MINNESOTA DEPARTMENT OF COMMERCE
ENERGY FACILITY PERMITTING

ENVIRONMENTAL ASSESSMENT
ST. CLOUD LOOP PROJECT
NEW 115 KV TRANSMISSION LINE

Alternative Permitting Process
MPUC Docket No. E002/TL-10-1026

September 16, 2011

RESPONSIBLE GOVERNMENT UNIT

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ABSTRACT

Pursuant to the provisions of Minnesota Statutes, chapter 216E, Xcel Energy (applicant) filed a high-voltage transmission line route permit application with the Minnesota Public Utilities Commission (Commission) on March 11, 2011, for a proposed 115 kilovolt (kV) transmission line and modifications to existing transmission lines and substations.

Xcel Energy proposes to construct a new 4.7-mile long 115 kV overhead transmission line. The Proposed Route is divided into two segments. The first segment (new Line 5520) is approximately 4 miles long and would be constructed between the Mayhew Lake Substation and the Granite City Substation. The second segment (extension of existing Line 5509) is approximately 0.7 miles long and would be constructed between the intersection of Line 5509 with Lines 0887 and 0899 and Structure 39.

Minnesota Department of Commerce Energy Facility Permitting (EFP) is tasked with conducting environmental review of applications for transmission line route permits. The intent of this environmental assessment document and 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.

Persons interested in these matters can register their names on the project contact list at http://energyfacilities.puc.state.mn.us/#mailing or by contacting: Scott Ek, Energy Facility Permitting, 85 7th Place East, Suite 500, St. Paul, Minnesota, 55101, phone: (651)-296-8813, email: scott.ek@state.mn.us.

Documents related to this project can be found at the above website or also by going to: https://www.edockets.state.mn.us/EFiling/search.jsp and entering "10" for Year and "1026" for Number, under search criteria.

This document can be made available in alternative formats (i.e. large print or audio) by calling 651-296-0391 (voice). Persons with hearing or speech disabilities may call us through Minnesota Relay at 1-800-627-3529 or by dialing 711.

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 REGULATORY FRAMEWORK 4
2.1 Certificate of Need 4
2.2 Alternative Permitting Process 4
2.3 Route Permit Application 4
2.4 Public Information and Scoping Meeting 4
2.5 Environmental Assessment 5
3.0 PROPOSED PROJECT 6
3.1 Purpose and Need 6
3.2 Project Location 6
3.3 Route Descriptions 7
3.4 Route Width 8
3.5 Right-of-Way 8
3.6 Associated Facilities and Substations 9
3.7 Cost 10
4.0 ENGINEERING AND DESIGN 12
4.1 Conductors 12
4.2 Structures 12
5.0 FACILITY CONSTRUCTION 15
5.1 Utility Right-of-Way Easement Acquisition 15
5.2 Transmission Line Structures 17
5.3 Conductors 19
5.4 Substations 19
5.5 Clean-up and Restoration 20
5.6 Maintenance Procedures 21
6.0 POTENTIAL IMPACTS & MITIGATIVE MEASURES 22
6.1 Environmental Setting 22
6.2 Socioeconomic and Cultural Setting 22
6.3 Project Economic Impacts 24
6.4 Human Settlement 24
6.5 Noise 28
6.6 Public Health and Safety 32
6.7 Air Quality 44
6.8 Transportation and Public Services 46
6.9 Zoning and Compatibility 48
6.10 Land Use & Land-Based Economies 49
6.11 Geology & Soils 54
6.12 Groundwater 55
6.13 Surface Water 56
6.14 Wetlands 57
6.15 Floodplain 60
6.16 Flora 60
6.17 Fauna 61
6.18 Rare and Unique Species and Habitat 63

6.19 Archaeological & Historic Resources 64
6.20 Interference 65
7.0 PERMITS & APPROVALS 68
8.0 ROUTE COMPARISONS 69
9.0 REFERENCES 73

TABLES

Table 1: Project Location Data 6
Table 2: Amount and Type Of Right-Of-Way Followed 9
Table 3: Estimated Project Costs 11
Table 4: Transmission Line and Structure Specifications 14
Table 5: 2010 Population Characteristics 23
Table 6: Distance and Number of Structures from Route Centerline 25
Table 7: Common Noise Sources and Average Sound Levels 29
Table 8: Noise Area Classifications 30
Table 9: Calculated Transmission Line Audible Noise Levels (3.28 Feet Above Ground) 31
Table 10: Summary Of Electric and Magnetic Field Properties 33
Table 11: Typical Electric Fields (Kv/M) from Common Home and Business Appliances 34
Table 12: State Established Electric and Magnetic Field Standards and Guidelines 35
Table 13: Electric and Magnetic Field Guidelines from Internationally Organizations 36
Table 14: Calculated Electric Fields (Kv/M) of the Proposed 115 Kv Transmission Line 37
Table 15: Typical Magnetic Fields (Mg) of Common Appliances 38
Table 16: Calculated Magnetic Fields (Mg) of the Proposed 115 Kv Transmission Line 40
Table 17: State and Federal Ozone Limits 45
Table 18: Farmland Soils Near or Along the Proposed Route, Route Segment A, and Douvier Alignment 51
Table 19: Estimated Wooded Land and Vegetated Areas 53
Table 20: Wetlands within the Proposed Route 58
Table 21: Summary of Permits and Approvals 68
Table 22: Comparison of Routes 69

FIGURES

Figure 1: Examples of Single-Pole Tangent Structures
Figure 2: General Vicinity Map
Figures 3 to 10: Route Maps (Route maps include natural resource features, parks, schools and parcel lines)
Figure 11: Zoning Map

APPENDICES

Appendix A: Scoping Decision
Appendix B: Route Permit Example

1.0 INTRODUCTION

Xcel Energy (applicant) has made application to the Minnesota Public Utilities Commission (Commission) for a route permit under the alternative permitting process of the Power Plant Siting Act (Minnesota Statute 216E). The route permit application is for the construction and the operation and maintenance of a new 4.7-mile long 115 kV transmission line and modifications to existing transmission lines and substations.[1]

The proposed 115 kV St. Cloud Loop transmission line (project) would be located northeast of the city of Sauk Rapids in Benton County, Minnesota. The project would specifically be located in portions of the city of Sauk Rapids and Minden and Sauk Rapids townships (**Figure 2**).

The project as described in the route permit application would consist of the following:

- constructing approximately 4 miles of new 115 kV transmission line (Line 5520) between the Mayhew Lake Substation and the Granite City Substation;
- removing a 1,700 foot segment of existing single-circuit 115 kV transmission line (Line 5509) between the Granite City Substation and its intersection with Lines 0887 and 0899;
- installing approximately 0.7 miles of new 115 kV transmission line to extend existing Line 5509 from its intersection with Lines 0887 and 0899 to Structure 39;
- installing either a new single-circuit pole or a new double-circuit structure near Structure 39 and connect Line 5509 from Structure 39 to existing Line 0899, thus creating newly designated Line 5509 connecting the Mayhew Lake Substation to the Benton County Substation;
- removing existing Line 0887 jumper at Structure 39 so that Line 0887 is no longer connected to Benton County Substation, and keeping Line 0887 connection between the St. Cloud and Granite City substations;
- disconnecting the existing Line 0899 at Structure 39 to the Benton County Substation and connecting to removed Line 0887 segment from Structure 39 to Benton County Substation, and designating this revised line from Granite City to Benton County substations as Line 0899;
- installing fiber optic ground wire with the new 115 kV line and the remaining segment of Line 0899; and

[1] Xcel Energy, Route Permit Application, St. Cloud Loop New 115 kV Transmission Line (RPA), March 11, 2011, Docket E002/TL-10-1026.

- modifying the Benton County, Crossroads, Granite City, Mayhew Lake, and St. Cloud substations to accommodate the above changes, which include changing and/or adding new line termination equipment and/or a ring bus, adding transfer trip and pilot relaying, installing fiber optic lines for relaying and transfer trip, installing breakers, reconfiguring line protection, replacing shield wire with fiber optic shield wire, and other related modifications.

Energy Facility Permitting (EFP) staff is tasked with conducting environmental review of applications for high-voltage transmission line route permits. The intent of the environmental review process is to inform the public, the applicant, and decision-makers about potential impacts and possible mitigation measures for a proposed high-voltage transmission line project.

This environmental assessment (EA) covers the environmental review requirements in accordance with the Scoping Decision Document for this EA, and as outlined in Minnesota Rules 7850, for the proposed project and route permit application as follows:

- **Section 1.0** - Introduction

- **Section 2.0** – Describes the regulatory framework associated with the project, which includes information on the certificate of need criteria, route permit requirements, and the alternative permitting processes.

- **Section 3.0** – Provides a detailed description of the project as proposed by the applicant.

- **Section 4.0** – Details the engineering and design of the proposed project including transmission facility specifications, route widths, and right-of-way requirements.

- **Section 5.0** – Describes the methods used when constructing the transmission line along with clean-up and restoration, maintenance procedures, cost, and utility rights-of-way acquisition.

- **Section 6.0** – Details the potential impacts of the proposed project to human and natural environments and identifies measures that could be implemented to avoid, minimize or mitigate any potential adverse impacts.

- **Section 7.0** – Lists additional permits that may be required for the proposed project.

- **Section 8.0** – Provides a comparison of the routes analyzed in this EA.

- **Section 9.0** – References

Much of the information used in this EA is derived from documents prepared by Xcel Energy. These include the Xcel Energy's Route Permit Application for the St. Cloud Loop New 115 kV Transmission Line, March 11, 2011, along with emails and information requests. Discussion of electromagnetic field issues came primarily from the white paper developed by the Interagency Task Force led by the Minnesota Health Department, the National Institute for Environmental Health and the World Health Organization. Additional information comes from earlier EFP environmental review documents in similar dockets, other state agencies such as the Department of Natural Resources and the Pollution Control Agency. Section 9.0 provides a listing of additional references used in writing this EA.

2.0 REGULATORY FRAMEWORK

In Minnesota, no person may construct a high-voltage transmission line without a route permit from the Public Utilities Commission under Minnesota Statute 216E.03, subdivision 2. A high-voltage transmission line is defined as a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kV or more and is greater than 1,500 feet in length. Associated facilities of the transmission line include: buildings, equipment, and other physical structures that are necessary to the operation of a high-voltage transmission line.

2.1 Certificate of Need

Pursuant to Minnesota Statute 216B.243, subdivision 2, "No large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the Commission." A large energy facility in this case, a high-voltage transmission line, is defined as, (1) any high-voltage transmission line with a capacity of 200 kV or more and greater than 1,500 feet in length, and (2) any high-voltage transmission line with a capacity of 100 kV or more with more than ten miles of its length in Minnesota or that crosses a state line.

The project as proposed does not qualify as a large energy facility and a certificate of need is not required.

2.2 Alternative Permitting Process

The proposed project is eligible for consideration under the alternative permitting process (Minnesota Rules 7850.2800 to 7850.3900) of the Power Plant Siting Act (Minnesota Statute 216E.04). The alternative permitting process is shorter than the full permitting procedures and does not require the applicant to propose 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.

2.3 Route Permit Application

The applicant filed a route permit application with the Commission for its proposed St. Cloud Loop 115 kV Transmission Line project on March 11, 2011. The Commission accepted the application as complete in an order issued on April 11, 2011. 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 may extend this time limit for up to three months for just cause or upon agreement of the applicant.

2.4 Public Information and Scoping Meeting

EFP staff held a public information and environmental assessment scoping meeting on May 11, 2011, at the Sauk Rapids – Rice Middle School in Sauk Rapids, Minnesota, as required by Minnesota Rule 7850.3500. The meeting provided the public an opportunity to learn about the proposed project and the state's high-voltage transmission line route permitting process, review the applicant's route permit application, ask questions, and submit comments.

A court reporter was present at the public meeting and transcribed questions asked and comments made by the public, as well as responses from EFP staff and Xcel Energy representatives. The attendance sign-in sheet indicated approximately six people attended the meeting.

A public comment period, ending on May 25, 2011, provided the public an additional opportunity to submit comments on issues and alternative routes for consideration in the scope of the EA. A total of three comment letters were received by the close of the comment period. After consideration of the public comments the deputy commissioner of the Department of Commerce issued the scope of the EA on June 3, 2011. The EA scoping decision document is included in **Appendix A**.

2.5 Environmental Assessment

An EA must be prepared for all high-voltage transmission projects being reviewed under the alternative permitting process. The procedures EFP staff must follow in preparing the EA are described in Minnesota Rule 7850.3700. The EA contains information on the human and environmental impacts of the proposed project as identified in the scoping decision document. It also addresses required methods to mitigate such impacts for all routes considered. The EA is the only state environmental review document required to be prepared for this project.

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 to the Commission for a final decision. An example of a route permit issued by the Commission for a high-voltage transmission line is provided in **Appendix B**.

Copies of the route permit application and other documents relevant to the process are available for viewing and downloading on the Commission website at: http://energyfacilities.puc.state.mn.us/Docket.html?Id=31941 or the eDockets website at: https://www.edockets.state.mn.us/EFiling/search.jsp, enter "10" for Year and "1026" for Number, under search criteria.

3.0 PROPOSED PROJECT

Xcel Energy proposes to construct a new 4.7-mile long 115 kV overhead transmission line. The Proposed Route is divided into two segments. The first segment (new Line 5520) is approximately 4 miles long and would be constructed between the Mayhew Lake Substation and the Granite City Substation. The second segment (extension of existing Line 5509) is approximately 0.7 miles long and would be constructed between the intersection of Line 5509 with Lines 0887 and 0899 and Structure 39.

3.1 Purpose and Need

Xcel Energy indicates in its route permit application that the proposed project will improve the reliability of service to customers served from the Mayhew Lake Substation in and near the cities of St. Cloud, Sartell and Sauk Rapids, and the surrounding townships. The proposed project will provide a second power source to the Mayhew Lake Substation, thereby eliminating the incidents where the load cannot be served during an outage of Line 5509 between the Granite City and Mayhew Lake substations. Xcel Energy also explains that with the proposed reconfiguration of 115 kV lines around Transmission Structure 39 in this project, the loss of any double-circuit transmission lines between the Granite City, Benton County, Mayhew Lake, and St. Cloud substations will not result in dropping the load at Mayhew Lake Substation or the large industrial customer facility (Verso Paper Corporation) served by these lines.

3.2 Project Location

The proposed project would be located in the northeastern part of the city of Sauk Rapids and the townships of Minden and Sauk Rapids in Benton County, Minnesota. Townships, ranges, and sections for the two routes and alignment alternative are shown below in **Table 1**. A depiction of the routes are shown in **Figure 2**.

Table 1: Project Location Data

Route	County	Township Name	Township	Range	Sections
Proposed Route	Benton	City of Sauk Rapids	36N	31W	14, 23, 24, 25
Proposed Route	Benton	Sauk Rapids Township	36N	31W	11, 12, 13, 14, 23, 24, 25, 36
Proposed Route	Benton	Minden Township	36N	30W	30, 31
Alternate Route Segment A	Benton	Sauk Rapids Township	36N	31W	11, 14
Douvier Alignment Alternative	Benton	Sauk Rapids Township	36N	31W	14

3.3 Route Descriptions

Detailed depictions of each route are shown in **Figures 3 through 10**. Descriptions of the routes analyzed in this EA are provided below.

Proposed Route

Xcel Energy proposes to construct a new 4.7-mile long 115 kV overhead transmission line to be located in the northeastern part of the city of Sauk Rapids. As described in the route permit application the new transmission line route would exit the existing Mayhew Lake Substation, head west along County Road 29 for one-half mile and south-southwest across open field and scattered forest land for three-tenths of a mile to Highway 10. The route would proceed south along the east side of Highway 10 for two and nine-tenths miles, turn east for three tenths of a mile following County Ditch 3 to the existing Granite City Substation. A second segment (extension of existing Line 5509) is approximately 0.7 miles long and would be constructed between the intersection of Line 5509 with Lines 0887 and 0899 and Structure 39 (**Figure 2**).

In addition to the route proposed by Xcel Energy in its route permit application, the EA will evaluate the following alternative route segment and alignment alternative:

Proposed Route with Route Segment A

The route would use the Proposed Route and incorporate Alternative Route Segment A as described in Xcel Energy's route permit application. Alternative Route Segment A is approximately five-tenths of a mile long and would connect with the Proposed Route approximately five-tenths of a mile west of the Mayhew Lake Substation and run west along County Road 29 for three-tenths of a mile to U.S. Highway 10. The route then proceeds approximately two-tenths of a mile southeast traversing scattered forest land along the U.S. Highway 10 interchange road before reconnecting with the Proposed Route. The total length of the Proposed Route with Route Segment A is approximately 4.9 miles (**Figure 2**).

Douvier Alignment Alternative

The alignment alternative using the Proposed Route would consist of shifting the alignment and right-of-way of the proposed transmission line 300 feet north-northwest at a point approximately one-quarter of a mile west from the intersection of County Road 57 and County Road 29 where the route turns directly south and then southwest to U.S. Highway 10 (Section 14 of Sauk Rapids Township). The alignment was provided by a citizen as an attempt to reduce the need for additional tree clearing in that area by follow an existing tree line. (**Figure 2**).

3.4 Route Width

Xcel Energy is requesting a 400 foot route width for the entire length of the proposed transmission line route, as follows: 200 feet on each side of the proposed alignment from the Mayhew Lake Substation west to its intersection with U.S. Highway 10; a 400 foot route width left-aligned with the eastern edge of the northbound lanes of U.S. Highway 10; 200 feet on either side of the proposed alignment from U.S. Highway 10 heading east along County Ditch 3 to the Granite City Substation; 200 feet on either side of the proposed alignment for the new segment extending Line 5509 at approximately 14th Avenue NE to Structure 39. A 200 foot route width extending from Xcel Energy-owned property at the Mayhew Lake and Granite City substations is also requested.

3.5 Right-of-Way

As indicated in the route permit application, the proposed transmission line will generally require a right-of-way of up to 75 feet (37.5 feet on either side of centerline). There are areas along the Proposed Route where the new transmission line would be located at or very near existing electric distribution or transmission easements. Xcel Energy indicates that the project may be designed to fit within these existing easements, thereby requiring less right-of-way while still satisfying the needs of the project. In addition, approximately 2.7 miles of the total proposed new transmission line will be underbuilt with an existing distribution line.[2]

Where the transmission line would parallel a road, the route permit application indicates that transmission centerline would be constructed approximately five feet outside the existing road right-of-way. This would allow the transmission line to share a portion of the road right-of-way. Xcel Energy provides that efforts will be made to place transmission structures as close to private property lines as is practicable.[3]

Minnesota Department of Transportation (Mn/DOT) indicates in its comment letter that the section of U.S. Highway 10 is freeway design and the provisions of the Utility Accommodation Policy[4] relating to freeways will be applicable at this location.[5] Along U.S. Highway 10, Xcel Energy has stated it will conform with Mn/DOT's Utility Accommodation Policy so that the transmission structures, davit arms (5 to10 feet in length) and conductors do not overhang into Mn/DOT right-of-way. Xcel Energy would move the structures over on private easements in order to meet the Policy. Xcel Energy indicates they have been discussing this project with Mn/DOT and will continue to work with them to optimally position and manage the transmission rights-of-way when paralleling roadways in order to meet the Utility Accommodation Policy.[6]

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[2] Xcel Energy, Notice of Application, 03/25/11, eDocket 20114-61774-01.
[3] RPA, Section 5.1.2, Page 25.
[4] Mn/DOT, Utility Accommodation Policy, http://www.dot.state.mn.us/utility/policy/index.html
[5] Mn/DOT Scoping Letter, 05/25/11.
[6] Xcel Energy e-mail, 09/12/11.

When the transmission line would be located on private property in areas such as open fields or scattered forest land, an easement for the entire right-of-way (up to 75 feet) would be acquired from the affected landowner(s). Again, the applicant plans to locate the poles or transmission centerline on or as close to property division lines where reasonably possible.[7]

Xcel Energy anticipates that approximately 0.5 miles of new right-of-way (up to 75 feet) would be needed for the Proposed Route along the south side of County Road 29 and 0.5 miles of new right-of-way between County Road 29 and U.S. Highway 10 (Alternative Route Segment A and Douvier Alignment).

Table 2, below summarizes the type of existing right-of-way, the miles and percent of the route that each of the three routes being evaluated would follow.

Table 2: Amount and Type of Right-of-Way Followed

Route	Existing Right-of-Way Type and Miles (Percent) Followed		
	Transportation	Electrical	New/Cross Country
Proposed Route	3.2 (68 percent)	2.8 (60 percent)	0.7 (15 percent)
Proposed Route with Alternative Segment A	4.1 (84 percent)	2.8 miles (57 percent)	0.8 (8 percent)
Proposed Route with Douvier Alignment	3.2 (68 percent)	2.8 (60 percent)	0.7 (15 percent)

Source: Xcel Energy e-mail, 09/09/11. The distances and percents do not add up to the total Proposed Route lengths, as there are areas where the types of right-of-way overlap along each respective route.

Additional rights-of-way may be needed where H-frame or other specialty structures are required for longer spans, road crossings (structure height requirements) or in environmentally sensitive areas.

3.6 Associated Facilities and Substations

The project would include changes and modifications to five existing substations and existing transmission lines 0887, 0899 and 5509; installation of fiber optic ground wire; and changing existing line designations.

[7] RPA, Section 5.1.2, Page 28.

Mayhew Lake Substation

Changes and modifications at the existing Mayhew Lake Substation would include the addition of oil circuit breakers, a 115 kV main bus, and a 115 kV line termination structure. The new structures and equipment would require site grading and expansion of the fenced area (approximately 0.6 acres), foundation installation, steel structure installation, equipment installation, and control room modifications. Changes would also include three new transmission line structures for routing of the proposed transmission line into the substation along with modifications to existing structures including possible removal and replacement of one old structure with one of the newly proposed structures.

Granite City Substation

Changes and modifications at the existing Granite City Substation would include the addition of oil circuit breakers, a 115 kV main bus, and a 115 kV line termination structure. A new dead-end transmission structure(s) would be required where the new transmission line would enter the substation site with a preliminary location in the northeast corner of the substation site.

Benton County, St. Cloud, and Crossroads Substations

Changes and modifications would include replacements or upgrades of relays and communication equipment internal to the control house(s), installing fiber optic lines for relaying and transfer trip, installing breakers, reconfiguring line protection, replacing shield wire with fiber optic shield wire, and related modifications.

Transmission Structure 39

Jumpers connecting existing lines would be removed and new jumpers would be added to Structure 39 depending on the proposed transmission line re-designations. New single- and/or double-circuit structures would also be constructed near Structure 39 to support the new transmission line connections and re-designations.

3.7 Cost

As provided in the route permit application, transmission line costs would vary depending on the structure type, the height and diameter and composition of the structures, the number of structures per mile, labor and hardware costs. The line construction costs include the cost of structures, insulators, conductors, and labor as well as any costs of equipment that will be used to construct the new line. Construction costs also include modifications to existing substations and Transmission Structure 39. The estimated project costs are summarized in **Table 3**.

Table 3: Estimated Project Costs

Route	Total Estimated Project Cost
Proposed Route	$10 million
Proposed Route with Alternate Route Segment A	$10.1 million
Proposed Route with Douvier Alignment	$10 million

Source: RPA, Table 4, Page 11 and Xcel Energy e-mail, 09/09/11.

Xcel Energy indicates that operating and maintenance costs for the transmission line will be nominal for several years, since the transmission line will be new and for the most part a upgrade of an existing line, therefore minimal vegetation maintenance would be required. Xcel Energy's typical annual operating and maintenance costs for 115 kV transmission lines in its Upper Midwest system are approximately $300 to $500 per mile of transmission line right-of-way. Costs include inspections typically performed by airplane or helicopter on a regular basis. Inspections of substations and other equipment are generally performed on a annual or semi-annual basis depending on the type of equipment. Maintenance and repairs to substations are performed on an as-needed basis with costs varying from substation to substation.[8]

[8] RPA, Section 3.5, page 11.

4.0 ENGINEERING AND DESIGN

High-voltage transmission line circuits generally consist of three phases, each at the end of a separate insulator, and physically supported by structures or poles. 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. Shield wires are strung above the phases to prevent damage from potential lightning strikes. The shield wire may also include a fiber optic cable that allows for substation protection equipment to communicate with other substation terminals on the line. Transmission structures and line details for this project described below and summarized in **Table 4**.

4.1 Conductors

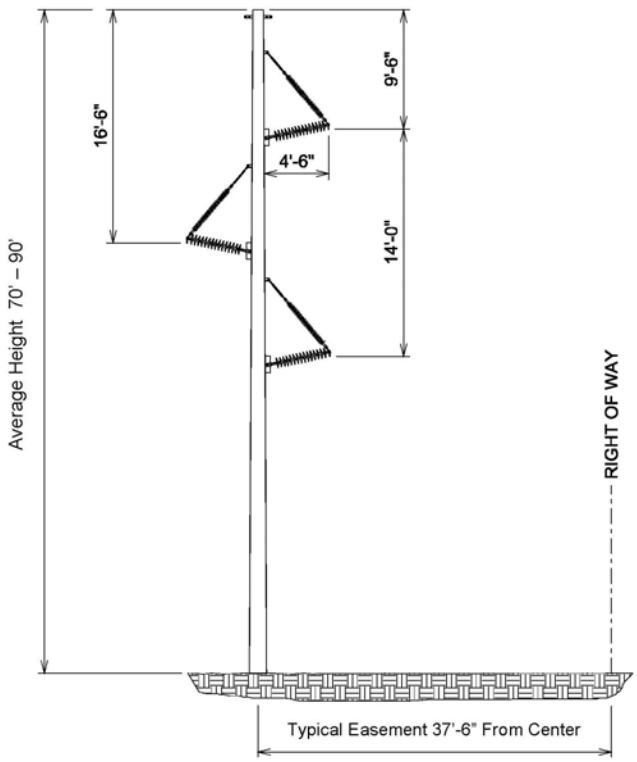
The phases for this project would be constructed with three single steel supported aluminum conductors (ACSS) which each consist of a single conductor comprised of seven steel core strands surrounded by 26 outer aluminum strands. The separate conductors are 795,000 circular mils or approximately 1.092 to 1.139 inches in diameter. The ground to conductor height depends on overall topography and man-made obstacles and will meet or exceed the minimum clearance requirements of the National Electric Safety Code (NESC). A 0.528 inch diameter fiber optic cable will be installed to protect from lightning strikes and allow for communication between substation protection equipment and other terminals. Ultimately, the transmission line would be three-phase, 60 Hz (hertz), alternating current line.

4.2 Structures

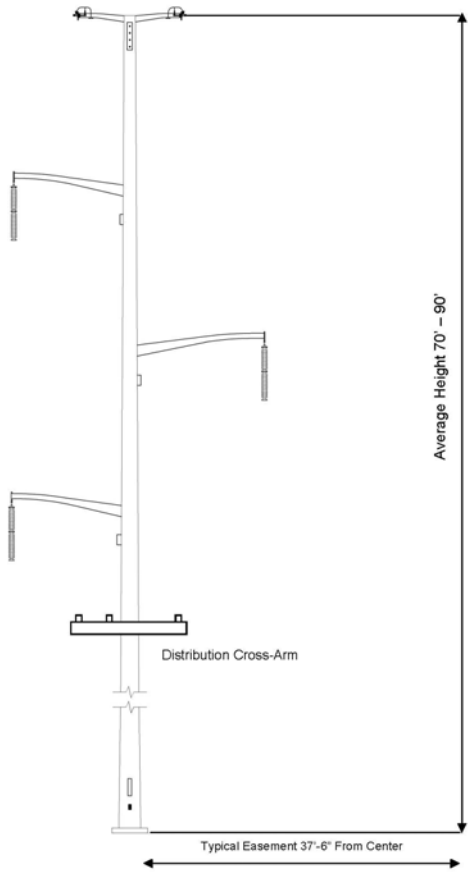
The primary structure or tangent structure Xcel Energy proposes to use for the project is a galvanized steel, weathering steel or wood single-pole structure with braced posts or davit arms. The tangent structures would be approximately 70 feet to 90 feet in height with an average span of 300 feet to 400 feet between structures (500 foot maximum). The steel structures would have up to a 5 foot to 8 foot average diameter foundation at ground surface and would taper with height (**Figure 1**).

Approximately 2.7 miles of the new transmission line is proposed to follow and be underbuilt with existing distribution lines. In its application, Xcel Energy indicates that, where feasible, the project would be designed to fit within these existing easements, thereby requiring less right-of-way while still satisfying the needs of the project. For this segment of the project Xcel Energy intends using the same tangent structures as described above with the addition of a distribution crossarm (**Figure 1**). Xcel Energy anticipates using approximately 24 to 42 tangent structures along the Proposed Route.

Figure 1: Examples of Single-Pole Tangent Structures



Typical Dimensions and Right-of-Way Requirements for Single-Circuit 115 kV Structure



Typical Dimensions and Right-of-Way Requirements for Single-Circuit 115 kV Structure with Distribution Underbuild

115 kV Single-Circuit Wood Braced Post Insulator Structure

115 kV Single-Circuit Steel Davit Arm Structure

115 kV Single-Circuit Steel Davit Arm Structure with Distribution Underbuild

Specialty structures may be required where angles in the line are required. The angle structures would be similar in design to the tangent structures described above. Xcel Energy anticipates using 36 to 42 angle structures along the Proposed Route. Xcel Energy indicates that given the limited right-of-way, guyed structures would likely not be necessary.

Double-circuit structures may be used for approximately 0.7 miles of the Proposed Route where existing Line 5509 would be extended from its intersection with Lines 0887 and 0899 to Structure 39. A double-circuit structure may also be required to connect the newly extended Line 5509 from Structure 39 to existing Line 0899 that runs to the existing Benton County Substation. The double-circuit structures would be a galvanized or weathered steel single-pole with davit arms approximately 75 to 105 feet in height with spans of 300 to 500 feet.

Table 4: Transmission Line and Structure Specifications

Line Type	Conductor	Structure Type	Structure Material	Estimated Foundation Diameter (feet)	Structure Height (feet)	Span Between Structures (feet)
115 kV Single-Circuit	ACSS 795 kcmil 26/7	Single Pole Braced Post or Davit Arm	Galvanized Steel, Weathering Steel, or Wood	5 - 8	70 - 90	300 - 500
115 kV Single-Circuit with Distribution Underbuild	ACSS 795 kcmil 26/7	Single Pole Davit Arm with Distribution Crossarm Underbuild	Galvanized Steel, Weathering Steel or Wood	5 - 8	70 - 90	300 - 500
115 kV Double-Circuit	ACSS 795 kcmil 26/7	Single Pole Davit Arm	Galvanized Steel or Weathering Steel	6 - 8	75 - 105	300 - 500

Source: RPA, Table 7, Page 24-25.

5.0 FACILITY CONSTRUCTION

Project construction cannot begin until after the appropriate federal, state, and local permits and approvals are issued. Xcel Energy would need to acquire property rights-of-way, complete soil investigations, and develop the final detailed design. The precise timing of construction would take into account the required permits and their conditions, system loading issues, existing transmission line outage restrictions, construction constraints, weather, road restrictions, mitigation or impact minimization, and availability of work force and materials. Additional details regarding the applicant's construction practices are provided in Section 5.0 of the route permit application.

As indicated in the route permit application, Xcel Energy designs and constructs transmission lines following construction and mitigation methods based on past experiences and in compliance with permit conditions, industry standards, and environmental factors. These practices address right-of-way clearance, staging, erecting transmission structures, and stringing transmission lines. Practices to mitigate potential construction impacts are established based on permit requirements, construction schedules, geology and topography, maintenance guidelines, inspection procedures, and encountering of sensitive environments or species. Xcel Energy indicates that in some cases, activities or schedules would be modified to minimize impacts on sensitive environments.

Xcel Energy states that the proposed transmission line would be designed to meet or exceed local and state codes, the NESC, North American Electric Reliability Corporation (NERC) requirements and Xcel Energy standards. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, clearances over roadways, and right-of-way widths.

5.1 Utility Right-of-Way Easement Acquisition

Should the Commission select a route and issue a route permit, the applicant's easement acquisition process would begin early in the detailed design phase. The Commission is not involved in the easement acquisition process.

Xcel Energy, in its route permit application indicates that where the transmission line route would use existing rights-of-way, a right-of-way agent would evaluate those existing easements to ensure they are sufficient and that no new right-of-way is needed. If the existing easement is deemed sufficient the right-of-way agent would continue to work with the landowner to address any construction needs/concerns, potential impacts, damage, and restoration issues. To the extent new right-of-way acquisition is necessary, the right-of-way agent would work with landowners to determine how to modify the existing easements, as necessary for the project.

Utilities typically acquire easement rights, not fee title from landowners to accommodate transmission lines. As described in the route permit application Xcel Energy's easement acquisition process can typically be broken down into the following steps:

Title examination. If a route permit is approved, Xcel Energy will perform a public records search of the land involved in the project. A title report is then developed for each parcel to determine the owner(s) of record of the property, and to gather information regarding easements, liens, restrictions, encumbrances, and other conditions of record.

Initial contact. A right-of-way representative contacts each property owner or the property owner's representative to discuss the project and how it may impact each parcel and also seeks information about any construction concerns specific to the landowner.

Initial transmission line survey. If a route permit is approved, the applicant will provide notification to property owners requesting permission for survey crews to conduct preliminary survey work on the property. The survey is performed to establish the right-of-way boundaries, locate natural and man-made features along and within the right-of-way, establish the transmission centerline and determine elevations for use during detailed design. Permission may also be requested at this time to obtain soil samples to assess soil conditions and to determine appropriate foundation design.

During the initial survey the survey crew, with permission of the property owner, may place surveyor's stakes to mark the tentative or anticipated structure locations, thereby allowing the landowner to see where the structures may be located on the property. The right-of-way boundary may also be delineated showing the area that is required for safe operation of the transmission line.

Easement acquisition. Xcel Energy collects land value data and based on the impact of the easement or purchase to the market value of each parcel develops a fair market value offer. The offer of compensation determined would be based on the specific attributes of each property, the amount of easement area, design of the transmission line, and other factors, as appropriate.

The right-of-way agent will then contact the property owner(s) to present the easement offer and discuss the amount of just compensation for the rights to construct, operate, access, and maintain the transmission facilities within the easement area. Xcel Energy indicates the landowner is then allowed a reasonable amount of time to consider the offer and to present any additional material that the property owner believes is relevant to determining the property's value.

Appraisal. If the landowner desires a second opinion on the fair market value of the property, the landowner may have an appraisal made and receive reimbursement from the applicant per Minnesota Statute 117.036 subdivision 2(b).

Pre-construction owner contact. Prior to construction, the agent would contact the owner of each parcel to discuss the construction schedule and any additional requirements not discussed during the time of the easement acquisition. To ensure safe construction and operation, special consideration may be needed for fences, crops, or livestock.

In each case the right-of-way agent assists in coordinating the process. Post-construction Xcel Energy would repair and/or compensate for any damages with the landowner, as applicable.

Eminent domain. If a negotiated settlement cannot be reached, it may be necessary for the applicant to file for eminent domain, pursuant to Minnesota Statute Chapter 117. In the eminent domain process, a judicial proceeding would commence to determine the scope of the applicant's easement and an independent commission would determine the value of the easement taken. Xcel Energy has indicated that the new transmission line would be designed so that all existing residences are located outside the proposed right-of-way and that the project will not require displacement of any buildings or residences.[9]

5.2 Transmission Line Structures

Construction of the transmission line would require the acquisition and preparation of rights-of-way for the transmission line, establishment of work and staging areas, installation of new single pole tangent and specialty structures, removal of the existing distribution lines, installation of safety structures at road and other utility crossings.

Transmission line structures are generally designed for installation at existing grades. However, along areas with more than 10 percent slope, working areas may have to be graded level or fill would be brought in to create working pads. If the landowner permits, Xcel Energy prefers to leave the leveled working pads in place for future maintenance activities, as necessary. If the landowner does not agree, Xcel Energy will grade the site back to its original condition and any imported fill is removed from the area.

Typically existing roads or trails that run parallel or perpendicular to the Proposed Route are used to access the actual transmission line right-of-way. Where use of private field roads or trails is necessary, permission from the property owner would be obtained by Xcel Energy prior to access. In some cases, new access roads or temporary lay down areas may be required due to problematic structure locations, when no current access is available, or existing access is inadequate for the heavy equipment used in construction. Should these areas fall outside the right-of-way, temporary easements would be arranged with the affected landowner. These temporary easements are not part of the route permit issued by the Commission for high-voltage transmission lines.

Transmission line structures are typically delivered to their staked location or to a designated marshalling yard depending on delivery and contractor availability. If the poles are delivered to a staked site, they are typically designed for the specific site location at which they are to be constructed and are placed along the right-of-way out of the clear zone of any adjacent highways or designed pathways and marked for visibility.

In nearly all cases, the tangent structures would be direct embedded. Direct embedding would generally require an excavation of a three to four foot diameter hole 10 to 15 feet deep or greater, depending on soil conditions and other factors.

[9] RPA, Section 6.2.3, Page 44.

The poles are typically framed with insulators and hardware on the ground and then lifted and placed in the hole via a bucket truck or a crane, depending on the weight of the structure. The poles would be backfilled with native soils or crushed rock depending on soil and design conditions. In lowland areas, a galvanized steel culvert may be also inserted for pole stability due to poor soil capacity. Any excess soil would be thin spread or removed from the site as required.

Where single pole structures are under higher stress (medium angle, heavy angle or dead-end structures), drilled pier concrete foundations may be required. The drilled pier would typically have a diameter of 5 to 7 feet and typically require an excavation depth of 12 feet or more, depending on soil conditions and design requirements. The excavation is filled with concrete and a concrete foundation is set, the pole or structure is then bolted to the foundation.

Xcel Energy indicates in its route permit application that environmentally sensitive areas and wetland areas may require special construction techniques beyond what is described above. Generally, whether following their own procedures or specific permit requirements, the applicant would minimize impacts from construction activities by:

- Coordinating with the landowners on replacement of fences, gates, drain tile or other;
- Placing construction mats in wet or soft soil locations and narrow ditches to minimize disturbances, utilizing tracking control at access roads and wetting surfaces that would be used;
- Working around cultivated areas until harvest has occurred;
- Spanning all streams and rivers, and spanning all wetlands to the extent possible;
- Crossing waterways using boats and not driving construction equipment across waterways except under special circumstances and only after discussion with the appropriate resource agency;
- Scheduling construction activities during the winter season, if possible, to mitigate any damage to wetland areas or other sensitive areas, or to comply with required crossing permits; and
- Fueling and lubricating far from waterways to ensure that fuel and lubricants do not enter waterways. Using equipment that contains appropriate mufflers and emission controls, using minimal number of equipment and vehicles for the project, and turning engines off and not idle equipment when not needed during construction.

5.3 Conductors

Once the structures have been erected, conductors and shield wires are installed by establishing stringing setup areas within the right-of-way. Stringing operations require brief access to each structure to secure the conductors wire to the insulators or the shield wire to shield wire clamps once final sag is established. These stringing setup areas are typically located every two miles along the project right-of-way. The wires are pulled with a rope lead that connects to every structure through a dolly attached at the insulator/clamp location.

Temporary guard or clearance poles are installed at crossings to provide adequate clearance over other utilities, streets, roads, highways, railroads, or other obstructions. Necessary notifications are made or permit requirements are followed, to mitigate any concerns with traffic flow or operations of other utilities.

5.4 Substations

Construction and modifications applicable to associated substations would occur on existing Xcel Energy property. No additional land would need to be acquired or rights-of-way obtained for the proposed substation work.

At the Mayhew Lake Substation, the existing substation graded area would be expanded by about 30,000 square feet to the north side of the existing graded area. The expansion area is all located on current Xcel Energy-owned land. In the newly graded area, the existing fence will be removed and a new fence installed in this area. Areas outside of the newly graded area will be graded to direct storm water to existing storm water drainage areas at the site. New 115 kV structures and equipment, including circuit breakers, will be added to the existing substation to accommodate the new 115 kV line termination.

The modifications to the existing Granite City Substation include system protection and control upgrades only. No new structures or equipment are required.

Xcel Energy has or will prepare the required Stormwater Pollution Prevention Plan (SWPPP) and obtain a National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) construction stormwater permit from the Minnesota Pollution Control Agency (MPCA). Erosion control methods will be utilized to minimize runoff during substation construction. Section 6.10 describes additional erosion control methods.

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

5.5 Clean-up and Restoration

Construction areas would be disturbed during the normal course of work, which can take several weeks in any one location. As construction on each parcel is completed, disturbed areas would be restored to their original condition. 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.

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, the property or adjacent properties, Xcel Energy would fairly reimburse the landowner(s) for the damages sustained. Xcel Energy may 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 may 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 (including personal liter); dismantling staging areas; restoring temporary workspaces, access roads, abandoned right-of-way and other public or private lands affected by construction of the transmission line; employing erosion control, such as silt fences, hay bales, seed blankets, or hydro seeding; and hand-planting disturbed areas with native vegetation.

Xcel Energy indicates in the route permit that these erosion control and vegetation establishment practices are commonly used in construction projects and are referenced in the construction permit plans. Long-term impacts are generally minimized by using these construction techniques.

Landowners would be contacted by an Xcel Energy representative at the close of construction activities to determine whether any damage has occurred as a result of the project. Areas damaged during construction activities (crops, fences, drain tiles or the property) will be restored to their pre-construction condition to the extent possible or Xcel Energy will reimburse the landowner for damages sustained that are not repaired. Upon completion of construction cleanup and restoration of damaged areas, landowners will be asked to notify Xcel Energy of any outstanding construction damage that has not been remedied.

Xcel Energy would be required to notify the Commission in writing 60 days after completion of all restoration activities and would also be required to compensate landowners for any yard/landscape, crop, soil compaction, drain tile, or other property damages that may occur during construction, as requirement of the route permit,

5.6 Maintenance Procedures

Xcel Energy explains in the route permit application that transmission lines and substations typically require only moderate maintenance after initial clearing of the right-of-way and are designed to operate for decades. Transmission infrastructure has few mechanical elements and is designed and constructed to withstand weather events that are normally encountered. Although infrequent, transmission lines are taken out of service by protective relay equipment when a fault is sensed on the system or for scheduled maintenance outages. As a result Xcel Energy estimates the average annual availability of transmission infrastructure exceeds 90 percent.

Routine maintenance and inspections are performed over the life of the facility to ensure its continued integrity. Annual inspections of the transmission facilities are usually done by aerial means. Periodic access to the transmission line rights-of-way and substations would be required to perform on-ground inspections and conduct routine maintenance or repairs. Inspections would be limited to the acquired right-of-way and/or areas where obstructions or terrain require access off the easement.

The transmission line rights-of-way are managed to remove vegetation that have the potential to interfere with the operation and maintenance of the line. The applicant would conduct vegetation surveys and remove undesired vegetation that may interfere with the operation of the transmission line. Typical vegetation maintenance for a 115 kV transmission line is on a three to seven year cycle dependent on vegetation growth and weather events. Vegetation management generally includes a combination of mechanical, hand clearing, and herbicide application to remove or control the growth of vegetation in and near the right-of-way. Herbicide application would be applied following U.S. Environmental Protection Agency (EPA) and state agency regulations and is applied by licensed applicators.

Substations require a certain amount of maintenance to keep them functioning in accordance with accepted operating parameters and NESC and NERC requirements. Transformers, circuit breakers, batteries, protective relays, and other equipment need to be serviced periodically in accordance with the manufacturer's recommendation. The site itself must be secure, kept free of vegetation, and proper drainage must be maintained.

6.0 POTENTIAL IMPACTS & MITIGATIVE 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, but are still reasonably foreseeable. This section describes the potential impacts on resources and the possible mitigation measures intended to avoid, minimize, or mitigate impacts caused by the construction and future operation and maintenance of the proposed transmission facility.

6.1 Environmental Setting

The proposed transmission line project is located in Benton County, Minnesota, primarily within the Anoka Sand Plain subsection of the Eastern Broadleaf Forest Ecological Province of Minnesota.[10] This area of Minnesota is a known for its broad and generally flat geology of outwash sands. This area is the largest sand and sand dune area within Minnesota, historically known for sparse native prairies, oak savannah, thin deciduous forest, and varied wetland complexes that have been replaced and stabilized in more recent years by jack and red pine stands. Agriculture in this region is generally poor due to the sandy soils and forest vegetation is sparse when compared to other regions of Minnesota.[11] The Mississippi River is located approximately 1.2 miles west of the proposed project and is the boundary between Benton and Stearns counties.

The proposed project site is situated northeast of the city of Sauk Rapids (largest populated city in Benton County) primarily running through an industrial corridor along U.S. Highway 10. This area of Benton County is approximately one hour north of the Twin Cities and an hour south of Minnesota's premier resorts, lakes, and tourist areas. To the east of the project lies the rapidly developing city of Sauk Rapids and to the west, Sauk Rapids and Minden townships. Land use in the immediate vicinity of the project area includes a mix of highway commercial, industrial, business, open space, and some residential and agricultural lands.

6.2 Socioeconomic and Cultural Setting

The general population of Benton County and the city of Sauk Rapids have seen a modest increase between the years 2000 and 2010, with the surrounding townships of Sauk Rapids and Minden showing a slight decrees in population. Naturally the population density is greatest in the city of Sauk Rapids which is west of the proposed project on the west side of U.S. Highway 10. Moving east from U.S. Highway 10 towards Sauk Rapids and Minden townships the population and population density dramatically decrease (**Table 5**).

[10] Minnesota Department of Natural Resources, Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife, Comprehensive Wildlife Conservation Strategy, Division of Ecological Resources, p. 172, (2006).
[11] Sansome, Constance Jefferson, *Minnesota Underfoot*, Voyageur Press (1983).

Based on city of Sauk Rapids 2010 Zoning information provided in the route permit application, the Proposed Route primarily crosses land zoned as highway commercial and other road right-of-way, agricultural districts, industrial, business enterprise districts, and Saint Cloud Joint Powers and Sauk Rapids Annexation areas.

Table 5: 2010 Population Characteristics [a]

Category	Minnesota	Benton County	City of Sauk Rapids	Sauk Rapids Township	Minden Township
2000 Population	4,919,492	34,235	10,213	723	1,790
2010 Population	5,303,925	38,451	12,773	584	1,664
Percent Change 2000-2010	7.8	12.3	20	-19.2	-7.0
2010 Minority Population (percent)	14.7	5.5	5.0	1.7	1.9
Median Household Income	$55,621	$49,671	$45,857 [b]	$61,161 [b]	$58,854 [b]
Percent Below Poverty Level (2009)	10.9	12.2	4.9 [b]	2.2 [b]	3.8 [b]
Land Area (sq. miles)	79,610	408.28	4.6	8.4	36.4
Population Density (person/sq. mile)	66.6	94.2	2,777	0.01	0.02

[a] U.S. Census Bureau, 2010 Census Data, http://factfinder.census.gov.
[b] U.S. Census Bureau, 2000 Census Data, http://factfinder.census.gov.

Compared to the state and county average, the proposed project location does not have disproportionately high minority or low-income populations. The two townships (Minden and Sauk Rapids) where the majority of the project is located have a slightly higher median household income when compared to the city of Sauk Rapids and the rest of Benton County. No disproportionate impacts on minority or low-income populations are anticipated.

6.3 Project Economic Impacts

The applicant indicates that approximately 15 to 25 workers will be needed for an approximate 26 week period to construct the proposed transmission line. Construction of the project should also result in small short-term positive economic impacts in the form of increased spending for lodging, meals and other consumer goods and services. It is not expected that additional permanent jobs will be created from the project. The construction activities will provide a seasonal influx of additional dollars into the communities during the construction phase, and materials such as concrete may be purchased from local vendors.

Upon completion of the transmission line project the applicant indicates that socioeconomic effects would generally be positive providing a more stable and reliable supply of electricity, encouraging economic development, providing for future growth, and increasing the local tax base resulting from the incremental increase in revenues from utility property taxes.

Xcel Energy does not anticipate any adverse socioeconomic impacts from the project. Therefore, no mitigative measures are proposed. Also, because the proposed project avoids or minimizes land uses associated with cultural values in the area, no impacts are anticipated and, therefore, no mitigative measures are proposed.

6.4 Human Settlement

The following section identifies and describes the potential impacts of the proposed project as they relate to the human settlement concerns of aesthetics, proximity to dwellings/businesses, displacement, and property values.

<u>Proximity to Homes and Businesses</u>

Regulators and utilities try to select routes that avoid residences as much as possible. Specifically, Minnesota Statute 216E.02, subdivision 1, provides that, "… the commission shall locate transmission lines in a manner that minimize adverse human and environmental impact while insuring continuing electric power system reliability and integrity and insuring electric energy needs are met and fulfilled in an orderly and timely fashion." In rural areas, there is a trade-off between routing the transmission lines along section-lines through farm fields or undeveloped natural areas, which helps avoid homes, and down existing roads, which avoids impacts to agricultural lands and natural resources, but potentially increases the number of nearby homes and businesses.

The only difference in the two routes is Alternative Route Segment A (0.5 miles). If selected, Alternative Route Segment A would replace the equivalent portion of the Proposed Route (0.3 miles). Both routes would be constructed to replace and be underbuilt with approximately 2.7 miles of existing distribution line that currently runs parallel to U.S. Highway 10. The two routes would both parallel and follow existing electric utility and road rights-of-way for a significant portion of their respective routes.

The Proposed Route would utilize approximately 85 percent of existing transportation and electric transmission rights-of-way and the Proposed Route with Alternative Route Segment A would utilize 92 percent.

The two routes being evaluated would have a low and very similar distribution of dwellings, farmsteads and commercial operations located from the approximated transmission centerline as summarized below in **Table 6**.

Table 6: Distance and Number of Structures from Route Centerline

Route	Farmsteads or Dwellings within 0-50' of Proposed Line	Commercial Operations within 0-50' of Proposed Line	Farmsteads or Dwellings within 51-100' of Proposed Line	Commercial Operations within 51-100' of Proposed Line	Farmsteads or Dwellings within 101-200' of Proposed Line	Commercial Operations within 101-200' of Proposed Line
Proposed Route	4	0	0	4	1	7
Proposed Route with Alternative Segment A	4	0	0	4	2	7
Proposed Route with Douvier Alignment	4	0	0	4	1	7

Source: Xcel Energy, e-mail, August 29, 2010.

It is important to note that the distances provided in **Table 6** are approximated. The measurements do not take into account, for example, the potential for moving the transmission right-of-way to an opposite side of a road or other final design placement that would modify the distances.

Displacement

Transmission line facilities require certain clearances from buildings for safe operation of the transmission line. The required clearances are defined in the NESC and Xcel Energy's standard engineering and design practices. As indicated in the route permit application, Xcel Energy would acquire a right-of-way of 75 feet for the project, but has indicated that the project may be designed to fit within the slightly smaller existing electric system easements along portions of the Proposed Route, thereby requiring less right-of-way while still satisfying the needs of the project.

Displacement can occur when a structure is located within the proposed right-of-way for a new transmission line facility. The closest structure/residence is currently located approximately 29.5 feet from the anticipated centerline. Xcel Energy has been discussing the project with the landowner and Benton County and believes the new pole structures can be placed within the existing County Road 29 right-of-way, as close to the road as is allowable. The structures may also be designed so that right-of-way width of 75 feet could be reduced along this specific portion of the route, thereby allowing the new pole structures to span the parcel and stay along the County Road 29 roadway.[12] In addition, Xcel Energy has indicated in its route permit application that the new transmission line would be designed so that all existing residences are located outside the proposed right-of-way and that the project will not require displacement of any buildings or residences.[13]

Aesthetics

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 alter the perceived visual character of the environment, or viewshed, and constitute a negative visual impact.

In this case the proposed project would primarily be routed along a mix of commercial highway and existing electric system right-of-way, commercial/industrial parks, and businesses. A very small portion of the route would run through or near residential and open space areas.

The majority of new 115 kV transmission structures would be single-circuit single pole structures made of wood or weathering or galvanized steel. These structures would be approximately 70 to 90 feet in height. The short stretch (approximately 0.7 miles) of 115 kV double-circuit single pole structures leading to the Granite City Substation and Transmission Structure 39 would be approximately 75 to 105 feet in height.[14]

The new structures would be similar to those already present within the viewshed of the project area. The taller transmission line structures would incrementally add (approximately 25 to 30 feet depending on topography) to the changing landscape of the area, most notably along the east side of U.S. Highway 10 and along County Road 29.

[12] Xcel Energy e-mail, 09/16/11.
[13] RPA, Section 6.2.3, Page 44.
[14] RPA, Section 6.2.6, Page 48.

There are instances where the proposed transmission line will be a new contrast to surrounding land uses, such as areas where the line will require new right-of-way through open spaces where no transmission structures currently exist (approximately 0.3 to 0.5 miles of the entire route).

During preliminary surveys and final design of the transmission line, Xcel Energy has stated that it will consult with landowners and identify concerns where it would be appropriate to apply various types of mitigation to enhance positive effects and minimize or eliminate negative effects. Some examples of such mitigation include:

- Input from landowners or land management agencies when locating structures, right-of-way, or other areas of potential disturbance, to assist in minimizing visual impacts.

- Following construction Best Management Practices (BMPs) to help prevent any unnecessary destruction of the natural surroundings in the vicinity of the work; tree clearing would be minimized to the extent practicable. Care will be used to preserve the natural landscape.

- New transmission lines will parallel existing transmission lines and other rights-of-way or may be constructed within existing rights-of-way replacing and underbuilding existing distribution lines as proposed along the east side of U.S. Highway 10 or may entail crossing to opposite sides of the road, to the extent that such actions do not violate sound engineering principles or system reliability criteria.

- Structures will be placed at the maximum feasible distance from trails, scenic by-ways, and water crossings, within the limits of structure design.

- Landowners will be compensated for removal of mature yard trees, either through easement negotiations or on a separate basis.

- In many cases certain low and slow growing species that do not exceed a mature height of 15 feet can be planted in the right-of-way to blend the difference between the right-of-way and adjacent wooded areas. In some instances, planting or maintaining a vegetated screen between the substation or transmission line and sensitive features such as homes or scenic areas may also minimize the visual intrusion from the proposed project.

Property Values

One of the first concerns of many residents near existing or proposed transmission lines is how the proximity to the line could affect the value of their property. Research on this issue does not identify a clear cause and effect relationship between the two. Instead, the presence of a transmission line becomes one of several factors that interact to affect the value of a particular property.

The Wisconsin Public Service Commission (WPSC) addressed the issue of changes in property value associated with high-voltage transmission lines in their Final Environmental Impact Statement on the Arrowhead – Weston Electric Transmission Line Project.[15] Their analysis of the relationship between property values and transmission lines looked at approximately 30 papers, articles and court cases covering the period from 1987 through 1999.

The WPSC analysis identified two types of property value impacts that property owners may experience: (1) potential economic impact associated with the amount paid by a utility for a right-of-way easement, and (2) potential economic impact regarding the future marketability of the property.

The Arrowhead – Weston Electric Transmission Line Project Final EIS provides the following six general observations from the studies it evaluated.

- The potential reduction in sale price for single family homes may range from 0 to 14 percent.
- Adverse effects on the sale price of smaller properties could be greater than effects on the sale price of larger properties.
- Other amenities, such as proximity to schools or jobs, lot size, square footage of a house and neighborhood characteristics, tend to have a much greater effect on sale price than the presence of a power line.
- The adverse effects appear to diminish over time.
- Effects on sale price are most often observed for property crossed by or immediately adjacent to a power line, but effects have also been observed for properties farther away from the line.
- The value of agricultural property is likely to decrease if the power line poles are placed in an area that inhibits farm operations.

Any potential impacts to the value of properties within the required right-of-way would typically be mitigated through negotiation in an easement agreement between the applicants and the landowner.

6.5 Noise

Potential noise impacts from high-voltage transmission line projects are typically associated with construction, conductors, and substations, and are expected to be temporary and/or minimal.

[15] Public Service Commission of Wisconsin, *Final Environmental Impact Statement* on the Arrowhead – Weston Electric Transmission Line Project, Volume 1, Docket 05-CE-113, (October 2000).

Noise 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). In general terms, a noise level change of 3 dB(A) is imperceptible to human hearing, a 5 dB(A) change is clearly noticeable, and a 10 dB(A) change is perceived as a doubling of noticeable sound. Cumulative noise increases occur on a logarithmic scale. Potential noise associated with the proposed project includes sources associated with construction and long-term operation of the proposed project. Estimates of some common sources of noise are presented in **Table 7**.

Table 7: Common Noise Sources and Average Sound Levels

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.

Noise standards in Minnesota have been established and are defined in Minnesota Rule 7030 and regulated by the MPCA. The Noise Control Requirement states that noise contributors shall comply with the Noise Area Classifications (NAC) established in Minnesota Rules part 7030.0040, which are shown in **Table 8**.

The NAC is based on land use activity at the location of the receiver. For example, household units are defined under NAC (1), bus passenger terminals are defined under NAC (2), and transportation right-of-way is defined under NAC (3). NAC (1) also includes other noise-sensitive areas such as medical and other health services, religious services, educational services and camping areas.[16]

Table 8: Noise Area Classifications

NAC	Day (7 a.m. – 10 p.m.)		Night (10 p.m. – 7 a.m.)	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

Notes: Minnesota Rules part 7030 uses the decibel A-weighting network and applies statistical sound levels (L-Level Descriptors) to account for changes in sound levels over a period time as shown. The L_{10} is defined as the noise level exceeded 10 percent of the time, or for six minutes in an hour. The L_{50} is the noise level exceeded 50 percent of the time, or for thirty minutes in an hour. The L_5 is the noise level exceeded five percent of the time, or for three minutes in an hour.

Construction Noise

Short-term exceedance of daytime noise standards would be intermittent and temporary in nature. General construction noise would be expected to occur during daytime hours as the result of heavy equipment operation and increased vehicle traffic associated with the transport of equipment and construction personnel to and from the work area.

Conductor Noise

Transmission conductors can produce noise under certain conditions. The level of noise depends on conductor conditions, voltage level, and weather conditions. In foggy, damp, or rainy weather, transmission lines can create a crackling sound due to the small amount of electricity ionizing the moist air near the conductors, or corona discharge.

The worst-case scenario is when the conductor is exposed to heavy rain conditions (one inch per hour). However, during heavy rain the background noise level of the rain is typically greater than the noise from the transmission line. As a result, people do not normally hear noise from a transmission line during heavy rain. Sound emanating from conductors would typically be noticed during light rain, dense fog, snow, and other times when there is moisture in the air; transmission lines would produce audible noise approximately equal to household background levels.

[16] Minnesota Rules 7030.0050.

Xcel Energy calculated the estimated audible noise that may be produced from the proposed transmission line using the Bonneville Power Administration CFI8X model. To ensure that the noise was not under-predicted the worst-case scenario was used as the benchmark. The anticipated noise levels derived from the modeling are presented in **Table 9**.

Substation Noise

Noise associated with substations includes the operation of transformers and switchgear. The transformers produce a constant low-frequency humming noise while the switchgear produces an impulsive or short duration noise during infrequent activation of the circuit breakers.

Xcel Energy indicates that there are currently one residence located approximately 640 northwest of the existing Mayhew Lake Substation, seven residences are located between 1,250 to 1,400 feet northeast of the existing Granite City Substation, and one commercial business is located approximately 800 feet southeast of existing Transmission Structure 39. Xcel Energy has indicated that there should be no noticeable sound/noise changes at the existing substations associated with the project from the proposed modifications.[17]

Table 9: Calculated Transmission Line Audible Noise Levels (3.28 feet above ground)

Structure Type	Audible Noise Levels at Edge of Right-of-Way (dBA)	
	L_5	L_{50}
Single Pole Davit Arm 115 kV Single-Circuit Delta Configuration	12.6	9.1
Single Pole Davit Arm 115 kV Single-Circuit Vertical Configuration	18.0	14.5
Single Pole Davit Arm 115 kV / 115 kV Double-Circuit	23.0	19.5
H-Frame Structure 115 kV Horizontal Configuration	16.7	13.2

Source: RPA, Table 13, Section 6.2.4, Page 47

As provided in the route permit application, Xcel Energy does not anticipate that noise generated from the proposed transmission line facility will exceed 23 dB(A), which is below typical ambient levels and the most stringent NAC level of 50 dB(A) established by the MPCA (Minnesota Rules part 7030.0040).

[17] Xcel Energy e-mail, 08/31/11.

6.6 Public Health and Safety

Proper safeguards need to be implemented for construction and operation of any electric transmission facility to protect public health and safety. High-voltage electric transmission facilities must meet certain requirements to prevent and reduce health and safety risks to the public. These may include maintaining proper clearances between transmission lines and the ground, roadways and treetops; ensuring adequate size and proper use of right-of-way; following established electric safety codes and permit requirements. This section discusses the following potential health and safety issues commonly associated with high-voltage transmission lines: construction practices, electric and magnetic fields, stray voltage, induced voltage/contact voltage, and implantable devices.

Xcel Energy indicates that proper safeguards would be implemented for construction and operation of the transmission facility to protect public health and safety. The project would be designed in compliance with local, state, NESC, and Xcel Energy standards for clearance to ground, crossing utilities and buildings, strength of materials, and right-of-way widths, and permit requirements.

The transmission lines would be equipped with protective devices (circuit breakers and relays located in the substation where the transmission lines terminate) to safeguard the public if an accident occurs, such as a structure or conductor falling to the ground. The protective equipment would de-energize the transmission line should such an event occur.

Substation facilities associated with the project will be fenced, drained, and free of vegetation with access limited to authorized personnel only. Proper signage would be posted to warn the public about the risk of coming into contact with the energized equipment.

Construction and contract crews will comply with local, state, NESC, and Xcel Energy standards for installation of facilities and standard construction practices. Established Xcel Energy and industry safety procedures will also be followed after the transmission line is installed. This would include clear signage during all construction activities.

Xcel Energy does not anticipate any adverse public health and safety impacts from the proposed project.

<u>Electric and Magnetic Fields</u>

Wherever there is electricity there are electric and magnetic fields (EMF). Electric and magnetic fields are not only created by high-voltage transmission and distribution lines, but also by home appliances, electronics, cell phones, wireless networks, fluorescent lights, and wiring configurations in homes, businesses, and schools. As a result, we are all exposed on a daily basis to a complex mix of electric and magnetic fields at many different frequencies.[18]

[18] World Health Organization, *Establishing a Dialogue on Risks from Electromagnetic Fields*, Radiation and Environmental Health, Department of Protection of the Human Environment, (2002).

Electric and magnetic fields are invisible just like radio, television, and cellular phone signals, all of which are part of the electromagnetic spectrum. The frequency of transmission line EMF in the United States is 60 hertz and falls in the extremely low frequency (ELF) range of the electromagnetic spectrum (any frequency below 300 hertz). By comparison, cellular phone communications operate at frequencies almost one billion times higher than EMF resulting from electric power.[19]

Natural and human-made electric and magnetic fields are, in fact, present everywhere in our environment. The Earth's natural static background electric field is approximately 120 to 150 volts per meter (V/m). Natural electric fields are also produced by the local build-up of electric charges in the atmosphere that are associated with thunderstorms. The Earth itself has a magnetic field that ranges from approximately 300 to 700 milligauss (mG), the field is a steady-state or static (zero hertz) magnetic field, but has similar characteristics to the magnetic fields emanating from human-made sources. Electric and magnetic fields created by humans include X-rays and magnetic resonance imaging (MRIs) machines, electric and magnetic passenger trains, electric cars, and cellular telephones.

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 field properties is summarized in **Table 10**.

Table 10: 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 kilovolts per meter (kV/m).	Their strength 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.

[19] Long Island Power Authority (LIPA), Magnetic Fields Around Your Home, http://www.lipower.org/residential/safety/emf.html,(August 5, 2010).

This section of the EA specifically addresses electric and magnetic fields produced through transmission of electric power at 60 Hz (cycles per second).

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 11**.

Table 11: 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: 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.

On the whole, scientific evidence indicates that chronic exposure to electric fields at or below levels traditionally established for safety does not cause adverse health effects. Safety concerns related to electric fields are sufficiently addressed by adherence to the Institute of Electrical and Electronics Engineers (IEEE) and NESC standards.

There are currently no federal guidelines on the strength of electrical fields beneath high-voltage transmission lines. However, six states have established their own regulations or guidelines with regard to transmission line electric fields (**Table 12**).

Table 12: State Established Electric and Magnetic Field Standards and Guidelines

STATE	ELECTRIC FIELD (kV/m)		MAGNETIC FIELD (mG)
	Within Right-of-Way	Edge of Right-of-Way	Edge of Right-of-Way
Florida	8[a]	2	150[a] (max load)
	10[b]	---	200[b] (max load)
	---	---	250[c] (max load)
Massachusetts	---	---	85[g]
Minnesota	8	---	---
Montana	7[d]	1[e]	---
New Jersey	---	3	---
New York	11.8	1.6	200 (max load)
	11[f]	---	---
	7[d]	---	---
Oregon	9	---	---

Source: Minnesota Department of Health. The Minnesota State Interagency Working Group on EMF Issues. *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options*. September 2002.) and National Institutes of Health. National Institute of Environmental Health Sciences. *EMF Electric and Magnetic Fields Associated with the use of Electrical Power*. (June 2002).

[a] 69 kV to 230 kV transmission lines
[b] 500 kV transmission lines
[c] 500 kV transmission lines on certain existing ROW
[d] maximum for highway crossing
[e] may be waived by the landowner
[f] maximum for private road crossings
[g] a level above 85 mG is not prohibited, but may trigger a more extensive review of alternatives.

In addition to the state guidelines identified above, there are a number of national and international boards, committees, and commissions that have recommended electric field exposure guidelines or thresholds for 60 hertz high-voltage transmission lines. **Table 13** summarizes the suggested electric field guidelines from a number of these internationally recognized organizations.

Table 13: Electric and Magnetic Field Guidelines from Internationally Organizations

ORGANIZATION	ELECTRIC FIELD (kV/m)		MAGNETIC FIELDS (mG)	
	General Public	Occupational	General Public	Occupational
IEEE	5	20	9,040	27,100
ICNIRP	4.2	8.3	830	4,200
ACGIH	---	25	---	10,000/1,000[a]
NRPB	4.2	---	830	4,200
European Union	4.2	---	830	---

Source: IEEE – Institute of Electrical and Electronics Engineers, ICNIRP – International Commission on Non-Ionizing Radiation Protection, ACGIH – American Conference of Industrial Hygienists, NRPB – National Radiological Protection Board. [a] for persons with cardiac pacemakers or other medical electronic devices.

As indicated by the applicant in the route permit application, the highest calculated electric fields at 100 and 200 feet from transmission centerline would be 0.139 kV/m and 0.032 kV/m, respectively.[20] These electric field strengths are within the range of electric fields generated by other common household/business sources and well below the various state and international organization established guidelines.

The maximum calculated electric field on the entire length of project, directly beneath transmission centerline at 3.28 feet above ground is estimated to be 0.998 kV/m. This maximum calculated electric field is 88 percent less than the 8 kV/m guideline historically recommended by the Minnesota Environmental Quality Board (EQB) and the Commission in other route permit proceedings and again, well below any of the national and international recognized electric field guidelines as identified in **Tables 12 and 13**.

Estimated electrical fields at maximum operating voltage for the proposed project, as provided by the applicant, are presented in **Table 14**. The expected electric field for the structure type and voltage have been calculated at various distances from the centerline.

[20] RPA, Table 8, Section 5.2.1, Page 34.

Table 14: Calculated Electric Fields (kV/m) of the Proposed 115 kV Transmission Line

Structure Type	Maximum Operating Voltage (kV)	Distance to Proposed Centerline (feet)												
		-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
Single Pole Davit Arm 115 kV Single Circuit Delta Configuration	121	0.012	0.029	0.131	0.220	0.358	0.443	0.596	0.714	0.368	0.182	0.110	0.030	0.013
Single Pole Davit Arm 115 kV Single Circuit Delta Configuration with 34.5 kV Distribution Underbuild	121	0.013	0.031	0.139	0.231	0.372	0.424	0.290	0.611	0.346	0.182	0.114	0.032	0.014
Single Pole Davit Arm 115 kV Single Circuit Vertical Configuration	121	0.009	0.017	0.028	0.020	0.039	0.222	0.614	0.602	0.200	0.020	0.031	0.023	0.011
Single Pole Davit Arm 115 kV Single Circuit Vertical Configuration with 34.5 kV Distribution Underbuild	121	0.011	0.021	0.047	0.054	0.048	0.038	0.294	0.466	0.152	0.012	0.043	0.026	0.013
Single Pole Davit Arm 115 kV/115kV Double Circuit	121	0.003	0.008	0.024	0.016	0.146	0.998	0.558	0.998	0.146	0.016	0.024	0.008	0.003
Single Pole Davit Arm 115 kV/115kV Double Circuit with 34.5 kV Distribution Underbuild	121	0.003	0.007	0.024	0.031	0.149	0.964	0.413	1.013	0.150	0.016	0.023	0.007	0.003
H-Frame Structure 115 kV Horizontal Configuration	121	0.007	0.021	0.119	0.215	0.385	0.478	0.091	0.478	0.385	0.215	0.119	0.021	0.007
H-Frame Structure 115 kV Horizontal Configuration with 34.5 kV Distribution Underbuild	121	0.007	0.021	0.121	0.218	0.389	0.486	0.111	0.516	0.405	0.225	0.125	0.022	0.008

Source: RPA, Table 8, Page 34.

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 (mG) or microtesla (μT).

People encounter magnetic fields from every-day things such as radar and microwave towers, television and computer screens, motors, fluorescent lights, microwave ovens, cell phones, electric blankets, house wiring and hundreds of other common electrical devices.

The general wiring and appliances located in a typical home can produce an average background magnetic field of 0.5 mG to 4 mG.[21, 22] 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.[23] **Table 15** summarizes the average level of magnetic fields of common appliances.

Table 15: Typical Magnetic Fields (mG) of 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	-

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

The study of cancer in relation to ELF magnetic fields has been a topic of study since the late 1970s. Since that time there have been several epidemiological studies that have explored the possible association of not only cancer risks, but other potential human maladies (brain tumors, leukemia, breast cancer, and mental health issues). Studies have focused on both occupational exposures for individuals working in electrical industries and public exposures for children and adults living and working around common magnetic field sources (in-home wiring, transmission lines, home and office appliances/equipment). The results of the various studies conducted over the last three decades, specifically those regarding the relationship between EMF and childhood leukemia and other cancer risks, have been mixed; some have found an association while others have not.[24]

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[21] National Cancer Institute, *Magnetic Field Exposure and Cancer: Questions and Answers Fact Sheet*, http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields, (April 21, 2005).
[22] United States Environmental Protection Agency, Office of Radiation And Indoor Air (6603J), *Electric Magnetic Fields In Your Environment*, U.S. Government Printing Office, December 1992. http://www.web-pub.com/library/brochure/emf.html
[23] The National Institute of Environmental Health Science, *Electric and Magnetic Fields Associated with the Use of Electric Power*, (June 2002), pp. 34-36.
[24] National Cancer Institute, (April 21, 2005).

Where there is association suggested in epidemiological studies, it is usually very near the statistical threshold of significance. However, when these studies are repeated in a laboratory, the results have not reproduced or identified a biological mechanism to support a link between health impacts and magnetic fields. The replication of field results in a laboratory setting is a basic test of scientific validity. Researchers continue to look at magnetic fields until more certain conclusions can be reached.

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 magnetic fields. Florida, New York, and Massachusetts are the only three states in the country that have set standards for magnetic field exposure (**Table 12**). These standards were not in response to health-based analysis, but rather on maintaining transmission systems within historic levels.

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has developed occupational and residential guidelines for magnetic field exposure (**Table 13**). The exposure guidelines established by the ICNIRP have typically been the guidelines adopted by most countries and organizations. 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 estimated magnetic fields based on the proposed line and structure designs at maximum operation as provided by the applicant are presented in **Table 16**. The expected magnetic fields for the structure type and voltage have been calculated at various distances from the centerline.

Table 16: Calculated Magnetic Fields (mG) of the Proposed 115 kV Transmission Line

Segment	System Condition	Current (Amps)	Distance to Proposed Centerline (feet)												
			-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
Single Pole Davit Arm 115kV Single Circuit Delta Configuration	Peak	450	1.13	2.39	7.76	11.75	18.73	29.45	38.49	33.62	21.23	12.86	8.21	2.29	1.01
	Average	270	0.68	1.43	4.66	7.05	11.24	17.67	23.09	20.17	12.74	7.71	4.93	1.37	0.60
Single Pole Davit Arm 115kV Single Circuit Delta Configuration with 34.5 kV Distribution Underbuild	Peak	450	1.07	2.21	7.24	11.03	17.72	28.00	36.44	31.58	19.85	12.10	7.83	2.33	1.11
	Average	270	0.65	1.34	4.36	6.65	10.69	16.93	22.21	19.16	11.99	7.30	4.71	1.40	0.67
Single Pole Davit Arm 115kV Single Circuit Vertical Configuration	Peak	450	0.63	1.34	4.19	6.23	9.86	16.30	24.72	24.76	16.36	9.90	6.26	1.70	0.75
	Average	270	0.38	0.80	2.51	3.74	5.91	9.78	14.83	14.86	9.82	5.94	3.76	1.02	0.45
Single Pole Davit Arm 115kV Single Circuit Vertical Configuration with 34.5 kV Distribution Underbuild	Peak	450	0.69	1.27	3.56	5.17	7.98	12.88	20.37	21.52	14.07	8.46	5.35	1.54	0.76
	Average	270	0.41	0.76	2.14	3.10	4.79	7.74	12.43	13.08	8.50	5.10	3.22	0.93	0.45
Single Pole Davit Arm 115kV/115kV Double Circuit	Peak	450	0.14	0.43	2.92	6.12	15.42	45.06	75.21	44.56	15.12	5.96	2.82	0.42	0.14
	Average	270	0.09	0.26	1.75	3.67	9.25	27.04	45.13	26.73	9.07	3.58	1.69	0.25	0.09
Single Pole Davit Arm 115kV/115kV Double Circuit with 34.5 kV Distribution Underbuild	Peak	450	0.25	0.57	3.24	6.59	16.13	45.97	78.34	44.47	14.74	5.74	2.71	0.46	0.22
	Average	270	0.16	0.36	1.98	4.01	9.77	27.77	48.51	26.99	8.90	3.46	1.63	0.28	0.14
H-Frame Structure 115kV Horizontal Configuration	Peak	450	0.74	1.68	6.11	9.74	16.61	27.71	34.87	28.05	17.04	10.13	6.44	1.87	0.87
	Average	270	0.44	1.01	3.67	5.84	9.97	16.62	20.92	16.83	10.22	6.08	3.87	1.12	0.52
H-Frame Structure 115kV Horizontal Configuration with 34.5 kV Distribution Underbuild	Peak	450	0.84	1.79	6.28	9.94	16.81	27.77	34.85	28.23	17.31	10.36	6.63	1.97	0.95
	Average	270	0.50	1.08	3.79	5.99	10.14	16.77	21.11	17.07	10.44	6.24	3.99	1.18	0.57

Source: RPA, Table 9, Page 36.

The maximum estimated magnetic field generated by the proposed transmission line would be 78.34 mG directly below a 115 kV/115 kV double-circuit transmission centerline at 3.28 feet above ground. This level is approximately 91 percent less than 830 mG general public magnetic field guideline established by ICNIRP. The right-of-way required for the proposed project is 75 feet (36.5 feet on each side of centerline); the highest estimated magnetic field at a distance of 25 feet and 50 feet from the transmission line centerline would be 45.97 mG and 21.23 mG, approximately 94 and 97 percent less than ICNIRP guidelines, respectively. At 300 feet from the transmission centerline the magnetic field level drops to a maximum of 1.13 mG, well within the average background magnetic field of a typical home (0.5 mG to 4 mG).

Based upon current scientific evidence, no adverse effects from electric fields or magnetic fields on health are expected for persons living or working at locations along or near the proposed project.

The Commission has consistently found that there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects. Below are some references to recent Commission proceedings relating to high-voltage transmission lines and the issue of electric fields and magnetic fields.

In the Matter of the Application of Great River Energy for a Route Permit for the Potato Lake 115 kV Transmission Line and Substation in Park Rapids, Minnesota, Docket No. ET2/TL-10-86, Findings of Fact, Conclusions of Law, and Order Issuing a Route Permit to Great River Energy for a 115 Kilovolt Transmission Line and Associated Facilities at p. 19, Finding 120 (November 17, 2010).

> *120. The absence of any demonstrated impact by electric field and magnetic field exposure supports the conclusion that there is no demonstrated impact on human health and safety. No adverse effects from electric fields and magnetic fields on health are expected for persons living or working at locations along or near the proposed Project.*

In the Matter of the Application of Xcel Energy for a Route Permit for a 115/69 Kilovolt Transmission Line Rebuild from a Proposed West New Ulm Substation to the Existing Fort Ridgely Substation, Docket No. E002/TL-08-956, Findings of Fact, Conclusions of Law, and Order Issuing a Route Permit to Xcel Energy for the 115/69 Kilovolt Transmission Line Rebuild and Substation Project at p. 8, Finding 40 (May 18, 2009).

> *40. The issue of electric and magnetic fields was discussed in the environmental assessment. 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 electric and magnetic fields exposure and health effects. Research 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 electric and magnetic fields could cause disease. No Minnesota regulations have been established pertaining to magnetic fields from high voltage transmission lines.*

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 provides 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.

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.

A document prepared by a State of Minnesota Interagency Workgroup on EMF titled *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options* is available for viewing and downloading at: http://energyfacilities.puc.state.mn.us/documents/EMF%20White%20Paper%20-%20MN%20Workgroup%20Sep%202002.pdf.

Stray Voltage

Stray voltage is an extraneous voltage that appears on grounded surfaces in buildings, barns and other structures, including utility distribution systems. Sources of stray voltage include a variety of on-farm wiring and grounding problems and off-farm problems related to connections on the electric distribution system. Sometimes a small voltage can develop at these grounding points and flow through the earth. This voltage is called a neutral-to-earth voltage (NEV). More precisely, stray voltage is a small voltage that is measured between two points that animals such as livestock can simultaneously come into contact with. When an animal simultaneously contacts these points a small current (NEV) will flow through the animal.[25] These NEV currents may contribute to an excess of acceptable current in a livestock contact area on an adjoining farm.[26] As such, stray voltage has primarily been raised as a concern on dairy farms because it may impact operations and milk production. Stray voltages are low-level voltages and should be distinguished from shocks felt by humans. Stray voltages are not lethal.

Stray voltage is by and large an issue associated with electrical distribution lines. Transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms.

Stray voltage (NEV) sources can be reduced in three fundamental ways: reduce the current flow on the neutral system; reduce the resistance of the neutral system; or improve the grounding of the neutral system. Making good electrical connections and making sure that these connections are maintained by the proper choice of wiring materials for wet and corrosive locations will reduce the resistance of the grounded neutral system and thereby reduce NEV levels.

As indicated by Xcel Energy in its route permit application, should a customer suspect that stray voltage/NEV is a concern on their property, they can call the Xcel Energy stray voltage hotline (651-779-3131) and discuss the situation with an Xcel Energy technician or engineer. If warranted, an on-farm investigation will be scheduled. Xcel Energy will conduct an investigation of the distribution utility system serving the farm and the farm wiring and discuss the preliminary results with the customer. In most instances, recording volt meters will be set to measure activity over several days. Upon completing the analysis, an Xcel Energy engineer or technician will call the farmer to discuss the results.[27]

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[25] Fick, R.J. and T.C. Surbrook. "A review of stray voltage research: Effects on livestock." Prepared by the Michigan Agricultural Electric Council.
[26] http://www.arrowhead-weston.com/pdf/appendixf.pdf
[27] RPA, Section 5.3, Page 40.

Induced Voltage/Contact Voltage

The electric field from a transmission line in some instances can reach a nearby conductive object, such as a vehicle or a metal fence, which is in close proximity to the transmission line. This may induce a voltage on the object, which is dependent on many factors, including the weather conditions, object shape, size, orientation, capacitance and location along the right-of-way. If these objects are insulated or semi-insulated from the ground and a person touches them, a small current would pass through the person's body to the ground. This touch may be accompanied by a spark discharge and mild shock, similar to what can occur when a person walks across a carpet and touches a grounded object or another person.

The major concern with induced voltage is the current that flows through a person to the ground when touching the object, not the level of the induced voltage. Most shocks from induced current are considered more of a nuisance than a danger, but to ensure the safety of persons in the proximity of high-voltage transmission lines, the NESC requires that any discharge be less than 5 milliAmperes (mA). In addition, the Commission's electric field limit of 8 kV/m was designed to prevent serious hazard from shocks due to induced voltage under high-voltage transmission lines. Proper grounding of metal objects under and/or adjacent to the transmission line is the best method of avoiding these shocks.

Xcel Energy has indicated that farm equipment, passenger vehicles, and trucks may be safely used under and near power lines. The power lines will be designed to meet or exceed minimum clearance requirements over roads, driveways, cultivated fields, and grazing lands as specified by the NESC. Recommended clearances within the NESC are designed to accommodate a relative vehicle height of 14 feet.[28] As a condition of the permit, the applicant would be required to design, construct, and operate the transmission line in a manner that meets with NESC standards.

Implantable Devices

Implantable medical devices such as pacemakers, defibrillators, neurostimulators, and insulin pumps may be subject to interference from strong electric and magnetic fields. Most of the research on electromagnetic interference and medical devices is related to pacemakers. According to a 2004 EPRI report, implantable cardiac devices are much more sensitive to electric fields than to magnetic fields. In the report, the earliest interference from magnetic fields in pacemakers was observed at 1,000 mG, far greater than the magnetic fields associated with high-voltage transmission lines.[29] Therefore, the focus of research has largely been on impacts from electric fields.

[28] RPA, Section 5.3, Page 40.

[29] Electric Power Research Institute, Electromagnetic Interference with Implanted Medical Devices, (March 2004).

Electric 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. 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 returns to its normal operation when the person moves away from the source of the interference.

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 modern bipolar devices.[30] Older unipolar designs; however, 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.[31] These initial interaction levels are significantly higher than 0.998 kV/m maximum electric field predicted for this project. The risk of interference inhibition of unipolar cardiac pacemakers from high-voltage power lines in everyday life is small.[32]

There are no anticipated permanent impacts on implantable medical devices as a result of the proposed project.

6.7 Air Quality

Air quality emissions directly related to high-voltage transmission lines are negligible amounts of ozone and oxides of nitrogen caused by the corona effect. The other potential air quality issues are associated with construction activities, such as fugitive dust and exhaust emissions from construction equipment.

Ozone and Nitrogen Oxides

Corona discharge is energy loss that physically creates very small amounts of sound, radio noise, heat, and chemical reactions of the air near a conductor, and is a phenomenon associated with all transmission lines. Under certain conditions, the localized electric field near an energized conductor can become strong enough to produce a tiny electric discharge that can ionize air close to the conductors. Several factors contribute to corona discharge, including conductor voltage, shape and diameter, and surface irregularities that can affect a conductor's electrical surface gradient such as scratches, nicks, dust, or water drops. In the case of air quality, this partial discharge of electrical energy can produce very tiny amounts of ozone and nitrogen oxide with ozone being the primary oxidant.

[30] Brookings DEIS, (October 2009), Section 6.2.
[31] Toivonen, L., J. Valjus, M. Hongisto, and M. Ritta. 1991. The Influence of Elevated 50 Hz Electric and Magnetic Fields on Implanted Cardiac Pacemakers: The Role of the Lead Configuration and Programming of the Sensitivity. Blackwell Publishing Limited. Helsinki, Finland.
[32] Scholten, A., S. Joosten, and J. Silney. 2004. *Unipolar Cardiac Pacemakers in Electromagnetic Fields of High Voltage Overhead lines.* FEMU, University Hospital, Aachen, Germany.

Ozone also forms naturally in the Earth's lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants such as hydrocarbons from auto emissions. Typical rural ambient levels are around 10 to 30 parts per billion (ppb) at night with peaks of 100 ppb and higher.[33] In urban areas, concentrations greater than 100 ppb are common.

The natural production rate of ozone is directly proportional to temperature and sunlight and inversely proportional to humidity. Therefore, humidity, the same factor that increases corona discharges from transmission lines, inhibits the production of ozone. Ozone is a very reactive form of oxygen and combines readily with other elements and compounds in the atmosphere. Because of its high reactivity, ozone is relatively short-lived. The state and federal government both have regulations regarding permissible concentrations of ozone and oxides of nitrogen (**Table 17**).

Table 17: State and Federal Ozone Limits

Standard	Ozone Limit	Averaging Period	Reference
State	0.08 ppm	Highest eight-hour average	Minn. R. 7009.0080
Federal	0.075 ppm	Fourth-highest eight-hour daily maximum average	40 CFR Part 50

Calculations according to the Bonneville Power Administration (BPA) Corona and Field Effects Program Version 3 for a standard single-circuit 115 kV project predicted a maximum concentration of 0.006 ppm near the conductor and 0.002 ppm at one meter above ground during foul weather or worst case conditions with rain at one inch per hour.[34]

During a mist (rain at 0.01 inch per hour) the maximum concentrations decreased to 0.0002 ppm near the conductor and 0.0001 ppm at one meter above ground level. For both cases, the ozone levels are below federal standards. Studies designed to monitor the production of ozone under transmission lines have been unable to detect any increase attributable to the transmission line facility.

[33] Electric Power Research Institute, *Transmission Line Reference Book*, Second Edition, 1982.
[34] United States Department of Energy, Bonneville Power Administration, Corona and Field Effects Program, Version 3.0 (Computer Program), Vancouver, Washington.

Construction/Fugitive Dust Impacts

Temporary air quality impacts caused by construction vehicle emissions and fugitive dust from right-of-way clearing and construction are expected to occur, but will be temporary and limited. The magnitude of emissions is influenced heavily by weather conditions and the specific construction activity taking place.

Temporary impacts due to construction vehicle emissions and fugitive dust would be minimized by using best management practices to reduce dust emissions. Tracking control practices and wetting of roads and temporary roads would be done to control fugitive dust. Proper maintenance of the contractor's equipment would be done to prevent excessive emissions.

There would be no anticipated permanent impacts on air quality as a result of the proposed project.

6.8 Transportation and Public Services

The main thoroughfares in the area of the proposed project are U.S. Highway 10, County Road 3, County Road 29, Benton Drive, and 14th Avenue NE. During the construction phase of the project local motorists may be temporarily inconvenienced by the increase in construction vehicles on the roadways and minimal delays in traffic. Xcel Energy may require temporary traffic control zones (work zone) in areas where transmission structures would be erected along roadways. The appropriate procedures and preparation needed for the work zone depend upon the space requirements, duration of construction, characteristics, and providing for a safe work zone and a safe route for pedestrians and motorists.

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 applicant 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. The applicant would work closely with Minnesota Department of Transportation (Mn/DOT) to obtain the appropriate permits and ensure minimal disruption to area traffic. Impacts to transportation would be localized and short term.

Construction of the transmission facilities would not impact the community's transportation corridors or emergency public infrastructure.

Airports

There are three airfields located in the vicinity of the proposed project. The airfields include:

- St. Cloud Municipal - Located approximately 3.7 miles southeast of the proposed project with a northwest/southeast runway configuration.
- Thens Private Airstrip – Located approximately 2.8 miles east of the proposed project with a north/south runway configuration.
- Aysta Field - Located approximately 3.8 miles south of the proposed project with a east/west runway configuration.

The St. Cloud Municipal Airport was contacted by the applicants and no comments from the airport were received.[35]

The proposed project is not expected to impact the airports in the area, because it entails replacing an existing 69 kV transmission line and structures. However, the applicant should contact the Minnesota Department of Transportation, Office of Aeronautics on the possible effects of the proposed project on airports or airstrips in the project area and ensure that Federal Aviation Administration (FAA) requirements for the project are met, prior to final design and construction.

No impacts to airports are anticipated as a result of the project at this time.

Utilities

Construction will not impact the county or city water, sewer, and electric services, or private wells and septic systems. Xcel Energy indicates that water and sewer service in the city of Sauk Rapids is provided by city-owned wells and wastewater treatment systems. Outside the city boundaries in the townships, water is obtained from private wells and wastewater is collected in private septic systems. Any utilities including pipelines, water wells, septic tanks and propane tank locations would be identified when detailed field survey is performed by the applicant. The locations would be incorporated into the design and pole placement locations. The applicant would discuss these and other easement issues with landowners during the acquisition phase.

Construction will not impact the county or city water, sewer, and electric services, or private wells and septic systems.

[35] Xcel Energy, e-mail, 08/31/11.

6.9 Zoning and Compatibility

In general the project is located on land zoned as Sauk Rapids Township/city of Sauk Rapids Orderly Annexation Area (61 percent). Specifically, the proposed project would cross areas zoned as Highway Commercial associated with road right-of-way (50 percent), Agricultural District (31 percent), Saint Cloud Joint Powers (7 percent), Light Industrial (4 percent), Industrial (3 percent), Business Enterprise District (3 percent), and Sauk Rapids Annexation Area (2 percent) based on the city of Sauk Rapids Zoning information, as provided in the route permit application (**Figure 11**).[36]

Although negligible amount of land use would be directly affected in some areas such as where new or expanded right-of-way is required, in general the proposed transmission line would be compatible with current zoning and land use. The existing land use is not expected to change as a result of construction and operation of the proposed transmission line. Approximately 83 percent of the Proposed Route is located within or immediately adjacent to existing utility, road, and highway rights-of-way, as indicated in the route permit application.

Available plans for future development have been evaluated by Xcel Energy in order to assess the compatibility of the proposed project with these future land uses. These future land use plans as indicated by Mn/DOT, the city of Sauk Rapids, and Benton County include interchange upgrades associated with U.S. Highway 10 and include:

- Modifying the County Road 29 and U.S. Highway 10 interchange on the east side of U.S. Highway 10 to include a loop ramp.[37]

- A planned interchange modification at County Road 3 and U.S. Highway 10 to also include a loop ramp.[38]

- Mn/DOT's long range plan for an interchange modification at Benton Drive and U.S. Highway 10 to include a loop ramp.[39] The planned interchange design may require the transmission line structures to be located further east from the proposed interchange.

The Benton County Board and the city of Sauk Rapids approved separate, but similar, resolutions that were adopted by Xcel Energy and are part of the Proposed Route, as provided in the route permit application. It appears at this time that both Benton County and the city of Sauk Rapids concerns regarding the Proposed Route and the future interchange modifications have been addressed by Xcel Energy. The city of Sauk Rapids in its resolution states:

[36] RPA, Section 6.2.2, Page 43.
[37] RPA, Appendix C.6, City of Sauk Rapids Resolution (10/12/2010).
[38] RPA, Appendix C.6, City of Sauk Rapids Resolution (10/12/2010).
[39] RPA, Appendix C.8, Mn/DOT Letter (7/13/2010).

- The Proposed Route would place less burden on private property owners while maintaining the future economic potential of the U.S. Highway 10 and Country Road 29 corridor while reducing the overall cost of the transmission line project.

- The city also requests that Xcel Energy work with Benton County on the placement of the proposed lines near the east ramp of U.S. Highway 10 on County Road 3 so that the transmission structures will not need to be relocated when the city, county, and school district reconstruct County Road 3 in the future.

The Benton County Board of Commissioners state in its resolution:

- The Benton County Board of Commissioners does hereby endorse the route for the St. Cloud Loop Project as proposed by the city of Sauk Rapids.

Documentation of the comments received from government agency consultation and the public/landowners is provided in Appendix C and D of the route permit application, respectively. The Proposed Route is not expected to directly conflict with current or future Mn/DOT, county and city land use plans, zoning ordinances, and public policies.

Should the Proposed Route using Alternative Segment A be selected it would conflict with the city of Sauk Rapids and Benton Counties plans for the future interchange at County Road 29 and U.S. Highway 10. This route would extend the route along County Road 29 to U.S. Highway 10 and head south along the U.S. Highway 10, crossing directly over the proposed interchange modification in that area.

6.10 Land Use & Land-Based Economies

The project area land use and land cover consists primarily of large plots of agricultural land (cultivated crops and hay/pasture), industrial and light industrial, commercial/incorporated, residential, and open space (mixed forest and wetlands).

Recreation

There are a number of community parks and playgrounds associated with residential developments at least one-quarter mile east of the Proposed Route. Mayhew Creek Park and the Sauk Rapids Senior High School are located approximately one-half mile east of the Proposed Route. West of the Proposed Route, and separated by U.S. Highway 10, is the Bob Cross Park and Nature Preserve and the Sauk Rapids Rice Middle School. These areas would not be crossed by the Proposed Route.

There are also a number of existing and planned hiking and biking trails in the vicinity of the project. The proposed project would not cross any of the existing trails in the Sauk Rapids area. There are future planned trails that would follow County Road 29 and County Road 3 that the proposed transmission line would potentially cross over.[40]

[40] http://www.ci.sauk-rapids.mn.us/

The timing of creating the hiking and biking trails is unknown. However, Xcel Energy has been, and will continue to be, in contact with Benton County Community Development staff to identify if the proposed project may impact these areas.[41]

There are a couple of small unnamed streams near the proposed project. These streams are not identified in the Minnesota Department of Natural Resources (DNR) public water inventory (PWI) and are not known to be used for designated recreational activities such as boating or fishing. There are areas where the proposed transmission line would span these small unnamed streams. No impacts are anticipated.

Xcel Energy has designed the route(s) to avoid or minimize any impacts on the recreational facilities in the vicinity of the proposed project. Direct impacts on existing recreational opportunities within the proposed project location will be avoided because the Proposed Route will not cross these areas; the Proposed Route is collocated with existing transmission facilities and major public road rights-of-way for the majority of the route. Because the Proposed Route avoids or minimizes any impacts and will not directly affect recreational areas, no mitigative measures are proposed. There may, however, be indirect and temporary impacts such as visual and noise impacts that would occur during construction, which is expected to only extend for the duration of construction (approximately two months).[42]

Agriculture

The U.S. Department of Agriculture, 2007 Census of Agriculture indicates that 73.6 percent of Benton County is utilized for cropland. Top crops include corn for grain (41 percent), soybeans for beans (23 percent), forage (hay fields, grass silage, greenchop) (19 percent), corn for silage (15 percent), and oats for grain (2 percent). The primary livestock are broiler chickens (95 percent), with some cattle (3 percent), hogs and pigs (2 percent), and layers (less than 1 percent). The market value of crop sales increased 29 percent between 2002 and 2007, although the number of farms and land dedicated to farming has decreased 5 percent during that same period.[43]

Although more than one-third of Benton County is primarily used for agricultural purposes, the project is located outside these areas and is mainly dominated by commercial, industrial, residential, and open space areas with the exception of the northern portion of the Proposed Route, Route Alternative A, and the Douvier Alignment which would run along or near approximately 18.4 acres of U.S. Department of Agriculture (USDA) designated farmland soils primarily along County Road 29 (see **Table 18**).[44]

[41] RPA, Section 6.2.9, Page 51.
[42] RPA, Section 6.2.9, Page 51.
[43] www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Minnesota/index.asp
[44] RPA, Table 15, Section 6.3.1, Page 53.

Table 18: Farmland Soils near or along the Proposed Route, Route Segment A, and Douvier Alignment

Farmland Soil (USDA)	Area (acres) [a]	Percent of Total Route Area
Prime Farmland	10.9	26
Prime Farmland if Drained	5.6	13
Statewide Importance	1.9	4
Total	18.4	43

Source: RPA, Table 15, Page 53. [a] Assumes an approximately 75-foot-wide right-of-way easement.

Construction of the new transmission structures and removal of existing structures will require repeated access to install foundations, structures and conductors. Impacts would originate from the various construction vehicles required to install the transmission line and structures, and may result in rutting and compaction of soil and farm fields. Because a great majority (83 percent) of the transmission line route would be located within or immediately adjacent to existing utility, road, and highway rights-of-way, new impacts to agricultural land should be minimal.

Permanent effects on agricultural land can include loss of land due to structure placement. The applicant indicates that transmission line construction would permanently impact approximately 50 square feet per structure (or 0.001 acre). Temporary impacts during construction may include soil compaction, disruption of agricultural practices, and potential crop damage within the right-of-way.

The applicant has identified the mitigation methods that could be employed should the transmission line route impact agricultural lands:

- Right-of-way easements would be purchased through negotiations with each landowner affected by the project and payment would be made for full value of crop damages or other property damage that occurs during construction or maintenance, as negotiated.

- Xcel Energy will work with landowners to minimize impacts to farming operations along the Proposed Route, such as initiating construction before crops are planted or following harvest. Xcel Energy will work with the property owners pre- and post construction to minimize any potential 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.

- To minimize loss of farmland and to ensure reasonable access to the land near transmission structures, when possible Xcel Energy intends to place the structures on private property approximately 5 feet away from, and overhang, the road right-of-way, when feasible.

- 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 require project related land impacts to be restored to pre-construction condition upon project completion.

- Xcel Energy will 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 (substation expansions) will be regulated by a NPDES permit and SWPPP prepared for the project. Mitigation under the NPDES includes implementation of the SWPPP with the appropriate erosion control methods developed specifically for the site. 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 federal, state, or locally designated forests or commercial logging operations located within the project location. There is no forest production located within the project area.

There is a moderately forested area at the north end of the proposed project just south of where U.S. Highway 10 and County Road 29 intersect. There is also a small wooded swale associated with a developed residential area located to the northeast of the intersection of U.S. Highway 10 and Benton Drive.[45]

[45] DNR Scoping Letter, 05/25/11 and DNR e-mail, 05/27/11.

TABLE 19: Estimated Wooded Land and Vegetated Areas

Route	Wooded Land and Vegetated Areas[a]	
	Length (feet)	Acres
Proposed Route	2,723	4.4
Proposed Route with Alternative Alignment A	1,058	1.9
Proposed Route using Douvier Alignment	1,857	3.0

Source: U.S. Geological Survey Land Use and Land Class Data, accessed September 2011 and Xcel Energy e-mail, 09/09/11. [a] Assumes an approximately 75-foot-wide right-of-way easement.

When routing a transmission line through a forested area, the transmission line right-of-way would have to be properly cleared of vegetation per NESC standards. In the case of this project, a 75-foot-wide right-of-way would be cleared in these areas and maintained throughout the life of the transmission line. Clearing for access would be limited to only those trees necessary to permit the passage of equipment, and will generally correspond to the transmission right-of-way. Native shrubs and other small-growing vegetation that will not interfere with the safe operation of the transmission line can be allowed to reestablish in the right-of-way.

The estimated acres of wooded and vegetated areas that would require clearing along each of the respective routes is very similar. Depending upon the route selected, a maximum estimated difference of 2.5 acres of clearing could be avoided. Section 6.3 (Aesthetics) provides examples of mitigation that could be utilized when constructing through wooded and vegetated areas.

Tourism

There are a number of tourist attractions and activities available to the public in Benton County, similar to other cities and communities throughout Minnesota. The more well known attractions in the area are the Benton County fairgrounds which are located over one-half mile west of the proposed project, the nearest park (Wilson Park) is located along the Mississippi River approximately one mile west of the proposed project, and the Golden Spike Raceway is located over one mile east of the project. Due to the respective distances away from the proposed project, effects to these tourism resources can easily be avoided during construction and operation or the proposed transmission line.

No impacts on tourism and community activities are anticipated from the proposed project.

Mining

According to USGS topographic maps there are gravel pits, rock quarries, and commercial aggregate sources located near the project area. Xcel Energy indicates that these resources can easily be avoided during detailed design and construction of the proposed transmission line.

Because no existing gravel, rock, and aggregate resources are being utilized within the project route itself, no impacts are anticipated.

6.11 Geology & Soils

The proposed project is located within the Anoka Sand Plain Subsection of the DNR Ecological Classification System. The geology in the project area is generally a mix of a gently rolling landscapes and open fields. Bedrock is locally exposed in the St. Cloud area and surface glacial deposits are usually less than 200 feet thick, underlain by Cambrian and Ordovician dolomite, sandstone, and Cretaceous marine and variegated shale.[46] The soils in the project area are primarily derived from fine the sands of the Anoka Sand Plain. Most of these sandy soils are droughty, moderately to excessively well-drained soils and upland soils with some organic soils along the Mississippi River.

Seventy to 80 percent of the soils are excessively well drained sands and another 20 percent are very poorly drained. Erosion tends to be a problem that occurs uniformly over the project area and the connecting region, particularly where agricultural crop production is taking place. Both wind and water erosion threaten the topsoil, which is many times lost or transferred to undesirable locations.[47]

Temporary short-term disturbance of soils would likely result from site clearing and excavation activities at structure locations, pulling and tensioning sites, setup areas and during transport of crews, machinery, materials and equipment over access routes (primarily along transmission right-of-way). Construction activities can increase erosion by removing vegetation, disturbing soil and exposing sediment to the elements. The eroded soil can quickly become a sedimentation problem when wind and rain carry the soil off the construction site and sediment is deposited in surface waters unless stabilized.

Conditions of a high-voltage transmission line route permit require the applicant to utilize erosion control techniques throughout the duration of the project to achieve vegetation establishment and ultimately, final stabilization. Consequently, no long-term impacts are expected to result from this project. Commonly used temporary and permanent cover practices that can be combined and used in conjunction with each other depending on the specifics of a site include:

[46] http://www.dnr.state.mn.us/ecs/222Mc/index.html
[47] http://soils.usda.gov/survey/online_surveys/minnesota/

- Utilizing seed to establish temporary and permanent vegetative cover on exposed soil. The Minnesota Department of Transportation (Mn/DOT) and DNR has researched various seed mixes and has identified mixes for specific site characteristics and uses.

- Mulch may be applied to form a temporary and protective cover on exposed soils. Mulch can help retain moisture in the soil to promote vegetative growth, reduce evaporation, insulate the soil, and reduce erosion. A common mulch material used is hay or straw.

- Erecting or using sediment control fences that are intended to retard flow, filter runoff, and promote the settling of sediment out of runoff via ponding behind the sediment control. Examples include biorolls, sandbags, and silt fences.

- Using Erosion control blankets and turf reinforcement mats that are typically single or multiple layer sheets made of natural (wood) and/or synthetic materials that provide structural stability to bare surfaces and slopes.

Upon completion of construction in a specific area route permit conditions require that contours be graded so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation, provide for proper drainage, and prevent erosion. All areas disturbed during construction of the facilities must be returned to their pre-construction condition.

Should construction activities require disturbing more than one acre of soil Xcel Energy will apply for a NPDES construction stormwater permit and would prepare a SWPPP. All construction projects disturbing one acre or more are required to apply for a construction stormwater permit through the MPCA. The permit states that prior to submitting a permit application, the owner must develop a SWPPP for the construction site. Erosion control methods and BMPs pursuant to MPCA requirements will be utilized to minimize runoff during substation construction.

6.12 Groundwater

The DNR divides the state of Minnesota into six groundwater provinces. The project area lies within the Central Groundwater Province that is generally described as sand aquifers in thick sandy and clayey glacial drifts overlying Precambrian and Cretaceous bedrock. Local groundwater sources are most often associated with deeper fractured and weathered Precambrian bedrock.[48]

[48] http://www.dnr.state.mn.us/groundwater/provinces/index.html

Groundwater information specific to the project area was obtained using information from the DNR Waters Division and the Minnesota Department of Health, Minnesota County Well Index[49]. Looking at a number of well construction records, depth to static groundwater in the area rages from approximately 7 feet to 28 feet below land surface (bls). Static groundwater levels in wells that are near lakes, streams and wetlands are typically much closer to land surface (approximately 7 feet bls).

Transmission structures will be either direct-embedded to a depth of 10-15 feet bls or drilled to a depth of 12 feet or more in depth, depending on soil conditions. As such, the placement of the transmission structures would not have an impact on the regional groundwater supply or domestic wells in the area of the project.

6.13 Surface Water

The proposed project area is located in northern part of the Upper Mississippi Watershed of the Mississippi River-St. Cloud Basin. The Mississippi River-St. Cloud Watershed is 717,770 acres in size[50] and includes parts of Benton, Mille Lacs, Morrison, Sherburne, and Stearns counties. The watershed has 381 lakes and 907 total miles of river. Drainage typically flows south towards the Mississippi River, the largest river in the watershed. Wetlands account for 21,162 acres of land within the watershed.[51]

Lakes located in the near vicinity of the project include Mayhew Lake and Little Rock Lake, both of which are located over 5 miles north of the specific project area. The Mississippi River is located west of the project in the city of Sauk Rapids. None of these surface water features would be impacted by the project.

There are a number of small streams and drainage ditches that would be crossed by the proposed transmission line, none of which are identified on the DNR public waters inventory. Because all streams and ditches would be spanned by transmission structures and no structures will be located within or near these features, no direct impacts to streams and ditches are expected. At this time it is not anticipated that a license to cross public waters or a public waters work permit would be required from the DNR, as the project does not affect any PWI features. However, should it be determined by the DNR, Xcel Energy would be required to obtain a permit.

Indirect impacts could include sedimentation reaching streams and ditches during construction due to ground disturbance by excavation, grading, construction traffic, and dewatering of holes drilled for transmission structures. These impacts will be avoided and minimized using appropriate sediment control practices and BMPs discussed in Section 6.10.

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[49] http://mdh-agua.health.state.mn.us/cwi/cwiViewer.htm
[50] Minnesota Department of Natural Resources, (Watershed Assessment Tool).
[51] Minnesota Pollution Control Agency, Upper Mississippi River Basin Information Document, Northern District, Brainerd Office, (2000).

6.14 Wetlands

Wetlands provide direct benefits to the environment and vary according to the type or class of wetland and the season. Wetlands serve as floodwater detentions, provide nutrient assimilation and sediment entrapment (water quality), and provide wildlife habitat. Wetlands are either protected federally under Section 404 of the Clean Water Act or by the State of Minnesota under the Wetland Conservation Act.
Wetlands are located throughout the proposed project area and increase in density and number in the northern and southern portions of the project area. The applicant indicates the Proposed Route would cross approximately 0.9 mile of wetlands or 8.3 acres[52]; the Proposed Route with Alternative Route Segment A would cross 0.8 mile of wetlands or 7.2 acres; the Proposed Route using the Douvier Alignment would cross 1.0 miles of wetlands or 8.8 acres of wetlands assuming a 75 foot wide easement and depending on final line design.[53]

The majority of the wetlands crossed by the proposed route are classified as palustrine emergent seasonally flooded. These areas are typically seasonally flooded basins and wet meadows and are often used as pasture areas for livestock. Other wetland types include palustrine scrub-shrub broad-leaved deciduous seasonally flooded (shrub swamp), palustrine forested broad-leaved deciduous seasonally flooded (wooded swamp), and palustrine unconsolidated bottom semi-permanently flooded (deep marsh). Shrub swamps are typically waterlogged during growing season, often covered with a much as 6 inches of water and are most commonly are dominated by woody vegetation less than 20 feet tall such as true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. Wooded swamps are waterlogged to within a few inches of the soil surface and can be covered with as much as one foot of water. These wetlands are characterized by woody vegetation that is approximately 19 feet tall or taller and normally possess an overstory of trees, an understory of young trees or shrubs, and an herbaceous layer. Deep marsh wetlands are typically characterized by nearly permanent open water (6 inches to 3 feet or more of water). Vegetation may include cattail, reed, bulrush, wild rice, pondweed, and duckweed.[54]

Recommendations provided by the U.S. Fish and Wildlife Service (USFWS) would be to avoid or minimize wetland impacts in the NW 1/4 of the NE 1/4 of Section 14, Township 36, Range 31 and NE 1/4 of SW 1/4 of Section 25, Township 36, Range 31.[55] These are the same areas DNR identified as an MCBS Site of Moderate Biodiversity and a wooded swale utilized by red-tailed hawks, respectively.[56] A small portion of the Proposed Route does overlap the western boundary of the above identified sites; however, the anticipated alignment and right-of-way for the transmission line is adjacent to and would follow an existing transmission alignment along U.S. Highway 10 and would, therefore, not physically encroach upon either site.

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[52] RPA, Section 6.5.4, Page 57.
[53] Xcel Energy e-mail, 09/09/11.
[54] USFWS Cowardin Classification System (1979).
[55] USFWS Scoping Letter, 04/14/11.
[56] RPA, Appendix C, DNR Letter

Table 20: Wetlands within the Proposed Route

Township	Range	Section	Wetland Type [a]	Wetland Area (acres)
Wetlands Within 75-foot-wide Easement				
36	31	14	PFO/SS	0.5
36	31	14	PEM	<0.1
36	31	24	PEM	0.4
36	31	25	PEM/SS	2.3
36	31	25	PUB	<0.1
36	31	25	PEM	0.5
36	30	30	PEM	0.3
36	30	30	PEM/SS	0.8
36	30	31	PEM	1.7
36	30	31	PEM/SS	0.6
36	30	31	PEM	1.2
			Subtotal	8.3
Wetlands Within 400-foot-wide Route Width				
36	31	11	PUB/F	0.4
36	31	14	PFO/SS	4.5
36	31	14	PEM	0.3
36	31	14	PEM	0.8
36	31	13	PUB	0.6
36	31	24	PEM	0.9
36	31	24	PEM	1.5
36	31	25	PEM/SS	8.7
36	31	25	PUB	0.1
36	31	25	PEM/SS	0.9
36	31	25	PEM	1.9
36	30	30	PEM	1.7
36	30	30	PEM/SS	3.5
36	30	31	PEM	8.6
36	30	31	PSS	0.3
36	30	31	PEM/SS	3.1
36	30	31	PEM	4.9
			Subtotal	42.7

[a] Based on the USFWS' Cowardin Classification System for wetlands. PEM – Palustrine Emergent, PFO Palustrine Forested Broad-leaved Deciduous, PSS – Palustrine Shrub-Scrub Broad-leaved Deciduous, PUBF – Palustrine Unconsolidated Bottom.

Source: RPA, Table 16, Page 58.

Temporary impacts to wetlands would be limited to ground disturbance related to construction traffic and placement of the transmission line structures. Minimal grading of areas around pole locations may be required to accommodate construction vehicles and equipment.

Permanent impacts to wetlands would occur where structures must be located within wetland boundaries. The applicant indicates that approximately 8.3 acres of wetlands are located within the 75-foot-wide easement area and 42.7 acres of wetlands are located within the 200 to 400-foot-wide route width of the Proposed Route. Because the proposed transmission line easement will be 75-foot-wide, potential impacts to wetlands will be limited to the area where the structures and line will be constructed and operated. Therefore, wetland impacts are anticipated to be much less than the wetland areas indicated in **Table 20**. The location of the transmission structures has yet to be determined.[57]

Temporary impacts to wetlands would be limited to ground disturbance related to construction traffic and placement of the transmission line structures. Minimal grading of areas around pole locations may be required to accommodate construction vehicles and equipment. Permanent impacts to wetlands would occur where structures must be located within wetland boundaries. The applicant indicates that transmission line construction would permanently impact approximately 50 square feet per structure (or 0.001 acre).[58]

As indicated by the applicant, wetlands crossed by the Proposed Route and route segment A are jurisdictional to the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. Once design details are available, Xcel Energy will apply for a Regional General Permit/Letter of Permission under Section 404 of the Clean Water Act from the U.S. Army Corps of Engineers. The joint application will also be subject to DNR and Benton County Soil and Water Conservation District (SWCD) review and regulation under the Minnesota Wetland Conservation Act, as necessary. If the U.S. Army Corps of Engineers authorizes the project under its general permitting program as expected, the MPCA would likely waive its Section 401 Water Quality Certification authority.

To minimize the temporary impacts and lessen the permanent impacts the applicant has indicated it would implement the following mitigation measures as they relate to wetlands:

- The project would be designed to incorporate spacing of structures to span wetlands and waterways to avoid and minimize impacts.

- Standard erosion control measures identified in the MPCA Stormwater BMP Manual, such as using silt fencing to minimize impacts on adjacent water resources would be followed. Practices may include containing excavated material, protecting exposed soil, and stabilizing restored soil. Wetland vegetation would be restored following construction.

[57] RPA, Section 6.5.4, Page 59.
[58] Xcel Energy e-mail, 09/09/11.

- No staging or stringing set up areas will be placed within or adjacent to wetlands or water resources, as practicable. The structures will be assembled on upland areas before they are brought to the site for installation, when practicable.

- Construction crews will attempt to access wetlands using the shortest route possible in order to minimize travel through wetland areas and prevent unnecessary impacts wherever possible.

- Construction in wetlands would be scheduled during frozen ground conditions, when practicable. When construction during winter is not possible, construction mats (wooden mats or a composite mat system) would be used to protect wetland vegetation. Additionally, all-terrain construction vehicles may be used, which are designed to minimize soil impact in damp areas.

6.15 Floodplain

The proposed project is not located within floodplains or floodways mapped by FEMA. Floodplain resources would not be affected by the project.

6.16 Flora

As stated earlier, the proposed project is located in the Eastern Broadleaf Forest Ecological Province of Minnesota.[59] The project lies along the western edge of this province which is sharply defined along much of its length as an abrupt transition from forest and woodland to open grassland.

Vegetation adjacent to the routes include undeveloped open and herbaceous land, open pasture and hay fields, cultivated land containing row crops, and some forest land. Row crops in the area primarily consist of corn and soybeans. Forest lands in the area primarily consist of deciduous forest types. The majority of forest land is associated with streams and residential and commercial landscaping, or with occasional small wooded uplands. However, as indicated in the route permit application, approximately 83 percent of the Proposed Route is located within or immediately adjacent to existing utility, road, and highway rights-of-way. In addition, the majority of the route would cross land zoned primarily for highway, agriculture, commercial, or development purposes.

All of the routes would impact some natural vegetation along their respective routes. **Table 19** (Section 6.9) summarizes the wooded acreage and vegetated lands that may be impacted by the proposed project. As shown in the table the Proposed Route would impact an estimated 4.4 acres of forested areas, the Proposed Route with Route Alignment A would impact an estimated 1.9 acres, and the Proposed Route with the Douvier Alignment would impact an estimated 3.0 acres. Additional land uses affected by the three routes include agricultural lands (cultivated crops and hay/pasture fields), open areas (herbaceous, herbaceous wetlands, and scrub/shrub vegetation), and developed land.

[59] Minnesota Department of Natural Resources, Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife, Comprehensive Wildlife Conservation Strategy, Division of Ecological Resources, p. 172, (2006).

Xcel Energy indicates it has selected the Proposed Route to avoid impacts on trees to the greatest extent possible. To further minimize the temporary impacts and lessen the permanent impacts the applicant has indicated it would implement the following mitigation measures as they relate to vegetation:

- During detailed design the new transmission line can be placed on the opposite side of the road from residences and to avoid existing trees where possible.

- Only trees located within the transmission line right-of-way will be removed, or those trees that will affect the safe operation of the line. Trees outside the right-of-way that may need to be removed will primarily include trees that are unstable and could potentially fall into the transmission facilities. After construction, certain low and slow growing species that do not exceed a mature height of 15 feet may be allowed within the right-of-way.

- Landowners and businesses would be consulted and proposed construction areas may be modified so that tree removal is avoided to the greatest extent possible.

- Areas disturbed due to construction activities would be restored to preconstruction contours and would be reseeded with a DNR-approved seed mix that is certified to be free of noxious weeds.

6.17 Fauna

Wetlands, rivers, streams, open areas and cropland in the area provide habitat for raptors, waterfowl, grassland/perching birds, deer, and small mammals that are common to Minnesota. The proposed project, however, predominantly runs along land utilized for commercial, industrial, or residential use.

USFWS records indicate there are no federally listed or proposed species or designated or proposed critical habitat within the action area of the proposed project.[60]

In a letter dated July 29, 2010, the DNR identified several avian species in the project area, including red-tailed hawks, American kestrels, trumpeter swans, Canada geese, and sandhill cranes.[61]

During construction, wildlife could temporarily be displaced and small amounts of habitat could be lost from the project area. Similar tree and agricultural habitats are found adjacent to the routes; therefore, it is likely that these species will only be displaced a short distance and would not incur population level effects due to construction of the transmission line. No permanent impacts to wildlife populations are anticipated.

[60] USFWS Scoping Letter, 04/14/11.
[61] RPA, Appendix C.8

The primary impact presented to fauna by transmission lines is the potential for injury and death of migratory birds such as raptors, waterfowl, and other large bird species.

Electrocution can occur when birds with large wingspans come in contact with two conductors or with a conductor and a grounding device. The electrocution of large birds, such as raptors, is more commonly associated with small distribution lines than large transmission lines. The applicant's transmission line design standards and adherence to standards outlined in the Avian Powerline Action Committee Report[62] would provide for adequate spacing to eliminate the risk of raptor electrocution. As such, electrocution is not a concern related to the project.

Avian collisions are also a recognized possibility with the construction and placement of a new transmission line. The types of birds more commonly involved in collisions are poor flyers, large-bodied and have long wing spans such as swans, geese, ducks, herons, pelicans, and cranes. Collision frequency may increase when a new transmission line is located between feeding and resting areas such as, agricultural fields, wetlands, or open water. In the case of the proposed project, the area is dominated by existing transportation and utility corridors as well as other infrastructure (e.g., businesses, residences) and, therefore, these species are likely already acclimatized to human development, and existing transmission structures.

Xcel Energy is working with the DNR to determine appropriate and applicable mitigation measures to address these concerns regarding the project mitigation measures specific to those species identified by the DNR. The DNR in a letter to Xcel Energy suggested the following mitigation to avoid the potential for avian impacts:[63]

- Avoid vegetation clearing to extent possible at the wooded swale near U.S. Highway 10 and Benton Drive where red-tailed hawks are periodically present and provide the final alignments for DNR review and comment. Also, conduct vegetation clearing outside of the migratory bird nesting season between April to July;

- Site the route to avoid tree and shrub removal at the wooded wet swale north and south of Golden Spike Road at the U.S. Highway 10 interchange, where an important wetland corridor exists;

- Attach kestrel nest boxes to power poles, one every ½ mile, along U.S. Highway 10, particularly between Benton Drive and Golden Spike Road, where American kestrels are known to occur; and

- In consultation with the DNR, incorporating swan flight diverters every 25 feet along the route and staggering them between the lines for trumpeter swans, Canada geese and sandhill cranes, three species identified in this area which are of particular concern to the DNR.

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[62] Avian Powerline Interaction Committee (APLIC), *Suggested Practices for Avian Protection on Powerlines: The State of the Art in 2006*, Edison Electric Institute, APLIC, and the California Energy Commission (2006).
[63] RPA, Appendix C.1

6.18 Rare and Unique Species and Habitat

There are four records of rare species, one animal assemblage, and one terrestrial community within one mile of the proposed project, according to information from the DNR's Natural Heritage Information System. Species include the Blanding's turtle, Northern myotis (bat), Easter pipistrelle (bat), and cowbane (vascular plant). The Blanding's turtle is listed as threatened at the state level, while the other three species, assemblage, and terrestrial community are listed as special concern or are not listed.[64]

The USFWS indicated that there are no federally-listed or proposed species and/or designated or proposed critical habitat within the action area of the proposed project.[65]

There is also a Minnesota County Biological Survey (MCBS) site of Moderate Biodiversity containing a native plant community, prairie rich fen, and a wet prairie identified by the DNR.[66] This is the same wetland area that the USFWS recommended avoiding that is located in the NW 1/4 of the NE 1/4 of Section 14, Township 36, Range 31.[67] A small portion of the requested route does overlap the western boundary of the Moderate Biodiversity Site; however, the anticipated alignment and right-of-way for the transmission line is adjacent to U.S. Highway 10 and would not physically encroach upon the MCBS site. Xcel Energy indicated it has already been working with the DNR to avoid impacts to this resource.

To prevent impacts on the Blanding's turtle, to the extent possible and applicable, Xcel Energy intends to adopt the mitigation measures recommended by the DNR, which include, but are not limited to, the following:

- a flyer with an illustration of a Blanding's turtle will be given to all contractors working in the area. Homeowners will also be informed of the presence of Blanding's turtles in the area;
- turtles which are in imminent danger will be moved, by hand, out of harm's way. Turtles which are not in imminent danger will be left undisturbed;
- if a Blanding's turtle nest is in a yard, it will not be disturbed. Silt fencing will be set up to keep turtles out of construction areas. Silt fencing will be removed after the area has been re-vegetated;
- small, vegetated temporary wetlands (Types 2 & 3) will not be dredged, deepened, filled, or converted to storm water retention basins (these wetlands provide important habitat during spring and summer);

[64] RPA, Appendix C.1
[65] USFWS Scoping Letter, 04/14/11.
[66] RPA, Appendix C.1
[67] USFWS Scoping Letter, 04/14/11.

- wetlands will be protected from pollution; use of fertilizers and pesticides will be avoided, and run-off from lawns and streets will be controlled. Erosion will be prevented to keep sediment from reaching wetlands and lakes; and

- vegetation management in infrequently mowed areas, such as in ditches, along utility access roads, and under power lines, will be done mechanically (chemicals will not be used). Work will occur fall through spring (after October 1st and before June 1st).

Xcel Energy is also working with the DNR to avoid to the extent possible impacts to the MCBS Site of Moderate Biodiversity associated with the native plant community, prairie rich fen, and wet prairie identified in the project area. Mitigation measures include the following:

- operate within already-disturbed areas;

- minimize vehicular disturbance in the area (allow only vehicles necessary for installation);

- inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of exotic species;

- if possible, do work in autumn or winter, to avoid damaging plants during the growing season;

- reduce runoff by completing the work as rapidly as possible and using erosion control measures such as straw bales or silt fencing;

- revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible; and

- use only invasive-free mulches, topsoils, and seed mixes.

6.19 Archaeological & Historic Resources

Twelve cultural resource sites are located within 0.5 mile of the proposed project area, including four archaeological sites, one unverified archaeological site lead, five standing structures, and two properties listed or eligible for listing on the National or State Registers of Historical Places (NRHP). The NRHP sites include the Leonard Robinson House, which is listed on the NRHP, and the Great Northern Railroad line, which has been determined eligible for listing on the NRHP. The historic character of these two properties would not be affected by the proposed project, as they are located west of the project area, and not in the immediate vicinity of the Proposed Route. The Phase Ia background research revealed that no archaeological site or inventoried standing structure is recorded within the immediate project location.[68]

[68] RPA, Appendix E.

The potential to impact any undiscovered archaeological site is low to very low because the project is proposed to be located along existing transportation and utility corridors, or it is in areas already disturbed by residential and commercial development. Also, there are no lakes or perennial rivers or streams in the proposed project location, all high potential locations for discovery of prehistoric archaeological sites.

In a letter dated August 2, 2010, the Minnesota State Historic Preservation Office (SHPO) commented on the proposed project and Phase Ia literature review report. The Minnesota SHPO stated that it is premature to conclude that no survey work will be required, and indicated that Xcel Energy should consult with the SHPO once a project route has been finalized.[69]

As indicated in the route permit application, avoidance of archaeological and historic architectural properties is the preferred mitigative policy which Xcel Energy follows for all of its transmission line construction projects. Xcel Energy indicated it would consult with the Commission, SHPO and invited consulting parties during their review process to determine what areas may require surveys for the project. In addition, Xcel Energy would carry out the appropriate field identification or construction monitoring. If there is an unanticipated discovery of cultural resources during construction, Xcel Energy would stop construction activities and consult with a professional archaeologist and the SHPO to determine the proper course of action. This could be included as a route permit condition.

6.20 Interference

The corona from transmission line conductors can generate electromagnetic noise at frequencies that may potentially impact electronic communication and similar devices, including radios, televisions, microwave communications, and GPS-based agricultural navigation systems. No impacts to electronic devices are anticipated as a result of the proposed project.

<u>Radio Interference</u>

Corona from transmission line conductors can generate electromagnetic "noise" in the radio frequency range. This noise may cause broadband interference at the same frequencies that many communication and media signals are transmitted. This noise can cause interference with the reception of these signals depending on the frequency and strength of the signal. Loose hardware on the transmission line may also cause interference.

AM radio frequency interference typically occurs immediately under a transmission line and dissipates rapidly to either side. If radio interference from transmission line corona does occur, satisfactory reception from AM radio stations can be restored by appropriate modification of (or addition to) the receiving antenna system.

[69] RPA, Appendix E.

FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 MHz); and the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

Television

Both digital and satellite television are expected to have little interference from corona generated noise, but may experience other types of interference.

- Compared to previously used analog broadcasts, digital television broadcast frequencies are high enough that any electromagnetic noise currents, if they were to exist at all, would be very small.
- An outdoor antenna can be used to solve issues with multipath reflections.
- Satellite television is transmitted in the K_u Band of radio frequency and is not very susceptible to corona generated noise.
- Line of sight for satellite television users could be obstructed by a transmission line structure. Line of sight can usually be restored by moving the consumer satellite dish to a slightly different location.

Internet and Cellular Phones

Wireless internet and cellular phones use frequencies in the ultra-high frequency (UHF) range. The specific UHF frequency used by a cellular phone would depend on the technology (global system for mobile communications (GSM), 3G, etc.) of the provider. All radio frequencies used for both cellular phones and wireless internet are high enough that the effect of corona generated noise near the line would be negligible, as such, no impacts are anticipated.

GPS-Based Navigation Systems

Corona-generated noise from transmission lines could be a source of interference for GPS systems.

- Satellite GPS signals are broadcast at 1.57542 GHz (L1 signal) and 1.2276 GHz (L2 signal) and are high enough that they would have minimal interference.
- Differential correction signal beacons on the nationwide Coast Guard network transmit at frequencies around 283-325 kHz and are susceptible to electrical noise.
- Interference with correction signals could result in reduced accuracy while operating directly under a high-voltage transmission line.

Any transmission line structure that is placed in an agricultural field would have GPS coordinates that may be added to the farmer's GPS unit coordinates. However, if the GPS unit is not configured to accept new coordinates, the user would have to manually divert around any structures placed in fields. There are also specialty antennas that can be connected to existing GPS-based systems that will increase reception.

7.0 PERMITS & APPROVALS

Should a route permit be issued for the project, the applicant may be required to apply for the various local, state, and federal permits listed in this section.

Table 21: Summary of Permits and Approvals

PERMIT APPROVALS	JURISDICTION
Federal Approvals	
Section 404 Permit, Clean Water Act (Local/State/Federal Application for Water/Wetland Projects, for discharge of fill due to placement of poles in wetlands). Section 106 Review	U.S. Army Corps of Engineers
Minnesota State Approvals	
License to Cross Public Waters or State Lands	DNR – Lands and Minerals
Utility Permit (Road Crossing Permits to cross or occupy state trunk highway road right of way)	Mn/DOT
NPDES/SDS Permit (construction)	MPCA
Section 401, Clean Water Act	MPCA
Minnesota Local Approvals	
Land Permits, including road crossing/right of way permits (may be required to occupy lands such as parklands, watershed districts, and other publicly-owned land)	County, Township
Wetland Permit	County
Road Crossing, Over-width Loads, Driveway/Access Permits	County, Township
Driveway Permit	County, City, Township
Culvert Extension/Connection	County

8.0 ROUTE COMPARISONS

The three routes analyzed in this EA, including Route Segment A and the Douvier Alignment (both utilizing portions of the Proposed Route), are very similar. The differences and similarities in the three routes is summarized below in **Table 22**.

Table 22: Comparison of Routes

Issue	Proposed Route	Proposed Route with Route Segment A	Proposed Route with Douvier Alignment	Comparison of Routes [a]
Route Length	4.7 miles	4.9 miles	4.7 miles	Proposed Route and Proposed Route with Douvier Alignment are 0.2 miles shorter
Effects on Human Settlement				
Structures within 101 to 200 feet of the route centerline[b]	8	9	8	One additional residence within 200 feet associated with Proposed Route with Route Segment A
Structures within 51 to 100 feet of the route centerline[b]	4	4	4	Same
Structures within 0 to 50 feet of the route centerline[b]	4	4	4	Same
Displacement	No impact	No impact	No impact	Same
Noise	Temporary / No impact	Temporary / No impact	Temporary / No impact	Same
Aesthetics	Viewshed would include new and incrementally taller transmission line structures	Viewshed would include new and incrementally taller transmission line structures	Viewshed would include new and incrementally taller transmission line structures	Same
Cultural Values	No impact	No impact	No impact	Same
Recreation	No impact	No impact	No impact	Same
Public Services	No impact	No impact	No impact	Same
Effects on Public Health and Safety				
Public Health and Safety	No impact	No impact	No impact	Same
Effects on Land-based Economics				
Agriculture[b] (includes cultivated crops and hay/pasture land)	8.6 acres	11.0 acres	9.1 acres	Proposed Route will affect less agricultural land, followed by Proposed Route with Douvier Alignment

Issue	Proposed Route	Proposed Route with Route Segment A	Proposed Route with Douvier Alignment	Comparison of Routes [a]
Forestry[c]	4.4 acres	1.9 acres	3.0 acres	Proposed Route with Route Segment A will affect less forest land, followed by Proposed Route with Douvier Alignment
Tourism	No impact	No impact	No impact	Same
Mining	One gravel pit/rock quarry in the project area	One gravel pit/rock quarry in the project area	One gravel pit/rock quarry in the project area	Same
Effects on Archaeological and Historic Resources				
Archaeological Resources	12 within 0.5 mile; two listed on or eligible for NRHP	12 within 0.5 mile; two listed on or eligible for NRHP	12 within 0.5 mile; two listed on or eligible for NRHP	Same
Historic Resources	2	2	2	Same
Effects on the Natural Environment				
Air Quality	No impact	No impact	No impact	Same
Water Quality	No impact	No impact	No impact	Same
Surface Water Crossings	3 crossings (not PWI)	3 crossings (not PWI)	3 crossings (not PWI)	Same
Wetlands[c]	0.9 mile of wetland spanned; 11 wetland crossings within 75-foot-wide easement	0.8 mile of wetland spanned; 10 wetland crossings within 75-foot-wide easement	1.0 mile of wetland spanned; 9 wetland crossings within 75-foot-wide easement	Proposed Route with Route Segment A will span least amount of wetlands followed by the Proposed Route
Floodplains	Not Located in floodplain	Not Located in floodplain	Not Located in floodplain	Same
Flora	Developed land with few native species; open and herbaceous, pasture and hay fields, row crops (corn, soybeans), deciduous forest (e.g., maple, oak)	Developed land with few native species; open and herbaceous, pasture and hay fields, row crops (corn, soybeans), deciduous forest (e.g., maple, oak)	Developed land with few native species; open and herbaceous, pasture and hay fields, row crops (corn, soybeans), deciduous forest (e.g., maple, oak)	Same
Fauna	Temporary / No impact	Temporary / No impact	Temporary / No impact	Same
Rare and Unique Natural Resources	1 Threatened, 2 Special Concern, 3 Other	1 Threatened, 2 Special Concern, 3 Other	1 Threatened, 2 Special Concern, 3 Other	Same
Use of Existing Transportation and Electrical Transmission Systems or Rights-of-Way and Cross Country [d, e]				
Transportation	3.2 miles (68 percent)	4.1 miles (84 percent)	3.2 miles (68 percent)	Proposed Route with Alternative Route A will use a greater percent of existing transportation rights-of-way

Issue	Proposed Route	Proposed Route with Route Segment A	Proposed Route with Douvier Alignment	Comparison of Routes [a]
Electrical	2.8 miles (60 percent)	2.8 miles (57 percent)	2.8 miles (60 percent)	Proposed Route and Proposed Route with Douvier Alignment will use greater percent of existing electrical rights-of-way
Cross Country	0.7 mile (15 percent)	0.4 mile (8 percent)	0.7 mile (15 percent)	Proposed Route and Proposed Route with Douvier Alignment will cross 0.3 miles more of cross country areas than Proposed Route with Route Segment A
Cost of Constructing, Operating, and Maintaining the Facility That are Dependent on Design and Route				
Costs	$10 million for construction; $300-$500 per mile per year for maintenance	$10.1 million for construction; $300-$500 per mile per year for maintenance	$10 million for construction; $300-$500 per mile per year for maintenance	Proposed Route with Route Segment A construction cost is approximately $100,000 more than Proposed Route and Proposed Route with Douvier Alignment
Adverse Human and Natural Environmental Effects That Cannot Be Avoided				
General	Pole placement, potentially resulting in wetland impacts and loss of prime farmland; potential need for tree removal	Pole placement, potentially resulting in wetland impacts and loss of prime farmland; potential need for tree removal	Pole placement, potentially resulting in wetland impacts and loss of prime farmland; potential need for tree removal	Same
Irreversible and Irretrievable Commitments of Resources				
General	Pole placement, potentially resulting in wetland impacts and loss of prime farmland; potential need for tree removal	Pole placement, potentially resulting in wetland impacts and loss of prime farmland; potential need for tree removal	Pole placement, potentially resulting in wetland impacts and loss of prime farmland; potential need for tree removal	Same

Source: RPA, Table 18, Page 68 and Xcel Energy e-mail, 09/09/11.

[a] Note that the Proposed Route is the entire length of the Project (approximately 4.7 miles) and Route Segment A is a portion of the overall route length (approximately 0.5 miles) located at the northwestern portion of the project area. If Route Segment A were constructed, it would replace the equivalent portion of the Proposed Route in this location.

[b] Includes residences, farmsteads, non-residential structures, and commercial buildings

[c] Assumes a 75-foot-wide easement. Land use data used to assess impacts to agriculture and forestry is from U.S. Geological Survey Land Use and Land Class Data (accessed September 2011), which is the same data source used for the Route Permit Application for this project.

[d] Wetland data used to assess impacts is from the US Fish & Wildlife Service National Wetland Inventory (NWI) (accessed September 2011), which is the same data source used for the Route Permit Application for this project.

[e] Includes major transportation and utility rights-of-way.

[f] Some areas include multiple, overlapping rights-of-way. Therefore, the total length of areas adjacent to transportation or electrical rights-of-way may exceed the total length of the route.

As provided in the EA and **Table 22**, the differences between the Proposed Route and the Proposed Route using Alternative Segment A and the Proposed Route using the Douvier Alignment are slight when comparing potential impacts.

9.0 REFERENCES

Much of the information contained within this document was provided by the applicant or the applicant's representatives in Xcel Energy's application to the Public Utilities Commission for a route permit, March 11, 2011 (available for viewing at: http://energyfacilities.puc.state.mn.us/Docket.html?Id=32121

Additional information sources include:

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