alternative
Figure 4: Proposed Route and Alternative
Figure 5: W. Ascherman Alignment Alternatives

APPENDICES

Appendix A – Environmental Assessment Scoping Decision
Appendix B – Sample Route Permit

1.0 INTRODUCTION

Northstar Transmission, LLC (Northstar) has made application to the Minnesota Public Utilities Commission for a certificate of need and a route permit under the alternative permitting process of the Power Plant Siting Act. The applications are for the construction, operation, and maintenance of a 10-mile (Option #1) or 9-mile (Option #2) 161 kilovolt (kV) transmission line and substation (Tatman substation).

The applicant proposes a transmission line route that would run between a newly proposed Tatman substation to be constructed near Petersburg Township, in Jackson County, Minnesota, and one of two potential interconnection points. The first point of interconnection (Option #1) would connect at the Jackson substation that is currently under construction for a total route length of 10 miles. The second point of interconnection (Option #2) would connect to the existing switching station pole #114 owned by Xcel Energy for a total route length of 9 miles.

The applicant indicates that the proposed project would be constructed to capture energy generated by the Northstar Wind Farm, a 200 megawatt (MW) facility located in Emmet and Dickinson counties, Iowa, and connect to the Xcel Energy Lakefield Junction-Fox Lake 161 kV #2 transmission line just east of Jackson, Minnesota.

Minnesota Office of Energy Security (OES) Energy Facility Permitting (EFP) is tasked with conducting environmental review of certificate of need applications and applications for transmission line route permits. The intent of the environmental review process is to inform the public, the applicant, and decision-makers of the potential impacts from the proposed project and possible mitigations for those impacts.

The OES has combined the environmental review into a single document to streamline the regulatory and public participation process. This Environmental Assessment (EA) document covers the environmental review required for both the certificate of need and route permit applications.

Section 2 provides information on the high voltage transmission line regulatory framework. Section 3 describes the proposed project, including location, route description, right-of-way requirements, and estimated costs. Section 4 provides information about the proposed engineering and operation of the project. Section 5 describes the proposed construction and maintenance procedures. Section 6 identifies the potential impacts of and mitigation for the proposed route. Section 7 describes the routing and siting alternatives proposed during the scoping process. Section 8 identifies alternatives to the proposed project. Section 9 identifies permits and approvals required for the proposed project.

2.0 REGULATORY FRAMEWORK

Authority for reviewing and permitting high voltage transmission lines is under the jurisdiction of the Minnesota Public Utilities Commission (the Commission). The proposed Northstar transmission line project requires two major decisions by the Commission, a certificate of need and a route permit.

2.1 CERTIFICATE OF NEED

The proposed project is considered a large energy facility under Minnesota Statute 216B.2421, subd. 2(3), as it would have a capacity of 100 kV or more and exceed 10 miles in length. Therefore a certificate of need from the Commission is required for the proposed project. The applicant filed a certificate of need application with the Commission for the Northstar 161 kV transmission line project on October 28, 2008. The Commission has one year to issue a certificate of need from the date an application is deemed complete. The Commission accepted the certificate of need application as complete on January 22, 2009. In its Order, the Commission found it appropriate for the certificate of need process to proceed under the informal or expedited review process (comment and reply) rather than referring the matter to the Office of Administrative Hearings for a contested case hearing.

2.2 ROUTE PERMIT

No person may construct a high-voltage transmission line without a route permit from the Commission under Minnesota Statute 216E.03, subd. 2. A high-voltage transmission line is defined as any conductor of electric energy and associated facilities designed for and capable of operating at a voltage of 100 kV or more and is greater than 1,500 feet in length. Associated facilities include, but are not be limited to, insulators, towers, substations, switches, and terminals.

The project is eligible for consideration under the alternative permitting process (Minnesota Rule 7849.5500) of the Power Plant Siting Act (Minnesota Statute 216E.04, subd. 2). The alternative permitting process is shorter than the full permitting procedures and does not require the applicant to propose any alternative sites or routes to the preferred site or route, but does require the applicant to disclose rejected route alternatives and an explanation of why they were rejected. Under the alternative permitting process, the Commission has six months to issue a route permit from the date a route permit application is deemed complete. The Commission accepted the Northstar route permit application as complete on December 1, 2008.

2.3 SCOPING AND ENVIRONMENTAL ASSESSMENT

The OES is required to prepare an EA on the route permit application. The EA contains information on the potential human and environmental impacts of the proposed project and addresses required methods to mitigate such impacts for all of the routes considered. The OES is also required to prepare an environmental report (ER) on the certificate of need application. The ER contains information on the potential human and environmental impacts of the proposed project and analyzes alternatives.

Pursuant to Minnesota Rule 7849.7100, subp. 1, the OES has combined the certificate of need and route permit environmental processes for this project. The certificate of need and route permit applications will be reviewed jointly and an EA will be prepared in lieu of the environmental report. The EA includes the analysis of the alternatives required in an ER in accordance with Minnesota Rule 7849.7060, subp. 1. Because the two processes have been combined the OES is not required to prepare an ER under Minnesota Rules 7849.7010 to 7848.7110.

On January 8, 2009, a public meeting on this project was held in the city of Jackson, as required by Minnesota Rule 7849.5570. This meeting provided the public with an opportunity to learn about the proposed project, to suggest route alternatives, and to identify additional issues and concerns that should be considered by EFP staff when preparing the EA.

The OES accepted comments on the scope of the EA until February 12, 2009. After consideration of the public comments the Director of the OES issued the scope of the EA on February 24, 2009. The EA scoping decision document is included in Appendix A.

Upon completion of the EA, continuing procedural steps include: providing notice on the availability of the EA, scheduling and providing notice of a public hearing in the area where the project is located, and bringing the matter and final record to the Commission for a final decision.

Copies of the route permit application and other documents relevant to the process are available for viewing and download on the Commission website at http://energyfacilities.puc.state.mn.us /Docket.html?Id=19789 or eDockets at https://www.edockets.state.mn.us/EFiling/search.jsp (Certificate of Need Docket 08-944 and/or Route Permit Docket 08-1120).

3.0 PROJECT DESCRIPTION

The applicant proposes to construct 9 to 10 miles of 161 kV transmission line, the Tatman substation, and a switching station in Jackson County, Minnesota. The proposed project would begin at a newly proposed Tatman substation to be located in Petersburg Township, Minnesota, near the Iowa border, and two alternative points of interconnection near the city of Jackson, Minnesota.

In addition, Northstar proposes to co-locate or underbuild existing Rural Electric Administration (REA) distribution lines onto the newly proposed transmission line structures or work with the REA to bury the lines, thereby consolidating electrical utilities within one right-of-way. Should Option #1 be selected, the proposed Northstar transmission line from pole #114 to the Jackson Substation and the existing 161 kV Xcel transmission line would be located on new double circuit single pole structures for a distance of approximately one mile, following the existing alignment. In general, approximately 85 percent of the proposed route uses or parallels existing electric transmission facilities and/or road rights-of-way. The applicant indicates in the route permit application that no residential or business displacements would result from the proposed project.

3.1 PROJECT LOCATION

The proposed project is located in Jackson County, Minnesota in Des Moines Township, Petersburg Township, Wisconsin Township, and the city of Jackson. Townships, ranges, and sections for the project are shown below in Table 1. A detailed depiction of the proposed project is presented as Figures 2 through 4.

Table 1: Project Location Data

County	Township	Township	Range	Section(s)
Jackson	Petersburg	101N	34W	5, 6, 7, 8, 17, 18, 19, 20, 29, 30, 31, 32
Jackson	Wisconsin	102N	34W	18, 19, 20, 29, 30, 31, 32
Jackson	Des Moines	102N	35W	13

3.2 ROUTE DESCRIPTION

The transmission line would originate at a newly constructed substation (Tatman substation) located approximately one-half mile north of the Minnesota-Iowa border in Petersburg Township. The transmission line route would head north out of the Tatman substation along County State Aid Highway (CSAH) 25/560th Avenue for approximately five and one half miles to 558th Avenue and continue north two miles to CSAH 14 traveling one-quarter mile east. At this point the transmission line route veers slightly north-northwest where it travels along property and section lines across private agricultural land to one of two points of interconnection:

Option #1 - The transmission line would be co-located on new double-circuit pole structures at existing pole #114 of Xcel's 161 kV Lakefield Junction to Fox Lake transmission line for approximately one mile west to the Jackson substation which is currently under construction.

Option #2 - The transmission line would terminate at a new switching station near pole #114 of Xcel's Lakefield Junction to Fox Lake 161 kV transmission line.

3.3 ROUTE WIDTH

The applicants are requesting a proposed route of varying widths. The requested route widths and lengths vary by segment and range from 300 feet to one mile in width. A 300 foot route width centered on CSAH 25 and then 558th Avenue is requested from the proposed Tatman substation to CSAH 14. The route width for the segment from CSAH 14 north is one mile and is requested to better accommodate potential routing issues when traversing private agricultural land. Should Option #1 be chosen, the requested route width for the additional one mile to the Jackson substation is 200 feet, utilizing the existing Xcel 161 kV 80 foot wide easement and extending the easement 120 feet to the north.

3.4 RIGHTS-OF-WAY

The route permit application indicates approximately 85 percent of the proposed route length uses or parallels existing electric transmission facilities and/or road rights-of-way. The required rights-of-way would vary in width from 100 total feet along the proposed route from the proposed Tatman substation to CSAH 14 and private land north of CSAH 14 to 80 total feet where the proposed transmission line would be co-located on double-circuit poles with the existing Xcel 161 kV transmission line from pole #114 to Jackson substation.

As indicated in the route permit application the proposed transmission alignment would be constructed within and share the existing road rights-of-way along CSAH 25/560th Avenue and 558th Avenue from the proposed Tatman substation to CSAH 14. The applicant would therefore require a 50 foot wide strip of new right-of-way along this segment of the proposed route and licensing agreements from the Jackson County and the respective townships for the 50 feet of required road rights-of-way sharing.

3.5 PROPERTY/RIGHT-OF-WAY ACQUISITION

Should a route permit be issued, the applicant would commence the easement acquisition process, to the extent that new right-of-way is needed. Landowners having a legal interest in the real estate on which the transmission facility would be constructed would be contacted by the applicant.

As indicated in the route permit application, a strip of private-owned land almost eight miles long and 50 feet wide has already been acquired for overhang easements by the applicant. Even if an existing easement condition appears to accommodate the project and no new right-of-way is needed, the applicant would still work with a landowner in order to address any construction needs, impacts, damages, or restoration issues, as a condition of the route permit.

The applicant may request permission from the landowner to enter the property to conduct a preliminary survey of existing features and topography (natural and man-made), collect soil samples, and determine appropriate foundation designs. The proposed locations of the transmission structures or substation facility may be staked with permission of the landowner.

Upon completion of the design and survey process, easement negotiations would ensue. The applicant would purchase easement rights from landowners for the transmission facility right-of-way. The easements would provide Northstar the right to construct, operate, and maintain the transmission line within the defined right-of-way. The applicant would work with landowners to negotiate the terms of new and existing easements that are acceptable to the landowner and the applicant.

3.6 ESTIMATED PROJECT COSTS

The applicant provided a preliminary cost estimate for the project in the route permit application. The cost of the project including the cost of mitigation measures was estimated between $10.1 to $10.2 million as follows:

161 kV Transmission Line	$5,200,000
Tatman Substation	$3,000,000
Double-Circuiting Xcel Energy's Existing 161 kV (Option #1)	$1,900,000
Switching Station	$2,000,000

4.0 ENGINEERING AND OPERATION DESIGN

The proposed project would consist of 9 or 10 miles of new conductor, structures, a new substation, and/or a new switching station. The designed voltage of the proposed line is 161 kV for the entire proposed route. This section describes the proposed structure and conductor design, capacity, and associated facilities.

4.1 SIZE AND TYPE OF TRANSMISSION LINE AND STRUCTURES

High voltage transmission line circuits generally consist of three phases, each at the end of a separate insulator, and physically supported by structures. A phase consists of one or more conductors (single, double, or bundled). A typical conductor is a cable consisting of aluminum wires stranded around a core of steel wires. There may also be shield wires strung above the phases to prevent damage from potential lightning strikes. The shield wire could also include a fiber optic cable that allows for substation protection equipment to communicate with other terminals one the line. Transmission structures and conductor details are summarized in Table 2.

4.1.1 Conductors

The three phases for this project would each consist of single 795 (Drake) aluminum conductor steel reinforced (ACSR). The ACSR conductors are 795,000 circular mils or approximately 1.108 inches in diameter and are compromised of seven steel wires in the center surrounded by 26 aluminum strands. Ultimately, the proposed 161 kV transmission line would be a single-circuit, three-phase, 60 Hz (hertz), alternating current line with the exception of the segment between pole #114 and the Jackson substation which would be a double-circuit 161/161 kV, co-located on new double-circuit structures with Xcel's existing 161 kV line (Option #1).

4.1.2 Poles

The transmission line would be supported by direct-embedded galvanized steel poles with braced posts for the majority of the route. These tangent structures would average 75 feet in height with foundations that are approximately 30 inches in diameter with a 400 foot span between each structure.

Should Option #1 be selected, the structures leading from pole #114 to the Jackson substation would be galvanized steel pole double-circuit structures with davit arms and supported by a concrete foundation. The structures would be approximately 110 feet to 150 feet in height and 36 inches inch diameter with an average span of 565 feet between poles.

Table 2: Transmission Line Structure Design

Line Voltage (kV)	Conductor	Structure Type	Pole Type	Foundation	Foundation Diameter (inches)	Average Height (feet)	Average Span Length (feet)
161 Single-Circuit	ACSR 795 kcmil 26/7	Single Pole Braced Post	Self-Supporting Steel (galvanized finish)	Direct Embed	30	75	400
161/161 Double-Circuit	ACSR 795 kcmil 26/7	Single Pole Davit Arm	Self-Supporting Steel (galvanized finish)	Concrete	36	110-150	565

Source: Tetra Tech EC, Inc. *Application to the Public Utilities Commission for a Route Permit, Northstar Transmission, LLC, Northstar 161 kV Transmission Line Project*. October 2008.

4.2 ASSOCIATED FACILITIES

The applicant is proposing to construct a new substation on approximately 2.5 acres of a 9 acre parcel located just north of the Minnesota-Iowa border on the east side of CSAH 25 in the southwest quarter of Section 32, Township 101N, Range 34W. The location was selected because it is due north of the center of the Northstar Wind Farm. The substation would be designed to accommodate the 161 kV line along with a 34.5 kV collector line that would be constructed underground from the Northstar Wind Farm collector system in Iowa to the proposed Tatman substation.

The substation design has not been completed but would generally include the following components:

- Circuit breakers
- High voltage switches
- Steel structures to support the high voltage bust, switches and other miscellaneous equipment
- Surge arresters
- Ground grid
- Power and control cable
- Control building and control panels
- DC battery system
- AC station power
- AC and DC station service panels
- Communication panel
- Crushed rock used as surfacing of the substation
- Fencing around the facility, to restrict public access

Should Option #2 be selected the applicants indicate a new switching station would be constructed on 2.5 acres on 790th Street just east of the city of Jackson. The switching station would be designed to accommodate the proposed 161 kV line and would generally include the following components:

- 161 kV High voltage bus
- 161 kV Circuit breakers
- 161 kV High voltage switches
- Steel structures to support the high voltage bus, switches, and other misc. equipment
- Surge arresters
- Ground grid
- Power and control cable
- Control building
- Control panels
    - DC battery system
    - AC station power
    - AC & DC station service panels
    - Communication panel
- Instrument transformers for protection and metering
- Control house for the substation control, relaying and communications equipment
- Concrete foundation to support the control house and electrical equipment
- Crushed rock used as surfacing of the switching station
- Fencing around the entire facility to restrict public access

5.0 CONSTRUCTION

Project construction would begin after the appropriate federal, state, and local permits and approvals are issued. The applicant will also need to acquire property rights-of-way, licenses, complete soil investigations, and develop the final detailed design.

A construction schedule will be developed and based on permit conditions, system loading issues, existing transmission line outage restrictions, weather, road restrictions, mitigation or impact minimization, and availability of work force and materials.

5.1 TRANSMISSION LINE

Construction will require the acquisition and preparation of rights-of-way required for the transmission line, establishment of work and staging areas, and stringing setup sites. Efforts will be made to stage construction within the road right-of-way to the greatest extent possible. In some cases, temporary lay down areas may be required due to problematic structure location. The applicant indicates a three to five acre staging area would be required to store and handle materials. The applicant would need to obtain temporary construction and staging area easements, as necessary.

Construction will follow standard transmission line construction practices. These practices include staging, erecting transmission line structures and stringing transmission lines. Construction best management practices and mitigation will be developed based on the proposed schedule for activities, permit requirements, prohibitions, maintenance guidelines, inspection procedures, terrain and other practices to minimize potential impacts.

Typical construction equipment used on a project consists of tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, dump trucks, front end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks and various trailers. Many types of excavation equipment are set on wheel or track-driven vehicles.[1]

Construction begins by moving the poles by truck from the staging areas, delivered to the staked location and placed within the right-of-way until the structure is set. Typically, access to the transmission line right-of-way corridor is made directly from the existing roads or trails that run parallel or perpendicular to the transmission line right-of-way.

[1] Tetra Tech EC, Inc. Application to the Public Utilities Commission for a Route Permit, Northstar Transmission, LLC, Northstar 161 kV Transmission Line Project. October 2008.

Where the transmission line right-of-way does not parallel a road, access will be gained where the route crosses an existing road. To accommodate the heavy equipment used in construction, such as cranes, cement trucks and hole drilling equipment, existing access roads may be upgraded or new roads may be constructed. New access roads may also be constructed when no current access is available or the existing access is inadequate to cross roadway ditches. In all cases, permission from the property owner would be obtained prior to accessing the transmission line route and constructing, upgrading, or reconfiguring roads.

The majority of steel pole structures will be directly embedded in the ground. Holes will be drilled one to two feet larger than the base of the pole, the pole is placed in the hole, and the hole is then filled with granular material. In some locations culverts may be used in the hole to provide adequate support for the pole. In cases where angle, dead-end, or double circuit structures are necessary the holes will be drilled the diameter (four to seven feet in diameter) and depth (12 or more feet deep) of the pole foundation, in preparation for the concrete, rebar and anchor bolts.

After the poles are set, the three conductors and shield wire are strung between the poles. The conductor is typically strung in approximately two mile sections. The stringing equipment is set up within the line right-of-way. Access to each structure is required to attach the conductors to the insulators and shield wire to the clamps. During this stage, avian flight diverters would typically be installed according to Minnesota Department of Natural Resources (DNR) requirements. Temporary guard structures would be set at each road, railroad and other crossings to keep the conductor off the crossing.

Environmentally sensitive areas and wetland areas may require special construction techniques in some circumstances. The applicant has indicated that the most effective way to minimize potential impacts to wetland areas is by locating structures outside of wetlands and adjacent to resource areas when possible and spanning all surface flows. The applicant's construction practices will not allow construction equipment to be driven across waterways except under special circumstances and only after discussion with the appropriate resource agency. Where waterways must be crossed to pull in the new conductors and shield wires, workers may walk across, use boats, or drive equipment across ice in the winter.

Construction crews will maintain sound water and soil conservation practices during construction and operation of the facilities in order to protect topsoil and adjacent water resources, to minimize soil erosion, and avoid major disturbance of individual wetlands and drainage systems during construction.

5.2 SUBSTATION AND SWITCHING STATION

Tatman Substation

The Tatman substation components would be delivered to the site on a flat-bed transport truck. Oversize and overweight truck permits will be coordinated with the Jackson County Department of Transportation.

Substation components would be stored onsite or on a temporary construction easement negotiated with private landowners adjacent to the site. The primary construction staging area would include a 3-acre parcel in the vicinity of the proposed Tatman substation site and would not be included as part of the route permit.

An access road will be developed from CSAH 25 into the proposed Tatman substation site. The internal access roadway would be covered with recycled concrete aggregate or crushed stone during construction activities, as appropriate, to prevent rutting and off-site tracking of soils by construction vehicles. As indicated by the applicant, significant clearing would not be required due to the agricultural type vegetation at the site and staging area. Construction of the substation would likely require general site grading and backfilling. Crushed stone for finish grading would be delivered to the site toward the end of the construction process.[2]

Switching Station

The 161 kV switching station would require an area approximately 250 feet by 250 feet and is proposed to be located approximately 500 feet south of existing pole #114, on the south side of the existing road and railroad tracks. Construction of the switching station site would require general site grading and backfilling. The appropriate soils will be brought in to build a stable site, as necessary.[3]

5.3 CLEANUP AND RESTORATION

Practices to mitigate potential construction impacts would follow permit requirements and be based on construction schedules, geology and topography, maintenance guidelines, inspection procedures, and presence of sensitive environments or species.

During construction, areas may be disturbed during the normal course of work, with construction continuing for several weeks in any one location. Every attempt will be made to limit ground disturbance wherever possible. Modifications would be made throughout the construction process to ensure that potential impacts are minimized to the greatest extent.

[2] Tetra Tech EC, Inc.. Route Permit Application – Northstar Transmission Line Project, Docket# TL-08-1120 Information Request. May 7, 2009.
[3] Ibid.

Upon completion of construction, disturbed areas would be restored to their original condition to the maximum extent practicable. If damage has occurred to crops, fences, drain tiles, or the adjacent property, the applicant would fairly reimburse the landowner(s) for the damages sustained. The applicant would employ an outside contractor to restore the damaged property to as near its original condition as is possible. Areas with significant soil compaction and disturbance from construction activities along the proposed transmission line route will require assistance in re-establishing the vegetation stratum and controlling soil erosion. Construction and post-construction reclamation activities would include but are not limited to removing and disposing of debris; dismantling staging areas and temporary workspace; employing erosion control blankets with embedded seeds, silt fences, hay bales, or hydro seeding; and hand-planting disturbed areas with native vegetation.

Landowners would be contacted at the close of construction activities to determine whether damages due to transmission line construction have occurred. Upon completion of construction cleanup and restoration of damaged areas, landowners would again be sent a final letter requesting notification of any outstanding construction damage that has not been remedied.

5.4 MAINTENANCE PROCEDURES

Transmission lines and substations typically require only moderate maintenance and are designed to operate for decades. However, regular maintenance and inspections are performed over the life of the facility to ensure its continued integrity. The applicant indicates that the annual operating and maintenance expenses would be between $5,000 and $10,000 per year.

The route permit application indicates that maintenance of the line will be performed by an experienced contractor under a long-term service agreement including line inspection, equipment maintenance, and repairs. Vegetation growth will be monitored approximately every 5 years. If undesirable vegetation has become established and would affect the safe operation or maintenance of the line, the vegetation would be removed.

The substation will require a certain amount of maintenance to ensure proper operation in accordance with accepted operating parameters and the National Electric Safety Code Standards (NESC) requirements. Transformers, circuit breakers, batteries, protective relays, and other equipment would need to be serviced periodically in accordance with the manufacturer's recommendation. The site itself would be kept free of vegetation and drainage maintained.[4]

[4] Tetra Tech EC, Inc. Application to the Public Utilities Commission for a Route Permit, Northstar Transmission, LLC, Northstar 161 kV Transmission Line Project. October 2008.

6.0 POTENTIAL IMPACTS AND MITIGATION MEASURES

The construction of a transmission facility involves both short- and long-term impacts. An impact is a change to the pre-construction environment as a direct or indirect result of the proposed action and may be positive or negative. Direct impacts are caused by the action and occur at the same time and place. Indirect impacts are caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable.

This section describes the potential impacts on social, economic, and natural resources and the possible mitigation measures intended to minimize impacts caused by the construction and future operation and maintenance of the proposed transmission facility.

6.1 ENVIRONMENTAL SETTING

The project area extends west and southeast from Jackson to Petersburg Township where the newly proposed Tatman Substation would be located near the Minnesota-Iowa border. The transmission line would eventually connect the proposed Tatman substation to the existing Jackson substation. The majority of the proposed project would be located in primarily agricultural areas and along existing road rights-of-way.

The proposed transmission line project traverses the Coteau Moraines, and the Minnesota River Prairie ecological subsections in the southwest corner of Minnesota. The Couteau Moraines subsection rises abruptly at Buffalo Ridge, the western boundary of the Coteau Moraines subsection. Buffalo Ridge is a high landform (1,995 feet above mean sea level), second in Minnesota only to Eagle Mountain on the North Shore of Lake Superior. Moving east from Buffalo Ridge the elevation tapers off and levels out into the Minnesota River Prairie Subsection. This area of Minnesota is well-known for its windy conditions, shallow lakes, and prairie wetlands. The area is drained by a number of small streams and one large river, the Des Moines. Row-crop agriculture and pasture is the predominant land use in this subsection today.[5]

[5] Minnesota Department of Natural Resources, Division of Ecological Resources. *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife.* 2006.

Located in the Western Groundwater Province, the area is generally comprised of 100 to 400 feet of clayey glacial drift overlying Cretaceous and Precambrian bedrock. Moderate to limited surficial and buried sand and sandstone aquifers consist within the glacial drift and Cretaceous bedrock, respectively. Sandstone layers interbedded with thick layers of shale are utilized in the area for local water resources. The aquifers generally occur beneath glacial drift but above older Cretaceaous bedrock.[6] Soil is typically a well-drained loamy soils with select areas of clayey and sand and gravelly soils.

6.2 SOCIOECONOMIC SETTING

The Project is located entirely within Jackson County in southwest Minnesota. The socioeconomic setting of the proposed project area was evaluated on a regional basis, comparing data for the area along the project route with average data for Jackson County and the state of Minnesota. Data was compiled from the U.S. Census data. Table 3 summarizes the socioeconomic characteristics within the project area.

Table 3: Socioeconomic Characteristics within the Project Area

Location	Population 2000	Estimated Population 2008 (2007*)	Change in Population	Land Area (acres)	Population Density (mile^2)	Per Capita Income	Population Below Poverty Level
Minnesota	4,919,479	5,220,393	6.1%	79,610	66	$23,198	7.9%
Jackson County	11,268	10,734	-4.7%	702	15	$17,499	8.6%
City of Jackson	3,501	3,350*	-4.3%	3.8	882	$18,444	11.1%
Des Moines Township	273	263*	-3.6%	31.7	8	$21,496	1.1%
Wisconsin Township	263	258*	-1.9%	35.5	7	$16,996	1.4%
Petersburg Township	269	263*	-2.2%	36.1	7	$16,799	6.4%

Notes: Land Area, Population Density, Per Capita Income, and Population Below Poverty Level reported from 2000 data.
Sources: U.S. Census Bureau (factfinder.census.gov). April and May 2009.
University of Minnesota Libraries, Government Publications. (govpubs.lib.umn.edu/census/profile_twp.phtml). April 2009.

[6] Minnesota Department of Natural Resources, Division of Ecological Resources. *Figure 1. Groundwater Provinces*. (www.dnr.state.mn.us.waters/ground_water/provinces/mngwprov.html). April 2009.

6.3 HUMAN SETTLEMENT

Settlements within the project area are primarily residences and farm structures with shelter belts common along the rural and county roads. The applicant indicates that there are approximately 20 residences located along the proposed transmission line route with several more within and north of the city of Jackson. The main thoroughfares in the area of the project are U.S. Interstate 90, CSAH 4, CSAH 8, CSAH 14, and CSAH 23.

6.3.1 Displacement

The route would parallel and share existing road rights-of-way for approximately 85 percent of the route, the other 15 percent would traverse and follow section lines through private agricultural land. The applicant indicates in the route permit application that no displacement of residential homes or business is anticipated to occur as a result of this project.

6.3.2 Noise

Noise can generally be described as an undesired sound and is measured in units of decibels (dB), or sound pressure level. The sound pressure level for purposes of human hearing is measured with the A-weighted decibel scale or dB(A). On the decible scale, a ± 1 dB increase is essentially imperceptible to most humans; a ± 3 dB increase in noise is the threshold of human perception; a ± 5 dB increase is clearly noticeable; and a ± 10 dB increase is perceived as a doubling in loudness.[7] Estimated decibel levels of common noise sources are provided in Table 4.

[7] Minnesota Pollution Control Agency. A Guide to Noise Control in Minnesota, Acoustical Properties, Measurement, Analysis and Regulation. 2008.

Table 4: Estimated Decibel Levels of Common Noise Sources

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

Source: Minnesota Pollution Control Agency. *A Guide to Noise Control in Minnesota, Acoustical Properties, Measurement, Analysis and Regulation*. 2008.

The Minnesota Pollution Control Agency (MPCA) has established regulatory standards for allowable noise levels in Minnesota, defined in Minnesota Rules 7030.0050. These regulatory standards are based on land use classifications, grouped according to noise sensitivity, or Noise Area Classifications. The most sensitive group of receptors is applicable to residences, hospitals, churches and campgrounds. These standards also vary between daytime and nighttime allowable limits. Table 5 summarizes the MPCA's noise standards grouped by Noise Area Classifications. The standards are expressed in terms of L_{10} (the dB(A) that may be exceeded 10 percent of the time within one hour) and L_{50} (the dB(A) that may be exceeded 50 percent of the time within one hour).

Table 5: Noise Area Classifications (Minnesota Rule 7030.0040)

Daytime (7:00 am – 10:00 pm)			Nighttime (10:00 pm – 7:00 am)	
Noise Area Classification	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

Source: Minnesota Pollution Control Agency. *A Guide to Noise Control in Minnesota, Acoustical Properties, Measurement, Analysis and Regulation*. 2008.

Potential noise associated with the proposed project includes sources associated with initial construction and long-term operation of the proposed project. Impacts from general construction noise are expected to occur during daytime hours as the result of heavy equipment operation and increased vehicle traffic associated with the transport of construction personnel to and from the work area. Short-term exceedance of daytime noise standards would be intermittent and temporary in nature.

Long-term operational noise would be associated with the insulators, transmission conductor hardware, and transformers at the substations. The level of noise is dependent upon the conductor conditions, voltage levels and weather conditions. Conductors and transformers may create subtle crackling noise due to the electric ionization of moist air near the wires when it is rainy, damp, or foggy (corona discharge, see also Sections 6.9 and 6.13). During dry weather, noise from electrical transmission facilities is typically inaudible. The applicant indicates the noise levels directly adjacent to 161 kV transmission lines and substation transformers would generally be below the 20 to 30 dBA level.

Mitigation

As indicated by the applicant, the transmission line project and the associated facilities would be designed and constructed to comply with state noise standards and would be a condition of the route permit. No mitigation is necessary, since there will be only minimal short-term noise impacts resulting from the proposed project.

6.3.3 Aesthetics - Visual Impacts

Aesthetics refer to the natural and human modified landscape features or visual resources that contribute to the public's experience and appreciation of the environment. Wetlands, surface waters, landforms, forests and vegetation patterns are among the natural landscape features that define an area's visual character, whereas buildings, roads, bridges and other structures reflect human modifications to the landscape. The level of impact to visual resources generally depends on the sensitivity and exposure of a particular viewer and can vary greatly from one individual to the next. It is, therefore, difficult to predict whether a transmission line project would or would not alter the perceived visual character of the environment and constitute a negative visual impact.

The proposed project area lies in a rural location with farming and related agricultural operations dominating the land use. Agricultural fields, farmsteads, pastures, and large open vistas visually dominate the area surrounding the proposed project. The topography is relatively flat with some gently rolling hills and valleys when nearing the Des Moines River.

There are approximately 20 residences along the transmission line corridor and several more just north of the city of Jackson. The settlements are primarily residences and farm buildings with shelterbelts in some locations along the rural and county roads. The major concentration of sensitive viewers near the project area would include receptors in Wisconsin and Petersburg Townships and the city of Jackson. A number of these residences, as indicated by the applicant, currently view two Rural Electric Association (REA) distribution lines which are situated on 60 to 75 foot high wood poles spaced approximately 100 to 200 feet apart along portions of CSAH 25 and 558th Avenue.

As indicated by the applicant, the closest residential structure to the proposed transmission centerline (located within the existing road rights-of-way) along the north-south segment of the route would be approximately 175 feet, four residences would be located approximately 200 to 500 feet from the proposed transmission centerline with the remainder of residences over 1,000 feet away. Along the east-west segment of the proposed route from pole #114 to the Jackson substation there are two residences that are currently located approximately 100 feet from the existing Xcel 161 kV transmission line with another nine located approximately 100 to 1,200 feet away.[8]

Mitigation

Northstar proposes to co-locate or underbuild the existing REA distribution lines onto the newly proposed 161 kV transmission line structures or work with the REA to bury their lines, thereby consolidating electrical utilities within one right-of-way. The proposed Northstar transmission line from pole #114 to the Jackson Substation (Option #1) and the existing 161 kV Xcel transmission line would be located on new double circuit single pole structures for a distance of approximately one mile, following the existing alignment. In general, the transmission line would be located along existing utility and road rights-of-way for most of the route. Additional mitigation measures would include:

- Considering input pertaining to visual impacts from landowners or land management agencies prior to final location of structures, rights-of-way, and other areas with the potential for visual disturbance.
- Care will be used to preserve the natural landscape and prevent any unnecessary destruction of the natural surroundings in the vicinity of the project during construction and maintenance.
- Crossing wetlands, lakes, and surface flows in the same location as existing transmission lines.
- Placing structures at the maximum feasible distance from intersecting roads, highway, or trail crossings and/or crossing sides of roads to minimize or avoid impacts.

[8] Tetra Tech EC, Inc. Route Permit Application – Northstar Transmission Line Project, Docket# TL-08-1120 Information Request. May 7, 2009.

In addition, the Commission could require, as a permit condition, that Northstar work with landowners to identify issues related to the transmission line such as distance from existing structures, tree clearing, and other aesthetic concerns, should a route permit be issued for the proposed project. An example of a route permit is presented in Appendix B.

6.4 Public Health and Safety

The transmission line, regardless of route location, must meet all requirements of the National Electrical Safety Code (NESC) and the Rural Utilities Service (RUS) Design Manual for High Voltage Transmission Lines. These standards are designed to protect human health and the environment. They also ensure that the transmission line and all associated structures are built from high quality materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment provided normal routine operational and maintenance is performed.

Utilities must comply with the most recent edition of the NESC, as published by the Institute of Electrical and Electronics Engineers, Inc., and approved by the American National Standards Institute, when constructing new facilities or reinvesting capital in existing facilities. See Minnesota Statute 326B.35 and Minnesota Rule 7826.0300 subpart 1.

The NESC is a voluntary utility developed set of standards intended to ensure that the public is protected. The NESC covers electric supply stations and overhead and underground electric supply and communication lines, and is applicable only to systems and equipment operated by utilities or similar systems on industrial premises.

Standards would be met for, but not limited to, clearance to ground, clearance to crossing utilities, clearance to buildings, right-of-way widths, erection of power poles, strength of materials, and stringing of transmission line conductors. The applicant indicates construction crews would comply with local, state, NESC standards regarding installation of facilities, and standard construction practices to protect public health and safety. The applicant's and general industry safety procedures would be followed during and after installation of the transmission line, including clear signage during all construction activities.

The proposed transmission line design includes devices to protect the public in the event of an accident involving structures and/or conductors. Protective devices would include breakers and relays located where the transmission line connects to the Tatman substation. The protective equipment would de-energize the transmission line should an accident occur. In addition, the substation facilities would be fenced and posted with warning signs, and access would be limited to authorized personnel.

6.4.1 Electric and Magnetic Fields

Electric and magnetic fields arise from the voltage and the flow of electricity (current) through a conductor. 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 electric current. The electric field associated with high voltage transmission lines "extend" from the energized conductors to other nearby objects whereas the magnetic field "surrounds" the conductor. Together, these fields are generally referred to electric and magnetic fields or EMF. A summary of electric and magnetic properties is summarized in Table 6.

This section of the EA specifically addresses electric and magnetic fields produced through transmission of electric power at 60 Hz (cycles per second), also referred to as power frequency EMF. Transmission lines, household appliances and electric equipment, lighting and wiring all create electric and magnetic fields.

Table 6: Summary of Electric and Magnetic Field Properties

Electric Fields	Magnetic Fields
Electric fields arise from voltage.	Magnetic fields arise from current flows.
Their strength is measured in volts per meter (V/m).	Their strength (magnetic flux density) is measured in milligauss (mG) or microtesla (µT).
An electric field can be present even when a device is switched off.	Magnetic fields exist as soon as a device is switched on and current flows.
Field strength decreases with distance from the source.	Field strength decreases with distance from the source.
Most building materials shield electric fields to some extent.	Magnetic fields are not attenuated by most materials.

Source: World Health Organization. "What are Electromagnetic Fields?", *Health and Environment Briefing Pamphlet*, Series 32 1999.

Electric Fields

Electrical fields are created by voltage. Voltage can be described as the potential difference between two points and will always try to drive an electric current. The voltage on any conductor produces an electric field that extends from the wire in all directions. The intensity of electric fields is associated with the voltage of the transmission line and is measured in kilovolts per meter (kV/m). Some typical electric field strengths measured near common household appliances are presented in Table 7.

Table 7: Typical Electric Fields (kV/m) from Common Home and Business Appliances

Source	Electric Field Strength (at a distance of 30 cm)
Iron	0.12
Refrigerator	0.12
Toaster	0.08
Coffee machine	0.06
Vacuum cleaner	0.05

Source: Source: World Health Organization, "What are Electromagnetic Fields?", *Health and Environment Briefing Pamphlet*, Series 32. 1999.

Transmission line electric field levels are typically greatest near the center of the line right-of-way with levels decreasing as one moves away from the central alignment. The electric field associated with a high voltage transmission line may extend from the energized conductors to other nearby objects such as the ground, towers, vegetation, buildings, and vehicles. These objects are commonly referred to as "screeners". The screening effect associated with these and other objects reduce the strength of transmission line electric fields.

Electrical fields at maximum conductor voltage for the proposed project as provided by the applicant are presented in Table 8. Maximum conductor voltage is defined as the nominal voltage plus 5 percent, or 121 kV.

Table 8: Calculated Electric Fields (kV/m) for Proposed 161 kV Transmission Line

Structure Type	Maximum Operating Voltage*	Distance to Proposed Centerline (feet) at 3.28 feet above the ground										
		-300	-200	-100	-50	-10	0	10	50	100	200	300
Steel Pole Braced Post 161 kV Single Circuit	169 kV	0.01	0.03	0.12	0.4	1.03	1.61	1.94	0.35	0.13	0.04	0.02
Single Circuit 161 kV with 12.47 kV Underbuild	169/13 kV	0.02	0.03	0.13	0.39	---	0.57	1.0	0.32	0.13	0.04	0.02
Steel Pole Davit Arm 161/161 kV Double Circuit	169 kV	0.04	0.08	0.21	0.07	3.39	3.9	3.39	0.07	0.21	0.08	0.04

*Maximum operating voltage is the nominal voltage plus five percent (i.e. 161 kV + 8.05 = 169 kV).
Sources: Tetra Tech EC, Inc. *Application to the Public Utilities Commission for a Route Permit, Northstar Transmission, LLC, Northstar 161 kV Transmission Line Project*. October 2008.
Tetra Tech EC, Inc. Route Permit Application – Northstar Transmission Line Project, Docket# TL-08-1120 Information Request. May 7, 2009.

The applicant has stated that the proposed single circuit 161 kV transmission line would have a maximum electric field of approximately 1.94 kV/m, at ten feet from centerline beneath the braced posts, one meter above the ground or 1.0 kV with the 12.47 kV underbuild. While the 161/161 kV double circuit transmission line segment would have a maximum electric field of 3.9 kV/m, at centerline, one meter above the ground.

The maximum calculated electric field of 3.9 kV/m for the entire transmission line is approximately 51.25 percent less than the 8 kV/m guideline historically recommended by the Minnesota Environmental Quality Board (EQB) and Commission in other route permit proceedings. The 8 kV/m guideline was designed to prevent serious hazard from shocks when touching large objects like a bus or combine parked under high-voltage transmission lines, usually of 345 kV or greater.

Magnetic Fields

Electric current passing through a conductor produces a magnetic field in the area surrounding the wire. Similar to electric fields, magnetic fields are strongest near the conductor and diminish with distance. Magnetic fields, however, are not shielded by most common materials and easily pass through them. The magnetic field may also be called magnetic flux density and is measured in units of milligauss or microtesla.

The estimated magnetic fields based on the proposed line and structure designs as provided by the applicant are presented in Table 9. The expected magnetic fields for the structure type and voltage have been calculated at various distances from the centerline.

Table 9: Calculated Magnetic Flux Density (mG) for Proposed 161 kV Transmission Line

Structure Type	System Condition	Current (Amps)	Distance to Proposed Centerline (feet) at 3.28 feet above ground								
			-300	-200	-100	-50	0	50	100	200	300
Steel Pole Braced Post 161 kV Single Circuit	Peak	300	0.31	0.66	2.47	8.13	36.5	10.2	3	0.8	0.33
	Average	755	0.77	1.67	6.21	20.5	91.9	25.5	7.5	1.9	0.84
Steel Pole Braced Post 161 kV Single Circuit with 12.47 kV Underbuild	Peak	755/8	0.9	1.9	6.4	19.0	65.2	22.8	7.2	1.9	0.8
	Average	300/5	0.4	0.8	2.7	7.7	25.7	9.1	2.9	0.75	0.33
Steel Pole Davit Arm 161/161 kV Double Circuit	Peak	300	0.07	0.21	1.39	6.75	39.1	6.75	1.4	0.2	0.07
	Average	755	0.17	0.52	3.49	17	98.4	17	3.5	0.5	0.17

Sources: Tetra Tech EC, Inc. *Application to the Public Utilities Commission for a Route Permit, Northstar Transmission, LLC, Northstar 161 kV Transmission Line Project*. October 2008.
Tetra Tech EC, Inc. Route Permit Application – Northstar Transmission Line Project, Docket# TL-08-1120 Information Request. May 7, 2009.

Magnetic fields are not singularly associated with transmission lines. People are exposed to varying magnetic fields to a greater or lesser extent throughout each day whether at home or in schools and offices. A U.S. government study conducted by the EMF Research and Public Information Dissemination Program determined that most people in the United States on average are exposed to magnetic fields of 2 mG or less daily, and varies by individual.[9] Median magnetic field readings for a select number of common home and business appliances are presented in Table 10.

Table 10: Typical Magnetic Fields (mG) from Common Appliances

Source	Distance from Source			
	0.5 foot	1 foot	2 feet	4 feet
Baby Monitor	6	1	-	-
Computer Displays	14	5	2	-
Fluorescent Lights	40	6	2	-
Copy Machines	90	20	7	1
Microwave Ovens	200	4	10	2
Electric Pencil Sharpeners	200	70	20	2
Vacuum Cleaner	300	60	10	1
Can Opener	600	150	20	2
Color Televisions	NA	7	2	-

The National Institute of Environmental Health Science. *Electric and Magnetic Fields Associated with the Use of Electric Power*. June 2002: 34-36.

There are currently no state or federal exposure standards for magnetic fields. Florida and New York are the only two states in the country that have set standards for magnetic field exposure (150 mG limit in Florida and 200 mG limit in New York). These exposure limits were not based on scientific analysis, but in response to maintaining transmission systems within historic levels.

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has developed occupational and residential guidelines for EMF exposure (see Table 11 below). They have also concluded that available data regarding potential long-term effects, such as increased risk of cancer, is insufficient to provide a basis for setting exposure restrictions.

The maximum peak estimated magnetic field generated by this project is 98.4 mG which is approximately 88 percent less than the 833 mG ICNIRP developed guidelines for the general public. The maximum estimated electric field generated by this project is 3.9 kV/m. This level is approximately 7 percent less than the 4.2 kV/m ICNIRP developed guidelines for the general public.

[9] The National Institute of Environmental Health Science. *Electric and Magnetic Fields Associated with the Use of Electric Power*. June 2002 34-36.

Table 11: Voluntary Exposure Guidelines for EMF ICNIRP Guidelines for 60 Hz EMF Exposure

Exposure	Electric Field (kV/m)	Magnetic Field (mG)
Occupational	8.3	4,200
General Public	4.2	833

The National Institute of Environmental Health Science. *Electric and Magnetic Fields Associated with the Use of Electric Power*. June 2002: 34-36.

Mitigation

Research on the effects of electric and magnetic fields to human health have been studied and debated since the 1970's. Conclusions have ranged from no significant association between exposure to EMF and health effects to a weak association between the two. A number of national and international health agencies (The Minnesota Department of Health, The World Health Organization, The National Institute of Environmental Health Sciences) have generally concluded in their research that there is insufficient evidence to prove a connection between EMF exposure and health effects. Research however has not been able to establish a cause and effect relationship between exposure to magnetic fields and human disease, nor a plausible biological mechanism by which exposure to EMF could cause disease.

In Fact Sheet, WHO/322, *Electromagnetic Fields and Public Health: Exposure to Extremely Low Frequency Fields*, June 2007, The World Health Organization provided an update. In its report, after reviewing recent studies that note a weak statistical link between exposure to EMF and incidence of childhood leukemia and studies finding statistical associations through regression analysis, The World Health Organization concludes that laboratory evidence does not support these findings and that a similar link has not been noted with other types of cancer:

> *… epidemiological evidence is weakened by methodological problems, such as potential selection bias. In addition, there are no accepted biophysical mechanisms that would suggest that low-level exposures are involved in cancer development. … Additionally, animal studies have been largely negative. Thus, on balance, the evidence related to childhood leukaemia is not strong enough to be considered causal. … Regarding long-term effects, given the weakness of the evidence for a link between exposure to ELF [extremely low frequency] magnetic fields and childhood leukaemia, the benefits of exposure reduction on health are unclear.*

Although scientists are still debating whether EMF is a hazard to health, at the current time in the United States, there are no federal standards for occupational or residential exposure to EMF.

The following resource provides additional information regarding electric and magnetic fields: *Electric and Magnetic Fields Associated with the Use of Electric Power*, The National Institute of Environmental Health Sciences, June 2002, and can be found on the internet at: http://www.niehs.nih.gov/health/topics/agents/emf/docs/emf2002.pdf.

To assist the public in understanding this issue, the applicant may provide information to the public, interested customers and employees. The information may references studies and provide data to help explain the relative impact of transmission line exposure to other common EMF exposures, and allow individuals to make informed decisions regarding EMF.

6.4.2 Pacemakers

Research has established that EMF can potentially interfere with cardiac pacemakers and implantable cardioverter defibrillators under certain circumstances. Electric and magnetic fields may interfere with an implanted cardiac device's ability to sense normal electrical activity in the heart if the electric field intensity is high enough to induce body currents strong enough to cause interaction. Modern bipolar devices are much less susceptible to interactions with electric fields. Medtronic and Guidant, manufacturers of pacemakers and implantable cardioverter defibrillators, have indicated that electric fields below 6 kV/m are unlikely to cause interactions affecting operation of most of their devices. Older unipolar designs are more susceptible to interference from electric fields with research suggesting that the earliest evidence of interference occurred in electric fields ranging from 1.2 to 1.7 kV/m.

Mitigation

The estimated electric fields for this project (Table 8) are below levels at which modern bipolar and older unipolar devices are susceptible to interaction. In the unlikely event a pacemaker is impacted, the effect is typically a temporary asynchronous pacing (commonly referred to as reversion mode or fixed rate pacing). The pacemaker would return to its normal operation when the person moves away from the source of the interference. Individuals using such devices should consult with their doctor regarding recommended precautions or avoidance. The interference of a cardiac pacemaker implant by high voltage transmission line electric and magnetic fields cannot be excluded, but the risk of the interference inhibition in everyday life is small.

6.4.3 Stray Voltage

Electrical supply systems delivering power to farms, homes, and businesses are grounded to the earth to make them safe and to ensure their reliability. Grounding of these electrical supply systems results in a small amount of current moving through the earth. A small voltage called neutral-to-earth voltage may develop at each point where the electrical system is grounded. When neutral-to-earth voltage is found near animal contact points at levels considered to have potential impact on animals, it is often called stray voltage. Stray voltage is the difference in voltage measured between two points contacted simultaneously by a person or animal (typically less than 10 volts).

Stray voltage arises from poor electrical connections, deteriorated insulation, or faulty equipment. Some sources of stray voltage are cathodic protection systems, telephone systems, and direct current power lines. Stray voltage has been raised as a concern on some dairy farms because of the potential for dairy cows to come into contact with two points and provide a conducting path for current to flow, thereby impacting operations and milk production.

Mitigation

In instances when transmission lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm/structure was directly under and/or parallel to the transmission line. These circumstances are considered when installing transmission lines and can be readily mitigated. Appropriate measures will be taken during transmission line detailed design and construction to prevent the potential for any stray voltage problems for this project. Northstar would be required to address and rectify any stray voltage problems that arise during transmission line operation as a condition of the route permit.

6.5 RECREATION

As indicated by the applicant, recreational opportunities in the area of the proposed project include the Des Moines River, a snowmobile trail, golf course, and campground. There are no state or national forests, parks, or wilderness areas; national wildlife refuges; federal waterfowl production areas; state trails, scientific and natural areas, wildlife management areas, water access points; or county parks present within the proposed project area.

The Des Moines River is used for recreational canoeing and fishing activities. The proposed transmission line route would cross the Des Moines River at approximately river mile 6.8 near the confluence of Stony Brook. There would be minor aesthetic impacts due to the installation of new overhead transmission line poles and conductors. There would be little if any impact to river users as a result of the proposed transmission line except that recreationalists utilizing the river for canoeing and fishing could view the transmission line structures.

A snowmobile trail managed by the Jackson County Snowdrifters runs east-west along CSAH 4. The proposed transmission line would cross over the snowmobile trail near the intersection of CSAH 4 and CSAH 25. There would be little if any impact to snowmobile trail users as a result of the proposed transmission line except for minor aesthetic impacts due to the overhead transmission line.

The Jackson Golf Club is a semi-private golf course located approximately 2 miles west of the proposed switching station location. The golf course would not experience any recreational or aesthetic impacts associated with the proposed transmission line.

The Jackson KOA campground is located approximately 2.2 miles northwest of the proposed switching station location. The campground would not experience any recreational or aesthetic impacts associated with the proposed transmission line.

6.6 Transportation and Public Services

Impacts to transportation would be localized and short term during the construction phase of the project. The proposed project will not impact public services provided by local municipal governments, including police and fire and emergency protection, water and sewer utilities, or private wells and septic systems.

The Jackson Municipal Airport is located within the vicinity of the project. The applicants contacted the MnDOT Aeronautics and Aviation Division for information on potential effects the project could have on the airports. MnDOT indicated that the project is located within the airports area of influence. The applicant would need to submit a Notice of Proposed Construction or Alteration Application for each transmission structure within the flight area of influence to ensure that structures comply with airport safety zones and ordinances.

Mitigation

All necessary provisions would be made to conform to safety requirements for maintaining the flow of public traffic. Traffic control barriers and warning devices would be used when appropriate. Construction operations would be conducted to offer the least possible obstruction and inconvenience to public traffic. The construction contractor would be required to plan and execute delivery of heavy equipment in such a manner that would avoid traffic congestion and reduce the likelihood of dangerous situations along local roadways. Northstar would work closely with Jackson County Department of Transportation and the city of Jackson to ensure minimal disruption to area traffic and licenses required road right-of-way sharing.

6.7 LAND-BASED ECONOMIES

The Jackson County Zoning Map indicates the northern most portion of the proposed project located in Wisconsin and Des Moines townships runs through an area zoned urban and rural with the remainder of the project area zoned as agricultural.[10]

Agriculture

Agriculture plays a strong economic role in Jackson County. There are 969 farms in Jackson County averaging 413 acres in size per farm. According to the 2007 Census of Agriculture, the top crops in the county were corn and soybeans with hogs, pigs, broilers, and chicken the top livestock. The total value of agricultural products sold for 2007 in Jackson County was $267,276,000.[11]

Approximately 85 percent of the proposed transmission alignment would be placed within the public road rights-of-way with no direct impacts to adjacent farmlands. Therefore, there would be minimal impacts to farm operations.

No farm fields would be bisected by the proposed transmission alignments, with the exception of the northernmost 1.5 miles of the transmission segment which follows property boundaries and section lines through existing agricultural fields. The applicant indicates that agricultural impacts caused by the proposed project in this northern portion of the route would be limited to pole placement within field production areas; and the impact area would be limited to the footprint of the poles.

The applicant indicates that the proposed Tatman substation would be located on a 9 acre parcel that is currently used by the Jack Tatman Trust for agricultural purposes. Approximately 2.5 acres at the northwest corner of this parcel would be needed for construction of the substation. The remainder of the parcel could continue to be used for agricultural production.

Fairland Management Company owns the land where the 2.5 acre switching station would be constructed at the north end of the route. The entire 2.5 acres would be required for the proposed switching station footprint, taking this land out of agricultural production.

[10] Jackson County. Zoning Map. (www.co.jackson.mn.us) April 2009.
[11] United States Department of Agriculture. The Census of Agriculture (2007). (www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Minnesota/index.asp). April 2009.

Mitigation

The applicants indicate the proposed project construction design would minimize agricultural impacts by placing the transmission structures within existing road rights-of-way for approximately 85 percent of the route. Construction of the proposed 161 kV transmission line would be scheduled to avoid conflicts with seasonal tillage, planting, and harvesting of agricultural crops wherever possible. Maintenance activity of the transmission line would be conducted in such a way as to minimize impacts to agricultural crops.

Construction vehicles will be limited to the existing right-of-way and/or temporary driveways created between the roadway and the structure locations using the shortest route possible. Construction mats may also be used to minimize impacts on access paths and construction areas. Furthermore, transmission line route permits generally require project related land impacts to be restored to pre-construction condition upon project completion.

The applicant would work with landowners to minimize impacts to farming operations along the proposed route, such as initiating construction before crops are planted or following harvest. Northstar would work with the property owners pre- and post construction to minimize the impact. The applicant would be required to compensate landowners for any yard/landscape damages, crop damage, soil compaction, or drain tile damage that may occur during construction, as a condition of the route permit.

Northstar would implement best management practices during construction in an effort to reduce dust, erosion, and minimize compaction. Soil erosion control best management practices will be employed to minimize loss of topsoil. Areas disturbed will be returned to their pre-construction condition. Transmission line route permits generally require use of soil erosion controls and require soils compacted by construction activities to be restored to pre-construction condition upon project completion.

Larger disturbed areas of one acre or more (proposed substation and switching station) will be regulated by a National Pollutant Discharge Elimination System (NPDES) permit and Stormwater Pollution Prevention Plan (SWPPP) prepared for the project. Mitigation under the NPDES permit includes implementation of the SWPPP with the appropriate erosion control methods developed specifically for the site. The MPCA issues combined NPDES/State Disposal System permits for construction sites, industrial facilities and municipal storm sewer systems. Compliance with the MPCA stormwater program would be a condition of the route permit.

Forestry

There are no state forests, federal forests, or commercial forest resources located along the proposed transmission line route or at the proposed substation and switching sites.

Mining

There are no mined areas or identified potential mineral resources in the immediate area of the proposed project or substation and switching station sites. The proposed transmission line would be built largely within existing public road rights-of-way which are already unavailable for mining activities. Therefore, the proposed project would not result in mining impacts.

6.8 ARCHAEOLOGICAL AND HISTORIC FEATURES

Archaeological and historic features represent aspects of the environment that relate to culture, society, and institutions that bond communities and link them to their environmental and social surroundings. Cultural resources may include but are not limited to prehistoric and historic archaeological sites, buildings, structures, objects, districts, natural features, and biota; all of which may be deemed significant to a culture or community for scientific, social, traditional, religious, or other reasons.

The applicant conducted a records review at the Minnesota State Historic Preservation Office (SHPO) and the Office of the State Archaeologist (OSA). The records review identified 71 historic architectural properties, one reported archaeological site, and two previous cultural resource investigations within one mile of the site, as provided in the route permit application. The proposed project area has not been formally surveyed for historic and archaeological sites.

The 71 architectural history properties indentified by the applicant within one mile of the proposed project are located in the city of Jackson. Of these properties, 36 are listed on the National Register of Historic Places with one property considered eligible for listing.

A literature search performed by the applicant at SHPO identified two previously performed surveys within one mile of the project, but located outside the proposed project area.

The Des Moines river valley was the frontier of settlement in Minnesota during the 1850's and was the site of raids by a renegade band of Indians led by the Warrior Inkpaduta. A replica of Fort Belmont and Inkpaduta's Camp can be found north of the city of Jackson.[12]

The applicant states in the route permit application that no documented archaeological sites will be impacted by the proposed project. It is agreed however that documentation suggests the proposed project area has the potential to contain previously undocumented historic and archaeological sites.

[12] Minnesota Department of Natural Resources. (www.dnr.state.mn.us/watertrails/desmoinesriver/more.html). April 2009.

Mitigation

The route permit application states Northstar will perform a Phase IA archaeological survey of the proposed project area to identify archaeological resources in areas to determine the need for additional subsurface testing along the route, prior to commencing construction activities. The results of the cultural resource assessment and the Phase IA survey would be provided to the SHPO for their review and response and would be a condition of the route permit.

In addition, the applicants indicate they will consult SHPO regarding the potential for visual impacts to the 36 properties listed on the National Register of Historic Places and one eligible architectural history property within one mile of the project area. An appropriate management plan or standing structures survey would be completed with assistance from the SHPO to address potential impacts, if any, on architectural resources.

In the event that a resource is encountered during construction activities, the SHPO would be contacted and consulted; the nature of the resource would be identified; and a determination would be made on the eligibility for listing in the National Registry of Historic Places. These requirements would be carried over as a condition of the route permit if granted by the Commission.

6.9 AIR QUALITY RESOURCES

There are minimal air quality impacts associated with transmission line construction and operation. The only potentially direct air quality issue associated with transmission lines is the production of ozone and nitrogen oxides resulting from the corona effect. The corona effect is the ionization of air in the electric field at the surface of a transmission line and may be a contributing source of audible noise, electromagnetic radiation, and chemical reactions. In this case, the chemical reactions that take place when corona is present result in minute amounts of ozone and nitrogen oxides being produced. Ozone comprises approximately 90 percent of the oxidants produced, with the remaining 10 percent composed principally of nitrogen oxides.

Corona is an undesirable occurrence for electric transmission line facilities, as it is oftentimes caused by imperfect conductor support hardware and/or faulty insulators or cracks and separations in the line. The corona effect is cumulative, in that its presence contributes to increased deterioration of the transmission facility components and could reduce electric transmission reliability if left unchecked.

The Clean Air Act, National Ambient Air Quality Primary Standard (2008) for ozone in an area is 0.075 parts per million (ppm). Studies designed to monitor the production of ozone under transmission lines have essentially been unable to detect a significant increase in ozone from a 115 kV transmission line. Calculations referenced from the Bonneville Power Administration (BPA), *Corona and Field Effects Program Ver. 3* (U.S. Department of Energy, BPA, Undated) for a standard single circuit 115 kV transmission line project predicted the maximum ozone concentration of 0.008 ppm near the conductor and 0.003 ppm at one meter above ground during foul weather or worst case conditions. During a mist (rain at 0.01 inch per hour) the maximum concentrations decreased to 0.0003 ppm near the conductor and 0.0001 ppm at one meter above ground level. In both instances the detectable ozone levels were well below Environmental Protection Agency standards. Given this, there are no anticipated impacts relating to ozone for the proposed project.

During project construction there will be emissions and fugitive dust from vehicles and other construction related equipment. The magnitude of the construction emissions is influenced heavily by weather conditions and the specific construction activity occurring. Adverse impacts to the surrounding environment would be minimal due to the short and intermittent nature of project construction.

Mitigation

There will be no significant impacts to air quality; therefore, no mitigation is necessary. Dust from construction activities will be controlled through periodic wetting of exposed soils/roadways. Dust mitigation will be performed on an as needed basis based on observed site conditions and the location and type of activities being performed. In general, temporary impacts due to construction would be minimized by using best management practices to reduce dust emissions.

6.10 Surface Water and Wetlands

Minnesota public waters are protected lakes, wetlands, and watercourses defined in Minnesota Statute 103G and regulated by the DNR. The route will cross at three public waters as identified on DNR Public Waters Inventory (PWI) maps. These include three watercourses, the Des Moines River, and two unnamed tributary to the Des Moines River. There are also a number of drainage ditches that have been modified by agricultural use that drain to the Des Moines River that would be crossed.

A license from the DNR is required for the passage of any utility over, under or across any state land or public water. The applicant will apply for a license to cross public lands and waters and must abide by the conditions established by the DNR.

A number of federal, state, county, and local regulations currently affect construction and other activities in wetlands. The principal laws in Minnesota affecting wetlands and streams are Sections 404 and 401 of the Federal Clean Water Act (CWA), the public waters laws administered by the DNR, and the Minnesota Wetlands Conservation Act (WCA). The U.S. Army Corps of Engineers (Corps) under Section 404 of the CWA regulate discharge of dredge/fill materials into wetlands. The public waters laws regulate work in public waters, including wetlands listed on the DNR PWI. Local government units (LGU) have the primary responsibility for administration of the WCA and for making key determinations. Generally, the LGU is the county or local watershed district. In many instances both jurisdictions overlap the same wetland feature. The Jackson County Soil and Water Conservation District is the identified LGU for the proposed project area.

There are approximately five wetlands identified in the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) within or adjacent to the proposed project area. The wetland types are palustrine and include: seasonally flooded basin, shallow marsh, and seasonally flooded wooded swamp.[13] The wetland areas directly adjacent to where the proposed line would cross the Des Moines River fall within the jurisdiction of the Corps. The applicant has indicated that permanent impacts to the wetland in this area may be unavoidable. It may be necessary to install two poles within this area and the pole installations would result in approximately 6 square feet of permanent impacts limited to ground disturbance related to construction traffic and placement of transmission line structures. There will be no poles or clearing impacts associated with the remaining wetlands and public water features. [14]

Should a route permit be issued, the applicant will need to consult with Corps upon completion of final design and prior to construction to determine whether a Section 404 permit would be required for placement of transmission structures.

According to Federal Emergency Management Agency, Flood Insurance Rate Maps, the proposed route crosses through the 100-year and 500-year floodplain (Zone B) in the area of the Des Moines River. The determined base flood elevation (one foot) in that area of the proposed route would be well below the 75 foot tall transmission structures and electrical components. In addition, due to the transmission structures small footprint area, water drainage or floodplain elevations will not be altered by the transmission line structures. Floodplain development permits are not anticipated for this project.[15]

The location of the proposed substation and switching station would not impact any wetlands or surface waters and are not located in a floodplain area.

[13] United States Fish and Wildlife Service. National Wetlands Inventory. (www.fws.gov/wetlands) April 2009.
[14] Tetra Tech EC, Inc. Application to the Public Utilities Commission for a Route Permit, Northstar Transmission, LLC, Northstar 161 kV Transmission Line Project. October 2008.
[15] Federal Emergency Management Agency. FEMA Issued Flood Maps. (msc.fema.gov). April 2009.

Mitigation

Due to the potential for temporary water quality impacts resulting from the installation of the transmission line and construction of the substation and the switching station due to soil exposure during clearing, excavation and grading activities.

Northstar proposes to minimize the potential impacts by using standard engineering Best Management Practices identified in the MPCA's Stormwater Best Practices Manual, such as installing silt fences, construction during frozen conditions, using check dams, using low-tracked vehicles and temporary matting, as appropriate.

Since the construction area will be greater than one acre, a Construction Stormwater NPDES permit would be required from the MPCA, including submittal of a SWPPP. All areas disturbed by construction would be re-vegetated or replanted with crops per negotiations with property owners. Soil excavated from the wetlands and riparian areas will be contained and not placed back into the wetland or riparian area. No permanent water quality impacts are anticipated as a result of the proposed project.

Prior to construction activities, the District Engineer for the Corps would need to be notified with a preconstruction notification authorized under the Corps St. Paul District Regional General Permit for structural discharges. In addition an application would need to be filed with the Jackson County Soil and Water Conservation District (SWCD) to determine if the proposed project would impact any wetlands or public waters under local jurisdiction of the SWCD. In addition, conditions provided the MPCA NPDES permit, and the DNR license to cross public lands and waters would be followed.

6.11 Flora and Fauna

The project area is largely characterized by row-crop agriculture and pasture land with sporadic wetlands and flood plain forests along the Des Moines River. The majority of the proposed project would be located within existing road rights-of-way in primarily agricultural areas.

There would be some loss of wildlife habitat in the areas where existing fence row, trees/shrubs, and ditch herbaceous vegetation would need to be cleared or reduced for the transmission line route. However, the total habitat area lost due to transmission line installation would be relatively small since most of the land is in agricultural use and is not unique vegetation or special wildlife habitat. The majority of potential vegetation impacts would be at the Des Moines River crossing. The applicant indicates the clearing of trees (red maples and cottonwoods) for maintaining the reliability of the transmission line in this area is anticipated to be 16 feet within the road right-of-way and 50 feet beyond the existing road right-of-way resulting in approximately 36,720 square feet of clearing impacts.

There is a potential for temporary displacement of wildlife during construction of the proposed project. The habitat that would be affected is limited to trees that require removal and fringe areas of agriculture plots and road rights-of-way. Wildlife species that may be displaced are considered "common" in Minnesota, and their displacement would not be detrimental to their populations. Displaced wildlife would likely re-establish itself in closely located and comparable habitats within the project area. Displacement of fauna will be minor and temporary in nature. No long-term effects related to displacement are anticipated except for conversion of agriculture crops for construction of the substation. Species that inhabit the Des Moines River and adjacent riparian/wetland areas will not be affected.

The principal impact posed by the transmission line project to wildlife is avian collision and/or electrocution once the transmission lines have been constructed and are operational.

Mitigation

In an attempt to minimize the tree clearing in and around the proposed Des Moines River crossing area the applicant should consider the feasibility of having the centerline of the proposed transmission line cross over the Des Moines River in a diagonal fashion with a structure located on east side of CSAH 25 south of the river and spanning diagonally over the existing bridge to the next structure located on the west side of CSAH 25 north of the river. If feasible, this design may reduce the amount of the potential tree clearing needed.

Northstar has indicated it's standard transmission design would incorporate adequate spacing of conductor(s) and grounding devices intended to eliminate the risk of electrocution to raptors with larger wingspans that may simultaneously come in contact with a conductor and grounding devices.

In addition, areas will be identified by the applicant in cooperation with the DNR and USFWS, where bird flight diverters would be incorporated into the transmission line design to prevent avian collisions attributed to visibility issues, specifically the portion of line that would span the Des Moines River and adjacent riparian areas.

6.12 Rare and Unique Natural Resources

The DNR's, Natural Heritage and Nongame Research Program and the USFWS were consulted by the applicant for listed endangered, threatened, and special concern species in addition to any unique native plant communities within or near the proposed project area.

The DNR database search identified 9 known occurrences of rare species and natural communities within 1 mile of the project. Of the 9 rare species and natural communities, 8 are located within or near the proposed project boundaries. Five of these rare species are threatened or of special concern mussels that are located in the Des Moines River. The Loggerhead Shrike a State Threatened bird specie, is known to occur in and around the proposed project area. There are also known occurrences of the State Threatened Sullivant's Milkweed and special concern specie Snow Trillium. There were also three records of mesic prairie remnants located within or near the proposed project area.

The USFWS indicated that the proposed project would pass directly over a state mussel survey site in the Des Moines River. USFWS also indicated the project may potentially pass through areas of prairie bush clover, a federally threatened specie. An email from the USFWS included in Appendix E of the route permit application states, "…[prairie bush clover] is a species that has been surveyed for quite a bit so I think the likelihood that it would be found in your area is pretty low… It's your responsibility to make the final determination of whether suitable habitat exists in your area and whether it will be affected (i.e. can it be avoided), but there is no hit in the Heritage Database for a known population of plants within your search area at the present time."

Mitigation

Based on the DNR Natural Heritage Database it is unclear whether the proposed project would impact the prairie remnants and Sullivant's Milkweed. Minnesota's endangered species law prohibits taking of threatened or endangered species without a permit. Ground disturbance within the prairie remnant area should be completely avoided, there should be no vehicle use or stockpiling of equipment within the prairie, construction runoff should be diverted from the prairie, and areas adjacent to the prairie should be immediately be replanted with prairie species native to Minnesota in consultation with DNR. The project should be designed to avoid transmission line and switch station construction within the railroad right-of-way on the north end of the proposed project. Should construction or encroachment of the prairie remnant near the railway become necessary, the applicant would perform a botanical survey as a condition of the route permit. In addition, Best Management Practices should be identified and implemented in cooperation with the DNR when working near the remnant prairie to reduce the potentially negative impacts to the Loggerhead Shrike. Construction and maintenance personnel would be made aware of the rare resources and plant communities during pre-construction meetings in effort to minimize possible disturbance. The applicant will use silt fencing or other erosion control measures when working near waterways and wetlands (i.e. the Des Moines River) to prevent sedimentation and disturbance of these areas and their inhabitants.

6.13 Radio, Television, and Cellular Phone Interference

The corona effect on transmission line conductors in rare circumstances can produce electromagnetic interference or high frequency (~120 Hz) electric noise that can potentially cause radio, television, and communication system interference. Radio interference is limited to amplitude modulation broadcast bandwidths and typically does not impact frequency modulation broadcasts. Television interference caused by corona usually occurs during foul weather when the conditions for corona are ideal. Corona-related television interference is rare and generally only a concern for conventional receivers within approximately 600 feet from the transmission line. Satellite and cable receivers are not affected by corona-generated electromagnetic interference.

Mitigation

This phenomena is generally associated with transmission lines that are operating at 345 kV or greater. No impacts are anticipated therefore no mitigation is necessary.

7.0 ROUTING AND SITING ALTERNATIVES

This section evaluates two alternatives to the proposed project, a route segment alternative and a site specific alignment alternative. The two alternatives were suggested in letters received during the comment period for the scope of this EA and were included as part of the scoping decision.

For the most part, impacts from the proposed route and the alternatives identified in this EA are quite similar. Impacts with respect to public health and safety, recreation, transportation, soils and geology, air quality, fauna, and radio/television/cellular phone interference are anticipated to be the same for the proposed route and both evaluated alternatives. The alternatives and the areas of potential differences are discussed below.

7.1 WITHERS/ASCHERMAN ALTERNATIVE

The proposed alternative would veer northwest and follow along Petersburg Road/CSAH 23 instead of continuing north along 560th Avenue. At the north-south property line dividing the northeast quarter of Section 7, the proposed alternative would head north following an existing fence line/property boundary joining the proposed route at the point where 560th Street runs direct north (Figures 2 and 3).

The alternative seeks to address perceived transmission line proximity, health, and aesthetic issues to four residences along this segment of the proposed route, the closest of which would be approximately 175 feet from the proposed alignment, as indicated by the applicant. Residents along this segment of the route currently view an REA distribution line that runs along the west side of 560th Street. The impact of constructing the proposed 161 kV transmission line along this segment would be incremental. The current REA distribution lines are situated on 60 to 70 foot high wood poles spaced approximately 100 to 200 feet apart, whereas the new structures would be 75 feet high steel poles spaced approximately 400 feet apart. The proposed project would likely reduce the number of transmission poles currently situated along this segment of the proposed route. In addition, as described in Section 6.3.3, the existing REA distribution lines would be underbuilt on the new structures or buried.

This alternative deviates from the route approximately 1,470 feet to the west, but would not add to the total length of the project. This alternative would however travel cross-country creating approximately 1.67 miles of new transmission right-of-way along privately owned land and impact approximately four residences not currently impacted by an existing overhead line.

7.2 W. ASCHERMAN ALIGNMENT ALTERNATIVES

The three proposed alignment alternatives are located in the area of the proposed route where the applicant is requesting a 1 mile wide route width (sections 10 and 20 north and adjacent to CSAH 14). The alternatives specify three separate alignment alternatives from CSAH 14 to the proposed switching station end point. All three suggested alignment alternatives are variations to the cross-country alignment proposed by the applicant and share at least one common segment (Figure 5). These alignment alternatives are minimal in their deviation from the preferred alignment and are located within the route width requested by the applicant. There would be no new or additional impacts attributed these alignment alternatives; therefore, the environmental impacts/mitigation described previously in this environmental assessment are relevant to these alternatives. Therefore, the most direct alignment configuration should be considered when evaluating these alternatives to the proposed. The approximate length of the proposed alignment and the alternative alignments are as follows: Proposed Alignment (~8,529 feet), Alignment Alternative I (~5,882 feet), Alignment Alternative II (~8,235 feet), and Alignment Alternative III (~8,529 feet). The most direct and shortest route alignment is Alignment Alternative I. This alignment configuration would likely have fewer poles, fewer corner structures, and less transmission line proliferation over the proposed alignment and the other alternative alignments.

8.0 ALTERNATIVES TO PROPOSED PROJECT

The purpose of environmental review at the certificate of need stage is to provide the Commission and the public with information on the potential environmental impacts of a proposed project and of alternatives to the project. It must address certain alternatives to the proposed project pursuant to Minnesota Rule 7849.7060, subp. 1(B). The requirements of this rule include a general description, analysis, and feasibility of the following alternatives:

- No-build
- Demand side management (Conservation)
- Purchased power
- Facilities of a different size or using a different energy source than the source proposed by the applicant
- Upgrading of existing facilities (Existing line or system improvements)
- Generation rather than transmission
- Renewable energy sources

The magnitude of any alternative is based on the assumption that the purpose of Northstar Transmission Line is to deliver approximately 200 megawatts (MW) of the renewable energy generated by the Emmet County Energy's Northstar Wind Farm to Minnesota utilities, to help those utilities to meet the Renewable Energy Standard (RES) requirements under Minnesota Statutes, Subd. 216B.1691.[16]

In the January 22, 2009, Certificate of Need Application Acceptance Order, the Commission, at the request of the applicant, granted exemption from the following alternative requirements applicable to certificate of need applications.[17]

- No facility alternative (No-build) – Minnesota Rule 7849.0340.
- Demand side management (Conservation) – Minnesota Rule 7849.0290.
- Upgrading existing transmission lines or existing generating facilities – Minnesota Rule 7849.0260 B(2).
- New generation as an alternative (Generation rather than transmission) – Minnesota Rule 7849.0260 B(1).

[16] Fredrickson & Byron, PA. *Application of Northstar Transmission, LLC for a Certificate of Need for a Large Energy Facility, Docket No. IP-6686/CN-08-944.* October 28, 2008.
[17] Minnesota Public Utilities Commission. *Order Granting Exemptions and Variance, Finding Application Complete and Directing Informal Review Process*, Docket No. IP-6686/CN-08-944. January 22, 2009.

In addition to the above exemptions, two other alternatives are not applicable in this case.

An alternative generally reviewed in a certificate of need application is whether the applicant could purchase power to meet the increased load growth. However, the purchase power alternative would not meet the need of the proposed project as the purpose of this proposed transmission project is to deliver approximately 200 MW of energy from the existing Northstar Wind Farm to Minnesota utilities through power purchase agreements. The applicant can not purchase power to meet their need, therefore this alternative is not applicable.

The applicant states that the project is intended to enable the delivery of renewable energy generated by the Northstar Wind Farm and is intended to help utilities satisfy the requirements of the RES under Minnesota Statute 216B.1691. A clear preference for renewable facilities is provided for in Minnesota Statues 216B.243, Subd. 3a and 216b.2422, Subd. 4. The proposed facility meets this preference, as it is a renewable energy source. For that reason the renewable energy alternative is not applicable in this case.

Therefore this section only discusses the feasibility and availability of the facilities of a different size alternative to the transmission line.

Facilities of a Different Size

Lower Voltage Alternative

The applicant considered lower voltage alternatives to the proposed 161 kV line during initial design. After further analysis they concluded that it was more cost effective to build a 161 kV line than to construct a lower voltage line. The Jackson substation and pole interconnection #114 are both 161 kV. In order for Northstar to connect to either of these locations they would need to build a step-up substation to bring the power up to 161 kV.[18]

Alternatively, if the power from the Northstar Wind Farm entering the proposed Tatman substation were stepped up to a voltage lower than 161 kV a second step-up station would be required near the either the Jackson substation or pole #114 interconnection. The applicant also states that in order to have the capability to transmit the anticipated 200 MW output of the Northstar Wind Farm, it would be necessary to equip a lower voltage line with large and expensive conductors and/or to double circuit the line.

[18] Fredrikson & Byron, PA. Northstar Transmission Reply Comments. March 9, 2009.

Constructing the project at a voltage level other than 161 kV is not as efficient and would add significant costs to the project without achieving any substantial benefit. The applicant indicates that transmitting power at a lower voltage would result in greater line losses and in this case would require the additional expense of constructing two step-up stations. Thus, transmission lines of a lower design voltage are not a viable alternative.

Interconnection with Existing Transmission

Northstar also considered interconnecting to an existing 69 kV line owned by Great River Energy that runs east-west 5.5 miles north of the Minnesota-Iowa border. A 69 kV tap could be constructed from this line southward to a 69/34.5 kV substation in the Wind Farm project area. The existing 69 kV system however, would only be able to transmit approximately 15 to 20 MW of generation interconnection without any improvements. As stated above, the capacity of the Northstar Wind Farm is expected to be up to 200 MW, therefore this option does not provide a reasonable alternative.[19]

[19] Fredrickson & Byron, PA. Application of Northstar Transmission, LLC for a Certificate of Need for a Large Energy Facility, Docket No. IP-6686/CN-08-944. October 28, 2008.

9.0 PERMITS AND APPROVALS REQUIRED

Federal, state and local permits for the proposed project are listed below in Table 12.

Table 12: Potentially Required Permits

Permit	Authority
Notice of Proposed Construction or Alteration Application	Federal Aviation Administration
Preconstruction Notification	U.S. Army Corps of Engineers
Route Permit	Minnesota Public Utilities Commission
License to Cross Public Waters	Minnesota Department of Natural Resources
National Pollutant Discharge Elimination System Permit	Minnesota Pollution Control Agency
Preconstruction Notification	Jackson County Soil and Water Conservation Dist.
Utility License Agreement/Line Crossing Permit	Jackson County Department of Transportation
Over-width/Overweight Road Permit	Jackson County Department of Transportation
Road Crossing Permit	Township, County
Road Right-of-Way Use License	Township, County
Driveway/Access Permit	Township, County
Over-width/Overweight Road Permit	Township, County

10.0 REFERENCES

Much of the information contained within this document was provided by the applicant or the applicant's representatives in the Tetra Tech EC, Inc. *Application to the Public Utilities Commission for a Route Permit, Northstar Transmission, LLC, Northstar 161 kV Transmission Line Project*. October 2008. (available for viewing at: http://energyfacilities.puc.state.mn.us/ Docket.html?Id=19789).

Additional information sources include:

Banks, Creighton, and Duening. *Sourcebook for Utility Communications on EMF.* Electrical Power Research Institute. June 1992.

Federal Emergency Management Agency (FEMA), Map Service Center. (http://www.fema.gov/).

Fredrickson & Byron, PA. *Application of Northstar Transmission, LLC for a Certificate of Need for a Large Energy Facility*, Docket No. IP-6686/CN-08-944. October 28, 2008.

Fredrikson & Byron, PA. Northstar Transmission Reply Comments. March 9, 2009.

Jackson County. Zoning Map. (www.co.jackson.mn.us). April 2009.

Medtronic. *Electrical Power and ICDs.* Rev. 6. 96.

Minnesota Department of Health. (www.health.state.mn.us/). April 2009.

Minnesota Department of Natural Resources. (www.dnr.state.mn.us/index.html). April 2009.

Minnesota Department of Natural Resources. *Ecological Classification System*. (www.dnr.state.mn.us/ecs/251ba/index.html). April 2009.

Minnesota Department of Natural Resources, Division of Ecological Resources. *Figure 1. Groundwater Provinces*. (www.dnr.state.mn.us.waters/ground_water/provinces/mngwprov.html). April 2009.

Minnesota Department of Natural Resources, Division of Ecological Services. *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*. 2006.

Minnesota Geological Survey. (www.geo.umn.edu/mgs/). April 2009.

Minnesota Land Management Information Center. (www.lmic.state.mn.us/). April 2009.

Minnesota Pollution Control Agency. (www.pca.state.mn.us/). April 2009.

Minnesota Pollution Control Agency, Stormwater Program for Construction Activity. (www.pca.state.mn.us/water/stormwater/stormwater-c.html). April 2009.

Minnesota Public Utilities Commission, *Order Granting Exemptions and Variance, Finding Application Complete and Directing Informal Review Process*, Docket No. IP-6686/CN-08-944. January 22, 2009.

Minnesota State Demographic Center. (www.demography.state.mn.us/). April 2009.

National Institute of Environmental Health Sciences – National Institutes of Health. *Electric and Magnetic Fields Associated with the Use of Electric Power, Questions and Answers*. June 2002. (www.niehs.nih.gov/health/topics/agents/emf/).

Natural Resource Conservation Service. Minnesota Online Soil Survey Manuscripts. (soils.usda.gov/survey/online_surveys/minnesota/). April 2009.

Scholten, Joosten and Silny. *Unipolar Cardiac Pacemakers in Electromagnetic Fields of High Voltage Overhead Lines.* Journal of Medical Engineering & Technology. Vol. 29, No. 4, July/August 2005, 170 – 175.

Tetra Tech EC, Inc. Route Permit Application – Northstar Transmission Line Project, Docket# TL-08-1120 Information Request. May 7, 2009.

Tetra Tech EC, Inc. *Application to the Public Utilities Commission for a Route Permit, Northstar Transmission, LLC, Northstar 161 kV Transmission Line Project*. October 2008.

United States Census Bureau, State and County Quick Facts. (quickfacts.census.gov/qfd/). December 2008.

United States Department of Agriculture. (www.usda.gov/wps/portal/usdahome).

United States Department of Energy. (eia.doe.gov/).

United States Department of Energy, Bonneville Power Administration, *Corona and Field Effects Program Ver. 3.* Undated.

United States Environmental Protection Agency. (www.epa.gov/).

United States Environmental Protection Agency. *Clean Air Act, National Ambient Air Quality Primary Standard (2008)*. (www.epa.gov/air/criteria.html#5).

United States Fish and Wildlife Service, National Wetlands Inventory. (www.fws.gov/wetlands). April 2009.

University of Minnesota Libraries, Government Publications. (govpubs.lib.umn.edu/census/profile_twp.phtml). April 2009.

The World Health Organization. *Electromagnetic Fields and Public Health: Exposure to Extremely Low Frequency Fields.* WHO/322. June 2007.

FIGURES

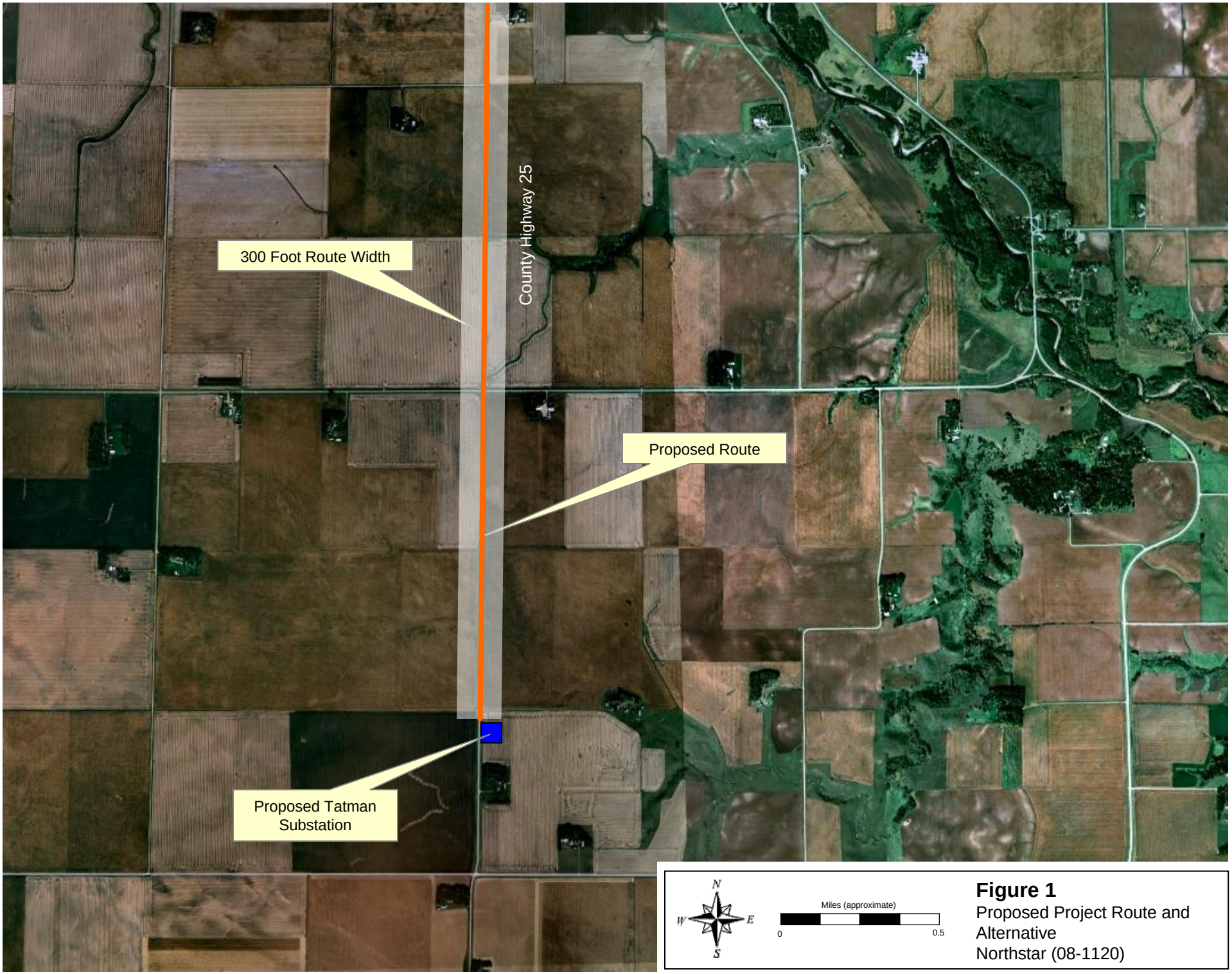


Figure 1
Proposed Project Route and Alternative
Northstar (08-1120)

Base map source: Google Earth (Accessed May 2009).

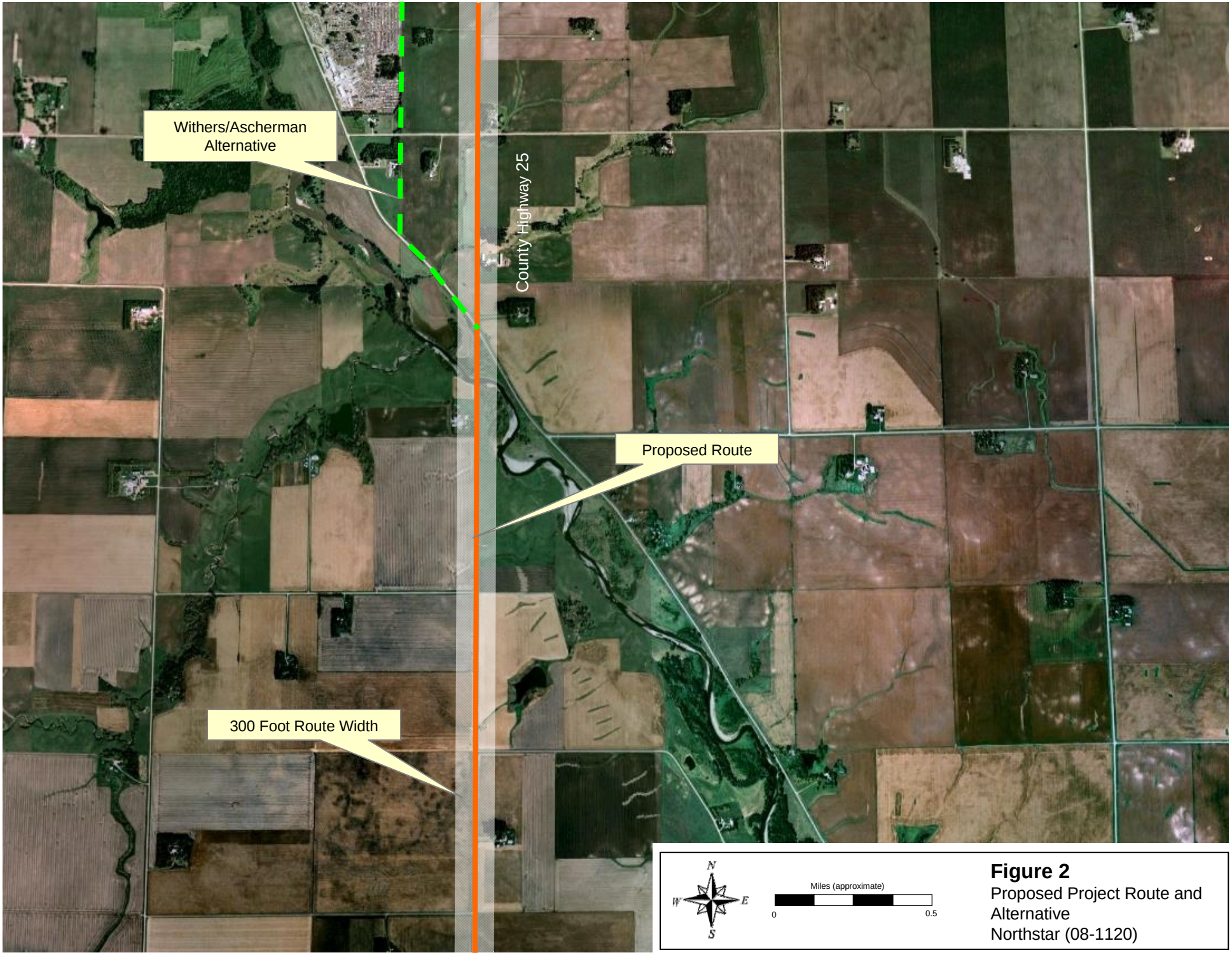


Figure 2
Proposed Project Route and Alternative
Northstar (08-1120)

Base map source: Google Earth (Accessed May 2009).

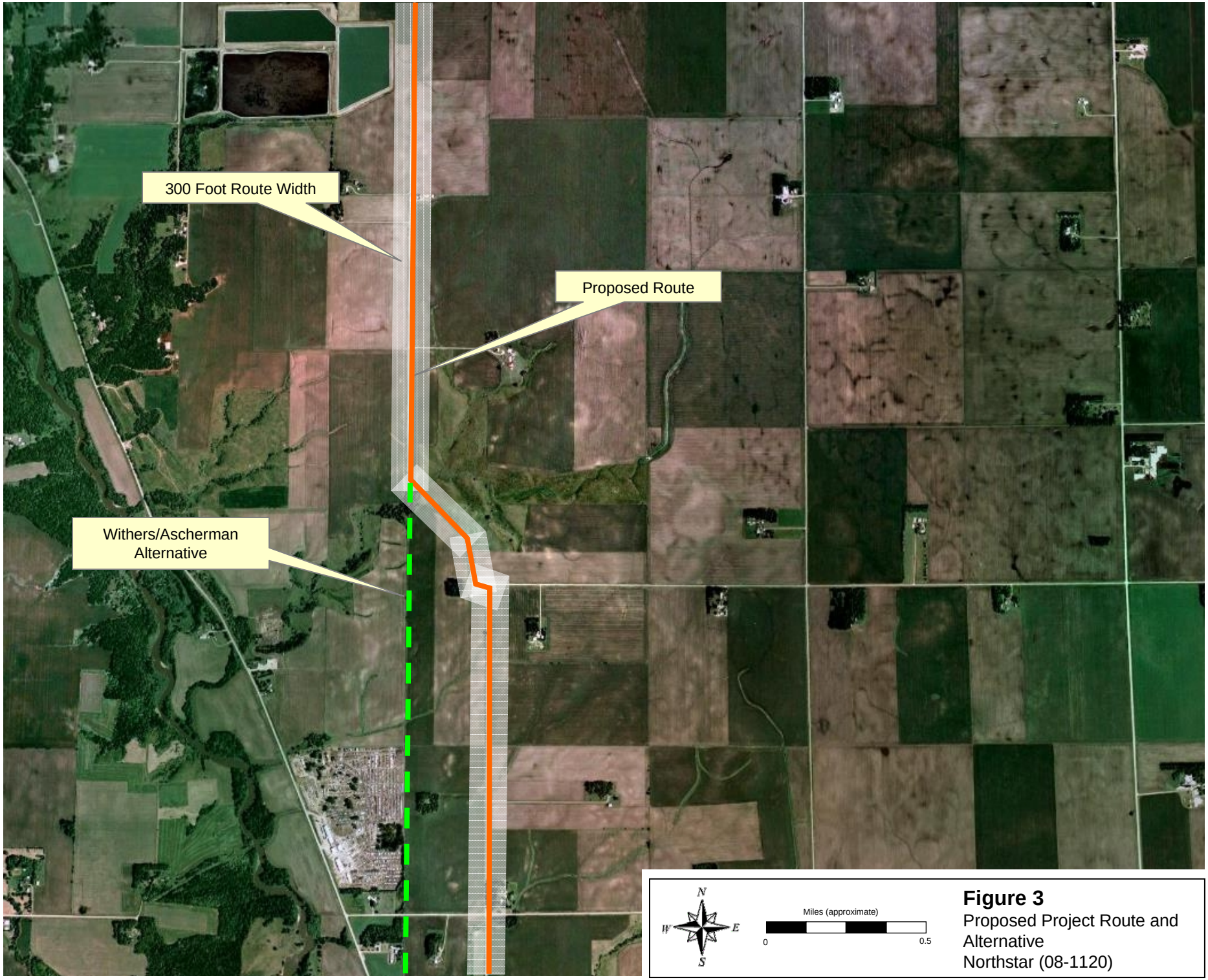


Figure 3
Proposed Project Route and Alternative
Northstar (08-1120)

Base map source: Google Earth (Accessed May 2009).

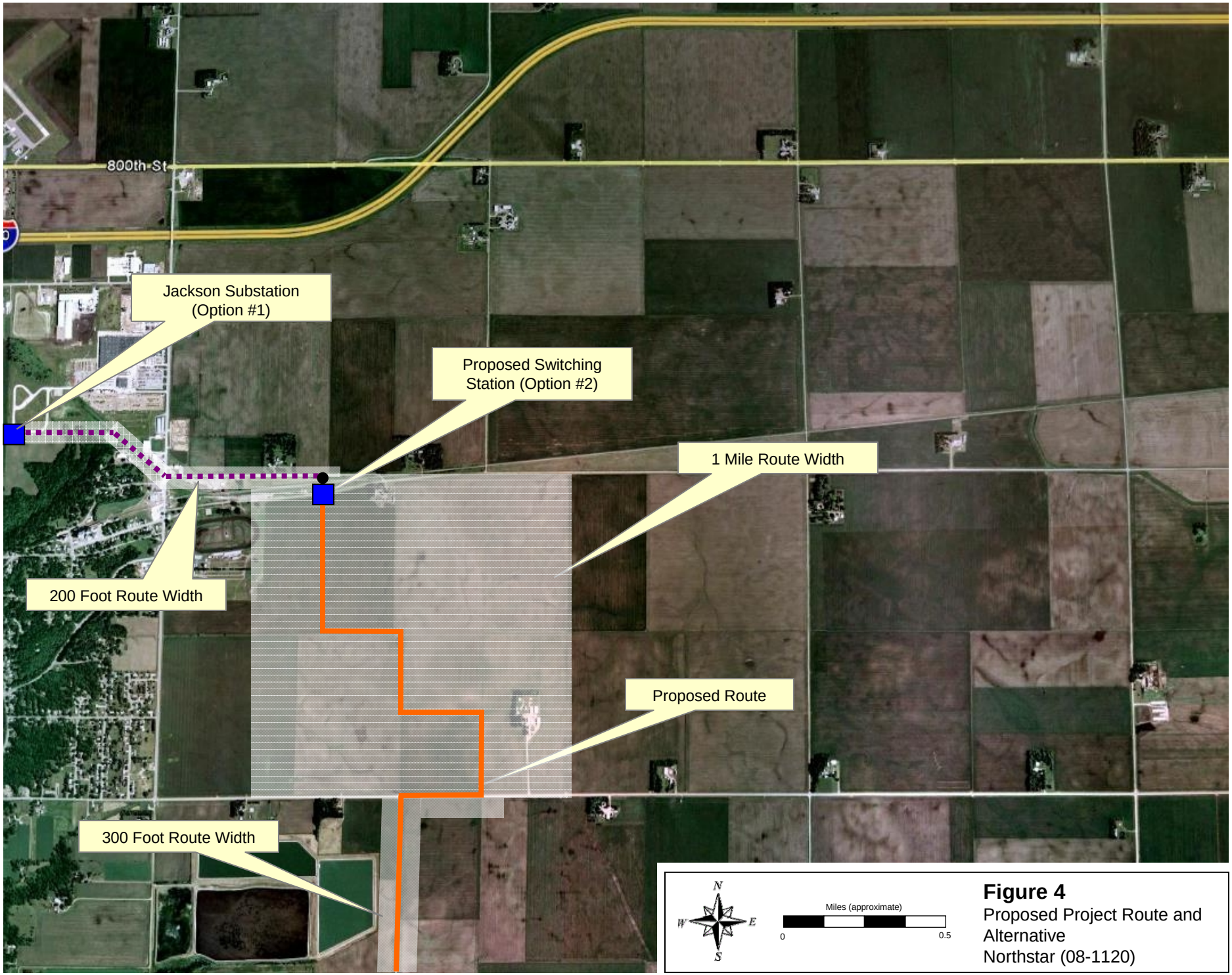
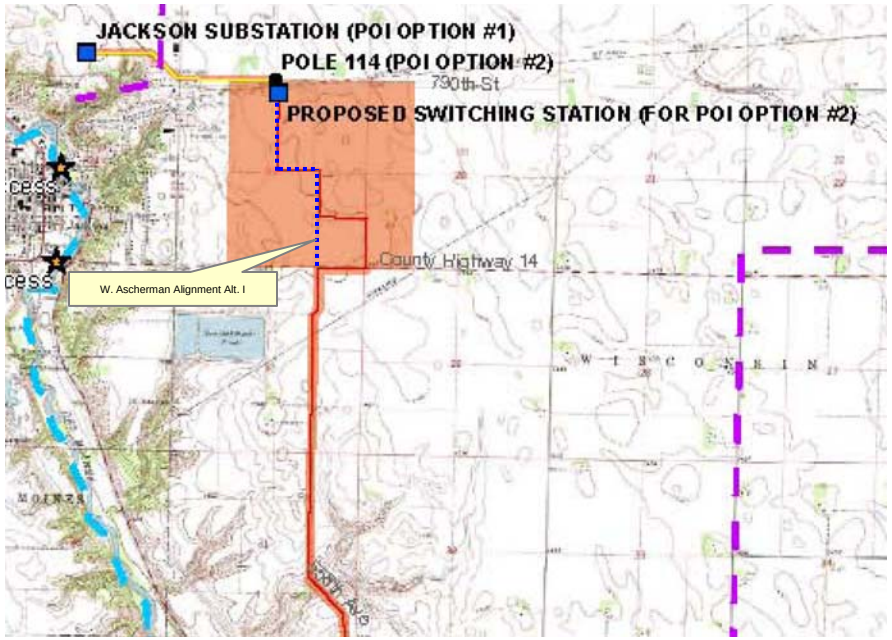
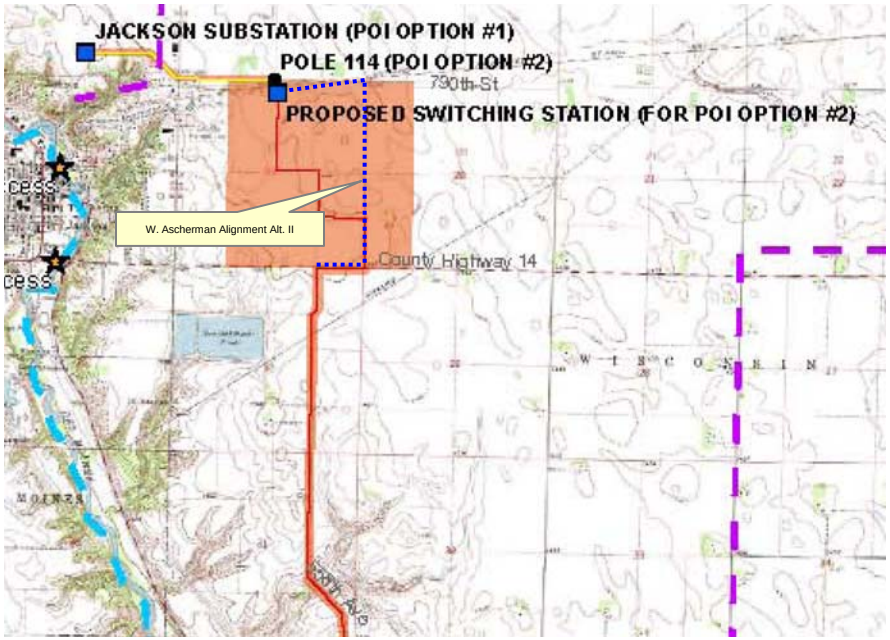


Figure 4
Proposed Project Route and Alternative
Northstar (08-1120)

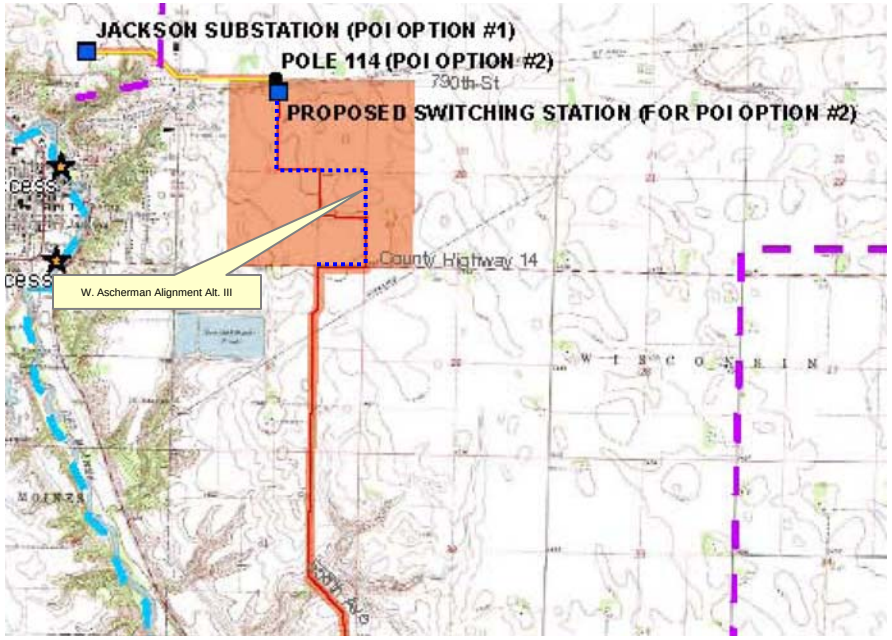
Base map source: Google Earth (Accessed May 2009).



Alignment Alternative I



Alignment Alternative II



Alignment Alternative III

Figure 5
W. Ascherman Alignment Alternatives
Northstar (08-1120)

APPENDIX A

Environmental Assessment Scoping Decision

In the Matter of the Application for a Certificate of Need and Route Permit for the Northstar Transmission 161 Kilovolt Transmission Line

JOINT ENVIRONMENTAL REPORT/ENVIRONMENTAL ASSESSMENT SCOPING DECISION
PUC Docket No. IP-6686/TL-08-944 and IP-6686/TL-08-1120

The above matter has come before the Director of the Office of Energy Security (OES) for a decision on the Scope of the joint Environmental Report/Environmental Assessment to be prepared on Northstar Transmission's proposed 161 kV transmission line project that involves the construction of a 10-mile 161 kV transmission line, a substation in Petersburg Township, and a switching station east of the city of Jackson, Minnesota (Figure 1).

The applicant indicates that the project will capture energy generated by the 200 megawatt Northstar Wind Farm in Iowa and transmit to the Xcel Energy Lakefield Junction to Fox Lake 161 kV transmission line east of Jackson, Minnesota.

A route permit application (IP-6866/CN-08-1120) for the project was filed on October 18, 2008, and accepted by the Minnesota Public Utilities Commission (Commission) on December 1, 2008.

Because the proposed transmission line capacity is greater than 100 kV and is 10 miles or more in length, a Certificate of Need (CN) application is required. A CN application (IP-6866/CN-08-944) for this project was filed by Northstar on October 28, 2008. The certificate of need and the transmission line routing environmental review processes for this project have been combined in accordance with Minnesota Rule 7849.7100, subp. 1, therefore an environmental assessment will be prepared in lieu of an environmental report.

The OES Energy Facility Permitting (EFP) staff held a public information and environmental assessment scoping meeting on January 29, 2008, at the AmericInn, in Jackson, Minnesota, to discuss the project with the public and solicit public input on the scope of the environmental assessment to be prepared. The attendance sign-in sheet indicated approximately 16 people attended the meeting. The public was given until February 12, 2008, to submit written and/or email comments.

In addition to the comments heard at the public meeting, the OES EFP also received a total of four comment letters, all of which were reviewed and considered during preparation of the Scope of the Environmental Assessment.

Two letters from citizens located along the proposed route voiced preference for an alternative to the segment of the applicant's proposed route that would run along 560th Avenue from County Highway 23 to 558th Street where it heads north. A second alternative with three variations was suggested for the area of the proposed route where the applicant is requesting a 1 mile wide route width (sections 10 and 20 north and adjacent to County Highway 14). These two alternatives have been incorporated into the Scope of the Environmental Assessment and are shown in Figures 1 and 2.

Having reviewed the matter, consulted with EFP staff, and in accordance with Minnesota Rules 7849.5700 and 7849.7060, I hereby make the following Scoping Decision:

MATTERS TO BE ADDRESSED

The Environmental Assessment on the proposed Northstar Transmission, LLC, 161 kV transmission line and substation project will address and provide information on the following matters:

A. REGULATORY FRAMEWORK

The Environmental Assessment will describe the regulations and regulatory processes which the project is being reviewed under, including the certificate of need, environmental review, and the public participation process.

B. GENERAL DESCRIPTION OF THE PROPOSAL

1. Purpose of the Transmission Line
2. Project Location and Environmental Setting
3. Engineering and Operation Design

    a. Transmission Line and Structures (including size and type)
    b. Construction Procedures
    c. Right-of-Way Requirements and Maintenance

C. IMPACTS AND MITIGATIVE MEASURES

1. Public Health and Safety (including electric and magnetic fields)
2. Noise
3. Aesthetics
4. Socioeconomics
5. Recreation
6. Transportation and Public Services
7. Radio, Television, and Cellular Phone Interference
8. Archaeological and Historic Resources
9. Land Use (land-based economies: forestry, mining, agriculture)
10. Soils and Geology
11. Air Quality
12. Surface Water and Wetland Resources
13. Flora and Fauna
14. Rare and Unique Natural Resources

D. ALTERNATIVES TO BE ADDRESSED IN THE ENVIRONMENTAL ASSESSMENT

The Environmental Assessment will describe and analyze the feasibility of the following alternatives:

- No-Build
- Demand Side Management
- Purchased Power
- Conservation
- Existing Line or System Improvements
- Generation

In addition to the route proposed by Northstar Transmission, the Environmental Assessment shall address the following alternative route and substation locations:

1. Withers/Ascherman Alternative – The proposed alternative would veer northwest and follow along Petersburg Road/County Highway 23 instead of continuing north along 560th Avenue. At the north-south property line dividing the northeast corner ¼ of Section 7, the proposed alternative would head north following an existing fence line/property boundary joining the proposed route at the point where 560th Street runs direct north (Figure 1).

2. W. Ascherman Alignment Alternatives (I, II, and III) – The proposed alternatives are located in the area of the proposed route where the applicant is requesting a 1 mile wide route width (sections 10 and 20 north and adjacent to County Highway 14). The alternatives specify three separate alignment alternatives from County Highway 14 to the proposed switching station end point. All three suggested alignment alternatives are variations to the cross-country alignment proposed by the applicant and share at least one common segment (Figure 2).

E. IDENTIFICATION OF PERMITS

The Environmental Assessment will include a list of permits that will be required for the project.

F. ISSUES OUTSIDE THE SCOPE OF THE ENVIRONMENTAL ASSESSMENT

The Environmental Assessment will not consider the following:

1. The manner in which land owners are paid for transmission rights-of-way easements, as that is outside the jurisdiction of the Commission.

2. Alternatives not described specifically in this Scoping Decision.

G. SCHEDULE

The Environmental Assessment shall be completed and available in May 2009. A public hearing will be held in the Jackson area after the Environmental Assessment has been issued and notice served.

Signed this 24th day of February, 2009

STATE OF MINNESOTA
DEPARTMENT OF COMMERCE
OFFICE OF ENERGY SECURITY

William L Glahn

William Glahn, Director

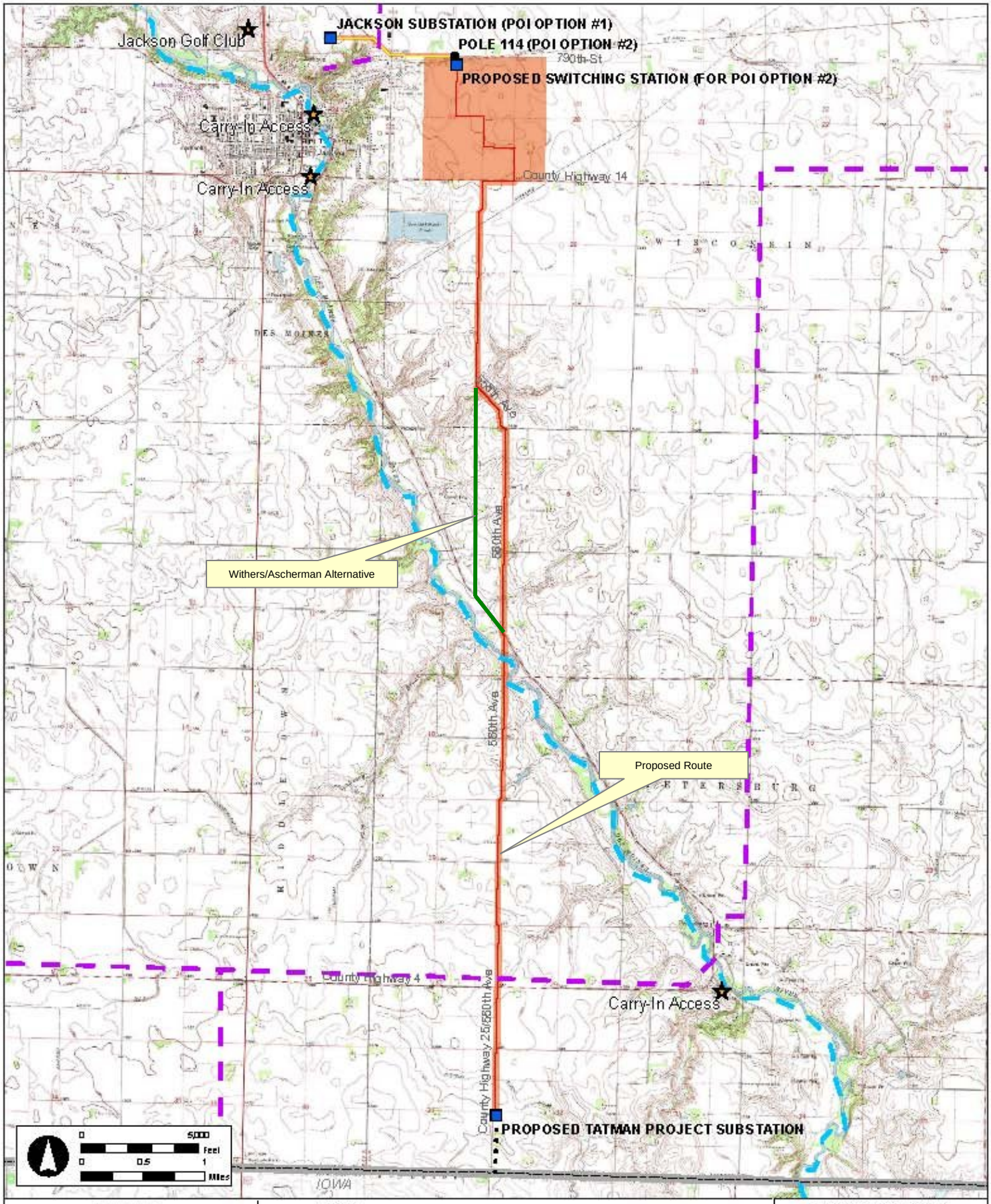


Figure 1
Proposed Route

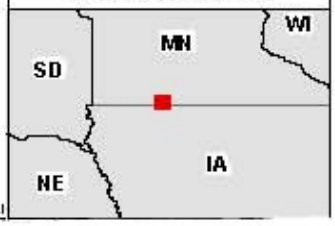
Northstar Transmission, LLC.
Project TL-08-1120

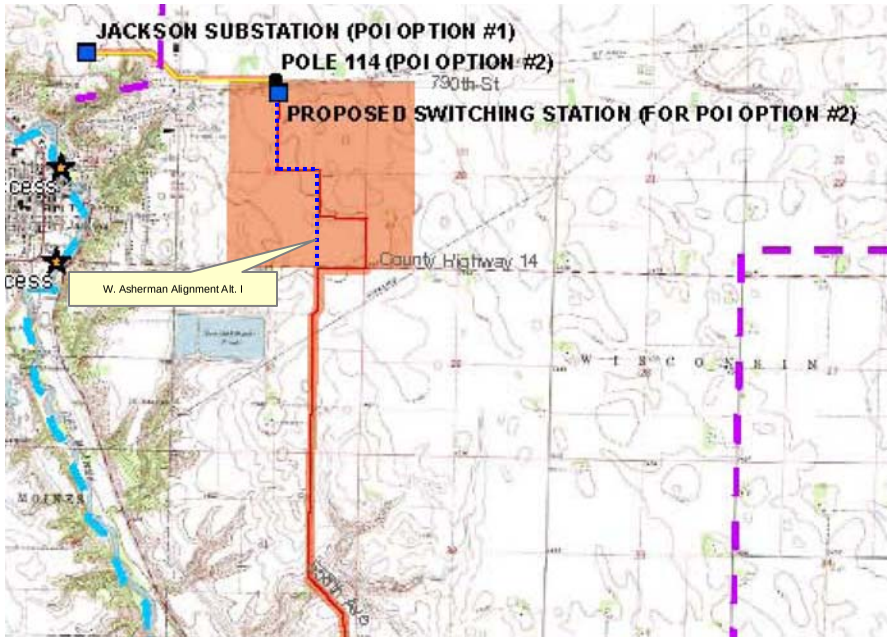
Legend

- Recreation Site
- Water Trail (Des Moines River)
- Grant In Aid Snowmobile Trails
- Substation
- Existing Pole
- Proposed Transmission Line
- Collector Line
- Proposed Upgrade of Existing Xcel Transmission Line
- Transmission Line Corridor
- State Boundary

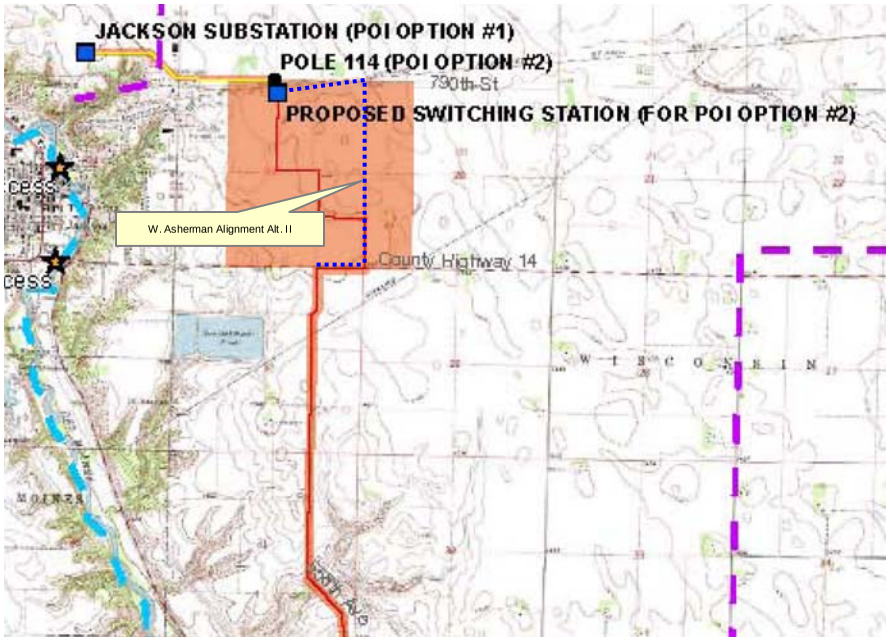
Sources: MN Land Management Information Center (LMIC), MN Data Deli, MN DNR, U.S. FWS, National Geographic TOPO! Pro, ESRI

LOCATION MAP

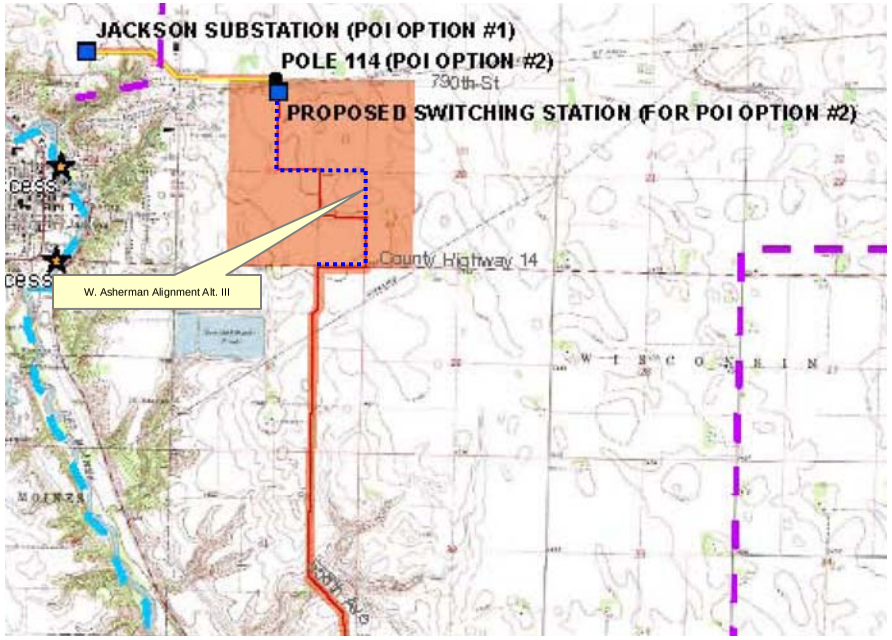




Alignment Alternative I



Alignment Alternative II



Alignment Alternative III

Figure 2
W. Ascherman Alignment Alternatives

Northstar Transmission, LLC.
Project TL-08-1120

APPENDIX B

Sample Route Permit

STATE OF MINNESOTA PUBLIC UTILITIES COMMISSION

ROUTE PERMIT FOR CONSTRUCTION OF A HIGH VOLTAGE TRANSMISSION LINE IN

CASS COUNTY AND CROW WING COUNTY, MINNESOTA

ISSUED TO GREAT RIVER ENERGY AND MINNESOTA POWER

PUC DOCKET No. ET2/TL-08-712

In accordance with the requirements of Minnesota Statutes Chapter 216E and Minnesota Rules Chapter 7849, this route permit is hereby issued to:

Great River Energy and Minnesota Power

Great River Energy and Minnesota Power, are authorized by this route permit to construct the nine and three-tenths mile segment located within the State of Minnesota, of a new 115 kilovolt (kV) high voltage transmission line between the Southdale Substation in Crow Wing County, Minnesota to a new Scearcyville Breaker Station in Cass County, Minnesota.

The transmission line shall be built within the route identified in this permit and as portrayed on the attached official route map, and in compliance with the conditions specified in this permit.

Approved and adopted this 9th day of April 2009

BY ORDER OF THE COMMISSION

Burl W. Haar

Burl W. Haar,
Executive Secretary

This document can be made available in alternative formats (i.e. large print or audio tape) by calling 651.201.2202 (voice). Persons with hearing or speech disabilities may call us through Minnesota Relay at 1.800.627.3529 or by dialing 711.

EXAMPLE ONLY

I. ROUTE PERMIT

The Minnesota Public Utilities Commission (Commission) hereby issues this route permit to Great River Energy and Minnesota Power (permittees) pursuant to Minnesota Statutes Chapter 216E and Minnesota Rules Chapter 7849. This permit authorizes the permittees to construct approximately nine and three-tenths miles of 115 kV high voltage transmission line and associated facilities between the Southdale Substation and a new Scearcyville Breaker Station.

II. PROJECT DESCRIPTION

The permitees are authorized to build an approximately nine and three-tenths mile segment of 115 kV transmission line and a new 115 kV breaker station. The proposed project will extend from the west side of Baxter to the north end of Sylvan Township and be located in Crow Wing and Cass counties, Minnesota.

The transmission line will be supported by single pole wood or steel structures with horizontal post insulators. In cases where longer spans are required, a braced post insulator design may be utilized. The pole structures will be approximately two to four feet in diameter, span 300 to 400 feet in length, and range from 65 to 80 feet in height. Poles structures will be anchored by directly embedding the pole 10 to 15 feet into an excavation roughly three to four feet greater than the pole diameter. Areas where existing distribution lines are present, the poles will be taller (75 to 90 feet) and designed to underbuild the distribution lines on the same poles, below the 115 kV circuit. Anchors and support cables or specialty structures will be required where the transmission line alignment angles or turns.

The three phases for this project will consist of one 795 steel supported aluminum conductor or ACSS. The ACSS conductors are 795,000 circular mils or approximately 1.1 inches in diameter and compromised of seven steel wires in the center surrounded by 26 aluminum strands. There will also be shield wires strung above the phases to prevent damage from potential lightning strikes. The shield wire may include a fiber optic cable that allows for substation protection equipment to communicate with other terminals on the line.

The breaker station will be constructed on approximately 10 acres of land and enclosed by a perimeter fence for security. The site location will likely require grading prior to construction. The breaker station will serve as the termination point for the proposed 115 kV transmission line and will be connected to Minnesota Power's existing 115 kV "24" transmission line by two new 115 kV lines approximately 0.1 miles in length total. A "lattice box" or low-profile structure design will be used for the construction of the breaker station, with the 115 kV transmission line termination towers being the tallest structure at 45 feet above grade.

EXAMPLE ONLY

A 280 foot by 290 foot fenced-in enclosure will house 115 kV switch structures, capacitors, breakers, and a control building. The breaker station will be designed to accommodate a future 230/115 kV transformer.

III. DESIGNATED ROUTE / SITE

The route designated by the Commission in this permit comprises the nine and three-tenths mile segment located in Cass and Crow Wing counties, Minnesota, and as described in detail below, and shown on the official route map attached to this permit.

The route width approved by this permit varies with each route segment and are as follows:

a. A 100 foot route width (centered on the current 34.5 kV distribution alignment) from the interconnect near the Southdale substation to the Crow Wing-Cass county line.

b. A 4,010 foot route width from the existing 34.5 kV distribution line north to Mapleton Road, incorporating 50 feet west of the Cass-Crow Wing county line and 3,960 feet (three-fourths of a mile) east of the county line.

c. A 2,690 foot route from Mapleton Road to Highway 210, this includes 50 feet west of the Cass-Crow Wing county line and 2,640 feet (one half of a mile) east of the county line.

d. A 535 foot route width along State Highway 210 from the Crow Wing County Line to County Highway 18 that includes the existing BNSF railroad corridor.

e. A 180 foot route width along County Highway 18 (90 feet on each side of road centerline) to the existing Minnesota Power transmission right-of-way.

f. A 400 foot route width centered along the existing Minnesota Power transmission right-of-way.

The portions of the proposed transmission alignment that would parallel State Highway 210 and County Highway 18 will be centered within a 70 foot right-of-way. The transmission line will be centered on a 100 foot right-of-way in Segment 1 where the new transmission line carries the Minnesota Power 34.5 kV distribution line and follows the existing alignment to the county line. When the transmission alignment is adjacent to a Public Waters Inventory (PWI) water body, the right-of-way will be limited to 70 feet when within 100 feet of the PWI. H-frame structures, if used, would also require at least a 100 foot wide right-of-way.

EXAMPLE ONLY

The proposed transmission line and breaker station will be designed to meet or exceed all relevant state and local codes, and requirements of the National Electric Safety Code, which is the utility safety standard that applies to all transmission lines. In addition, the breaker station facilities will be fenced, and access will be limited to authorized personnel. Appropriate standards will be met for construction and installation, and all applicable safety procedures will be followed during and after installation.

IV. PERMIT CONDITIONS

The permittees shall comply with the following conditions during construction of the transmission line and associated facilities and the life of this permit.

A. Plan and Profile. At least 14 calendar days before right-of-way preparation for construction begins, the permittees shall provide the Commission with a plan and profile of the right-of-way and the specifications and drawings for right-of-way preparation, construction, cleanup, and restoration for the transmission line. The permittees may not commence construction until the 14 days has expired or until the Commission has advised the permittees in writing that it has completed its review of the documents and determined that the planned construction is consistent with this permit. If the permittees intends to make any significant changes in its plan and profile or the specifications and drawings after submission to the Commission, the permittees shall notify the Commission at least five days before implementing the changes. No changes shall be made that would be in violation of any of the terms of this permit.

B. Construction Practices.

1. **Application.** The permittees shall follow those specific construction practices and material specifications described in the Great River Energy and Minnesota Power Application to the Public Utilities Commission for a Route Permit, dated July 17, 2008, and as described in the environmental assessment and findings of fact, unless this permit establishes a different requirement, in which case this permit shall prevail.

2. **Field Representative.** At least 10 days prior to commencing construction, the permittees shall advise the Commission in writing of the person or persons designated to be the field representative for the permittees with the responsibility to oversee compliance with the conditions of this permit during construction. The field representative's address, phone number, and emergency phone number shall be provided to the Commission and shall be made available to affected landowners, residents, public officials and other interested persons. The permittees may change its field representative at any time upon written notice to the Commission.

3. **Local Governments.** The permittees shall cooperate with county and city road authorities to develop appropriate signage and traffic management during construction.

EXAMPLE ONLY

4. **Cleanup.** All waste and scrap that is the product of construction shall be removed from the area and properly disposed of upon completion of each task. Personal litter, including bottles, cans, and paper from construction activities shall be removed on a daily basis.

5. **Vegetation Removal in the Right-of-Way.** The permittees shall minimize the number of trees to be removed in selecting the right-of-way. As part of construction, low growing brush or tree species are allowable within and at the outer limits of the easement area. Taller tree species that endanger the safe and reliable operation of the transmission facility need to be removed. To the extent practical, low growing vegetation that will not pose a threat to the transmission facility or impede construction should remain in the easement area.

6. **Erosion Control.** The permittees shall implement reasonable measures to minimize runoff during construction and shall promptly plant or seed, erect silt fences, and/or use erosion control blankets in non-agricultural areas that were disturbed where structures are installed. All areas disturbed during construction of the facilities will be returned to their pre-construction condition.

7. **Temporary Work Space.** The permittees shall limit temporary easements to special construction access needs and additional staging or lay-down areas required outside of the authorized right-of-way.

8. **Restoration.** The permittees shall restore the right-of-way, temporary work spaces, access roads, abandoned right-of-way, and other private lands affected by construction of the transmission line. Restoration within the right-of-way must be compatible with the safe operation, maintenance, and inspection of the transmission line. Within 60 days after completion of all restoration activities, the permittees shall advise the Commission in writing of the completion of such activities. The permittees shall compensate landowners for any yard/landscape, crop damage, soil compaction, or other that may occur during construction.

9. **Notice of Permit.** The permittees shall inform all employees, contractors, and other persons involved in the transmission line construction of the terms and conditions of this permit.

C. Periodic Status Reports. Upon request, the permittees shall report to the Commission on progress regarding finalization of the route, design of structures, and construction of the transmission line. The permittees need not report more frequently than quarterly.

D. Complaint Procedure. Prior to the start of construction, the permittees shall submit to the Commission, the procedures that will be used to receive and respond to complaints. The procedures shall be in accordance with the requirements set forth in the complaint procedures attached to this permit.

EXAMPLE ONLY

E. Notification to Landowners. The permittees shall provide all affected landowners with a copy of this permit at the time of the first contact with the landowners after issuance of this permit.

EXAMPLE ONLY

The permittees shall contact landowners prior to entering the property or conducting maintenance along the route and avoid maintenance practices, particularly the use of fertilizer, herbicides, or pesticides, inconsistent with the landowner's or tenant's use of the land.

The permittees shall work with landowners to locate the high voltage transmission lines to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads.

F. Completion of Construction.

1. **Notification to Commission.** At least three days before the line is to be placed into service, the permittees shall notify the Commission of the date on which the line will be placed into service and the date on which construction was complete.

2. **As-Builts.** Upon request of the Commission, the permittees shall submit copies of all the final as-built plans and specifications developed during the project.

3. **GPS Data.** Within 60 days after completion of construction, the permittees shall submit to the Commission, in the format requested by the Commission, geo-spatial information (GIS compatible maps, GPS coordinates, etc.) for all above ground structures associated with the transmission lines, each switch, and each substation connected.

G. Electrical Performance Standards.

1. **Grounding.** The permittees shall design, construct, and operate the transmission line in a manner that the maximum induced steady-state short-circuit current shall be limited to five milliamperes, root mean square (rms) alternating current between the ground and any non-stationary object within the right-of-way, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the right-of-way, except electric fences that parallel or cross the right-of-way, shall be grounded to the extent necessary to limit the induced short circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the National Electric Safety Code.

2. **Electric Field.** The transmission line shall be designed, constructed, and operated in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms.

EXAMPLE ONLY

3. **Interference with Communication Devices.** If interference with radio or television, satellite or other communication devices is caused by the presence or operation of the transmission line, the permittees shall take whatever action is prudently feasible to restore or provide reception equivalent to reception levels in the immediate area just prior to the construction of the line.

H. Special Conditions

1. **Archaeological and Historic Resources.** The permittees shall make every effort to avoid impacts to identified archaeological and historic resources when installing the high voltage transmission line on the approved route. In the event that an impact would occur, the applicants will consult with State Historic Preservation Office and invited consulting parties. Where feasible, avoidance of the resource is required. Where not feasible, mitigation for project-related impacts on National Register of Historic Properties-eligible archaeological and historic resources must include an effort to minimize project impacts on the resource.

2. **Wetlands/Water Resources.** Wetland impact avoidance measures that shall be implemented during design and construction of the transmission line will include spacing and placing the power poles at variable distances to span and avoid wetlands. Unavoidable wetland impacts as a result of the placement of poles shall be limited to the immediate area around the poles. To minimize impacts, construction in wetland areas shall occur in the winter. If necessary, wooden or composite mats will be used to protect wetland vegetation. All requirements of the U.S. Army Corps of Engineers (wetlands under federal jurisdiction), Minnesota Department of Natural Resources (Public Waters/Wetlands), and County (wetlands under the jurisdiction of the Minnesota Wetland Conservation Act) shall be met.

Impacts to floodplains, in particular the placement of power pole structures, shall be avoided to the maximum extent possible by placing these structures above the floodplain contours outside of the designated floodplain, and by spanning the floodplain with the transmission line.

If construction activities will result in the disturbance of one acre or more of soils, a National Pollutant Discharge Elimination System stormwater permit from the Minnesota Pollution Control Agency will be required. Standard erosion control measures outlined in Minnesota Pollution Control Agency guidance and best management practices regarding sediment control practice during construction. These practices include, but are not limited to, protecting storm drain inlets, use of silt fences, protecting exposed soil, immediately stabilizing restored soil, controlling temporary soil stockpiles, and controlling vehicle tracking.

EXAMPLE ONLY

3. Avian Collision. The applicant will evaluate mitigative measures in areas of the project where the chance of avian collision or electrocution is higher, specifically where the route will span the Gull River. The Gull River and other areas will be identified by the permittees in cooperation with the Minnesota Department of Natural Resources (DNR) and the U.S. Fish and Wildlife Service where bird flight diverters will be incorporated into the transmission line design to prevent large avian collisions attributed to visibility issues.

Due to the areas importance to Osprey, Red-shouldered hawks, and other raptors, standard transmission design will incorporate adequate spacing of conductor(s) and grounding devices. This is intended to eliminate the risk of electrocution to raptors with larger wingspans that may simultaneously come in contact with a conductor and grounding devices.

The applicants will work with the DNR to ensure construction activities are scheduled so as not to impact Osprey nesting.

4. Rare and Unique Resources. The DNR indicated occurrences of Blanding's turtles near the project area. The Blanding's turtle is considered a species in greatest need of conservation in Minnesota. The permittees will use silt fencing or other erosion control measures when working near waterways and wetlands to prevent sedimentation and disturbance of these areas. Construction and maintenance personnel will be made aware of the Blanding's turtle and their habitat during pre-construction meetings in an effort to minimize possible disturbance.

5. Accommodation of Existing and Planned Infrastructure. The permittees are required to work with the landowners, townships, cities, and counties along the route to accommodate their concerns regarding tree clearing, distance from existing structures, drain tiles, pole depth and placement in relationship to existing roads and road expansion plans. The permittees will work with Minnesota Department of Transportation when locating the transmission facilities along State Highway 210.

I. Other Requirements.

1. Applicable Codes. The permittees shall comply with applicable requirements of the National Electric Safety Code including clearances to ground, clearance to crossing utilities, clearance to buildings, right-of-way widths, erecting power poles, and stringing of transmission line conductors.

EXAMPLE ONLY

2. Other Permits. The permittees shall comply with all applicable state rules and statutes. The permittees shall obtain all required local, state and federal permits for the project and comply with the conditions of these permits. A list of the required permits is included in the route permit application and the environmental assessment. The permittees shall submit a copy of such permits to the Commission upon request.

3. Pre-emption. Pursuant to Minnesota Statutes 216E.10, subdivisions 1 and 2, this route permit shall be the sole route approval required to be obtained by the permittees and this permit shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose government.

J. Delay in Construction. If the permittees have not commenced construction or improvement of the route within four years after the date of issuance of this permit, the Commission shall consider suspension of the permit in accordance with Minnesota Rule 7849.5970.

V. PERMIT AMENDMENT

The permit conditions in Section IV may be amended at any time by the Commission. Any person may request an amendment of the conditions of this permit by submitting a request to the Commission in writing describing the amendment sought and the reasons for the amendment. The Commission will mail notice of receipt of the request to the permittees. The Commission may amend the conditions after affording the permittees and interested persons such process as is required.

VI. TRANSFER OF PERMIT

The permittees may request at any time that the Commission transfer this permit to another person or entity. The permittees shall provide the name and description of the person or entity to whom the permit is requested to be transferred, the reasons for the transfer, a description of the facilities affected, and the proposed effective date of the transfer. The person to whom the permit is to be transferred shall provide the Commission with such information as the Commission shall require to determine whether the new permittees can comply with the conditions of the permit. The Commission may authorize transfer of the permit after affording the permittees, the new permittees, and interested persons such process as is required.

VII. REVOCATION OR SUSPENSION OF THE PERMIT

The Commission may initiate action to revoke or suspend this permit at any time. The Commission shall act in accordance with the requirements of Minnesota Rules part 7849.6010 to revoke or suspend the permit.

EXAMPLE ONLY