Environmental Assessment

Kohlman Lake to Goose Lake 115 kV Transmission Line Project

In the Matter of the Route Permit Application by Northern States Power Company
for the Kohlman Lake to Goose Lake 115 kV Transmission Line Project in Ramsey County

PUC Docket No. E002/TL-12-1151

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Minnesota Department of Commerce

Responsible Government Unit

Department of Commerce
Energy Facility Permitting
85 7th Place East, Suite 500
Saint Paul, Minnesota 55101

Department Representative
Ray Kirsch, Environmental Review Manager
(651) 539-1841
raymond.kirsch@state.mn.us

Project Owner

Northern States Power Company (Xcel Energy)
414 Nicollet Mall
Minneapolis, Minnesota 55401

Project Representative
Sage Tauber, Permitting Analyst
(612) 330-2909
sage.tauber@xcelenergy.com

Abstract

On January 17, 2013, Northern States Power Company (Xcel Energy) filed a route permit application with the Minnesota Public Utilities Commission (Commission) for the Kohlman Lake to Goose Lake 115 kV transmission line project. Xcel Energy indicates in its application that the proposed project is needed to avoid potential low voltages and thermal overloads and to meet North American Electric Reliability Corporation (NERC) planning standards.

Xcel Energy proposes to replace an existing single circuit 115 kilovolt (kV) transmission line with a new double circuit 115 kV line, approximately 2.8 miles in length, in Ramsey County, Minnesota. The project also includes the installation of new equipment at the Kohlman Lake and Goose Lake substations.

Under the Power Plant Siting Act (Minn. Stat. 216E), a route permit from the Commission is required to construct a high voltage transmission line (HVTL). Department of Commerce, Energy Facility Permitting (EFP) staff is responsible for conducting the environmental review for route permit applications submitted to the Commission (Minn. Rules 7850). Accordingly, EFP staff has prepared this environmental assessment (EA) for the Kohlman Lake to Goose Lake project. This EA addresses the issues required in Minnesota Rule 7850.3700, subpart 4, and those identified in the Department's scoping decision of June 26, 2013.

Persons interested in this project can place their names on the Department's project mailing list by registering online at: http://mn.gov/commerce/energyfacilities/Docket.html?Id=33013 or by contacting Ray Kirsch, Energy Facility Permitting, 85 7th Place East, Suite 500, St. Paul, Minnesota 55101, phone: (651) 539-1841, e-mail: raymond.kirsch@state.mn.us. Documents of interest can be found at the above website and on the eDockets system: https://www.edockets.state.mn.us/EFiling/search.jsp (enter the year "12" and the number "1151").

Following release of this environmental assessment, a public hearing will be held in the project area. The hearing will be presided over by an administrative law judge from the Office of Administrative Hearings. Upon completion of the environmental review and hearing process, the record compiled on the route permit application will be presented to the Commission for a final decision. A decision on a route permit for the Kohlman Lake to Goose Lake project is anticipated by December 2013.

Acronyms, Abbreviations, and Definitions

AC	Alternate Current
ALJ	Administrative Law Judge
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe railroad
Commission	Minnesota Public Utilities Commission
CN	Certificate of Need
CSAH	County State Aid Highway
dB	Decibels
dBA	A-weighted sound level recorded in units of decibels
DNR	Minnesota Department of Natural Resources
Department	Minnesota Department of Commerce
EA	Environmental Assessment
EFP	Department of Commerce Energy Facilities Permitting
EMF	Electromagnetic field
EPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency
G	Gauss
HVTL	High Voltage Transmission Line
Hz	Hertz
kV	kilovolt
kV/M	Kilovolt per meter
mA	milliAmperes
MCBS	Minnesota County Biological Survey
MDH	Minnesota Department of Health
mG	milligauss
MHz	Mega Hertz
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MSIWG	Minnesota State Interagency Working Group
MW	Megawatt
NAC	Noise area classification
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NEV	Neutral-to-Earth Voltage
NIEHS	National Institute of Environmental Health Sciences
NPDES	National Pollution Discharge Elimination System
NWI	National Wetland Inventory
ppm	parts per million
PWI	Public Waters Inventory
ROW	Right-of-Way
SHPO	State Historic Preservation Office
SNA	Scientific and Natural Area
USACE	United States Army Corp of Engineers

USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WCA	Minnesota Wetland Conservation Act
WHO	World Health Organization
WPA	Waterfowl Production Area
WMA	Wildlife Management Area

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1.0 Introduction

Under the Power Plant Siting Act (Minn. Stat. 216E), a route permit from the Minnesota Public Utilities Commission (Commission) is required to construct and operate a high voltage transmission line (HVTL) in Minnesota. On January 17, 2013, Xcel Energy filed an HVTL route permit application with the Commission for the Kohlman Lake to Goose Lake 115 kV transmission line project.

Department of Commerce, Energy Facility Permitting (EFP) staff is responsible for conducting the environmental review for route permit applications submitted to the Commission (Minn. Rules 7850). EFP staff has prepared this environmental assessment (EA) for the Kohlman Lake to Goose Lake project. The intent of the environmental review process is to inform the public, the applicant, and decision-makers about potential impacts and possible mitigations of the proposed project and alternatives.

1.1 Organization of the Environmental Assessment

This environmental assessment (EA) addresses the issues noted in Minnesota Rule 7850.3700, subpart 4, and those identified in the Department's scoping decision for this project (**Appendix A**), and is organized as follows:

Section 1.0	**Introduction**	The introduction provides an overview of this document and of the proposed project. It also provides a summary of the potential impacts of the project and mitigative measures.
Section 2.0	**Regulatory Framework**	Section 2.0 describes the regulatory framework associated with the project, including certificate of need criteria, route permit requirements, and the alternative permitting process.
Section 3.0	**Proposed Project**	Section 3.0 describes the Kohlman Lake to Goose Lake project as proposed by Xcel Energy, including rights-of-way, structures, and conductors.
Section 4.0	**Project Construction**	Section 4.0 describes the construction methods for the project including easement acquisition.
Section 5.0	**Potential Impacts and Mitigation Measures**	Section 5.0 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 potential adverse impacts.
Section 6.0	**Unavoidable Impacts and Irreversible Commitments of Resources**	Section 6.0 describes the impacts of the project that cannot be avoided, and the irreversible and irretrievable commitments of resources for the project.
Section 7.0	**Application of Routing Factors**	Section 7.0 reviews the potential impacts of the project relative to the routing factors of Minnesota Rule 7850.4100.

Sources of Information

The primary source of information for this environmental assessment is the route permit application submitted by Xcel Energy. Additional sources of information are indicated in footnotes. Information from earlier EFP environmental review documents and other state agencies, such as the Minnesota Department of Natural Resources, is included. Information was also gathered by a site visit.

1.2 Project Overview

Xcel Energy proposes to replace an existing single circuit 115 kilovolt (kV) transmission line with a new double circuit 115 kV line between the Kohlman Lake substation and the Goose Lake substation in northeast Ramsey County.[1] The proposed route for the project is approximately 2.8 miles in length and follows an existing transmission line and railroad corridor. Xcel Energy proposes to build the new double circuit 115 kV line on the same alignment as the existing line which it will replace (**Figure 1**).

Xcel Energy is requesting a 200 foot route width for the project. Xcel Energy proposes to use a mix of existing rights-of-way and new right-of-way for the project. Where new right-of-way is necessary, Xcel Energy is proposing a right-of-way (easement) of 75 feet for the project. In addition to the new double circuit 115 kV line, the Kohlman Lake and Goose Lake substations will be modified and new equipment installed. All modifications will occur within the existing footprint of the substations.

Xcel Energy proposes to use steel poles ranging in height from 80 to 90 feet for the new double circuit line. The estimated cost for the Kohlman Lake to Goose Lake project is $9.3 million dollars.

Project Location

The Kohlman Lake to Goose Lake project is located in northeast Ramsey County and within the cities of Maplewood, Vadnais Heights, and White Bear Lake, and White Bear Lake Township. The project roughly parallels U.S. Highway 61 (Highway 61) from the intersection of Highway 61 and Interstate 694 (I-694) northward to Goose Lake Road. The project area is a developed urban area. The proposed route follows the existing single circuit transmission line and a railroad corridor through this development. On the northern end of the project, Goose Lake substation is in a relatively less developed area due to the prevalence of wetlands and lakes.

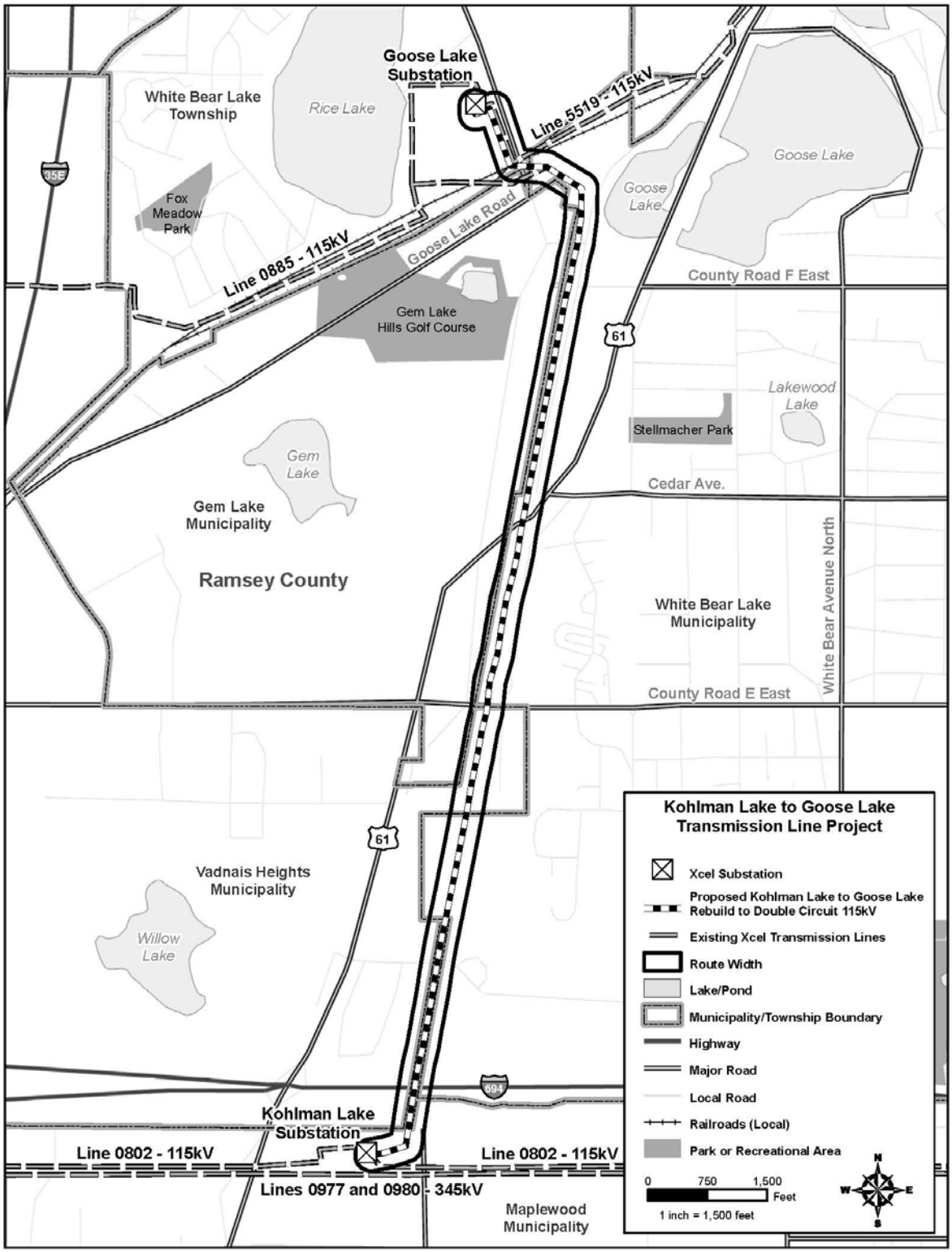
Project Purpose

Xcel Energy indicates in its route permit application that the project is needed to meet North American Electric Reliability Corporation (NERC) planning standards.[2] Electrical loads in northeast Ramsey County are served generally from three sources – the Chisago County, Kohlman Lake, and Riverside substations. Absent the proposed project, an outage at one of these substations would result in the inability to maintain electrical service in the area. The new double circuit 115 kV line will provide a redundant power source such that electrical service can be maintained should an outage occur.

[1] Northern States Power Company, Application to the Minnesota Public Utilities Commission for a Route Permit, Kohlman Lake to Goose Lake Rebuild from 115 kV Single Circuit to 115/115 kV Double Circuit Transmission Line Project, January 17, 2013, eDockets Numbers 20131-82893-01, 20131-82893-02, 20131-82893-03, 20131-82893-04, 20131-82893-05, 20131-82893-06, 20131-82893-07, 20131-82893-08, 20131-82893-09, [hereinafter Route Permit Application].

[2] Route Permit Application, Section 3.3.

Figure 1. Project Overview Map



1.3 Summary of Potential Impacts and Mitigative Measures

In issuing a route permit for the Kohlman Lake to Goose Lake project, the Minnesota Public Utilities Commission is charged with selecting a route and an anticipated alignment that minimize adverse human and environmental impacts of the project.[3] Due to the nature and location of the project, potential impacts of the Kohlman Lake to Goose Lake project are anticipated to be minimal.

Impacts to human settlements, public health, public services, and land-based economies are anticipated to be minimal. Aesthetic impacts – i.e., impacts resulting from taller structures and more conductors in the project area – are anticipated to be incremental and minimal. Potential impacts to sewer lines in the area can be mitigated by coordination between Xcel Energy and the Metropolitan Council. Construction impacts (e.g., dust, noise) are anticipated to be temporary and minimal.

Impacts to water resources, soils, flora, fauna, and rare and unique natural resources are anticipated to be minimal. Impacts to water resources and soils can be mitigated by construction best management practices. Potential impacts to the one identified rare species in the project area – the Blanding's Turtle – can be mitigated by several strategies.

[3] Minnesota Statute 216E.02, Subd 1, https://www.revisor.mn.gov/statutes/?id=216E.02.

2.0 Regulatory Framework

Persons seeking to construct and operate a high voltage transmission line in Minnesota must seek permission to do so from the Minnesota Public Utilities Commission (Commission) and from other state and federal agencies with permitting authority for the project.

2.1 Certificate of Need

No person may construct a large energy facility in Minnesota without a certificate of need from the Commission (Minn. Stat. 216B.243). A high voltage transmission line is a large energy facility if it (1) has a capacity of 200 kV or more and is greater than 1,500 feet in length, or (2) has a capacity of 100 kV or more with more than 10 miles of its length in Minnesota, or (3) has a capacity of 100 kV or more and crosses a state line (Minn. Stat. 216B.2421).

The project as proposed, a double circuit 115 kV transmission line with a length of approximately 2.8 miles, does not qualify as a large energy facility; thus, the project does not require a certificate of need.

2.2 Route Permit

In Minnesota, no person may construct a high voltage transmission line without a route permit from the Commission (Minn. Stat. 216E.03). 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 greater than 1,500 feet in length (Minn. Stat. 216E.01). Associated facilities of a transmission line may include buildings, equipment, and other physical structures that are necessary to the operation of a high voltage transmission line.

The Kohlman Lake to Goose Lake project will consist of approximately 2.8 miles of new double circuit 115 kV transmission line and therefore requires a route permit from the Commission. Xcel Energy submitted the route permit application for the Kohlman Lake to Goose Lake project under the Commission's alternative permitting process (Minn. Rules 7850).[4] The application was submitted on January 17, 2013, and accepted as complete by the Commission on March 15, 2013. The alternative permitting process includes environmental review and a public hearing, and typically takes six to nine months to complete.

A copy of Xcel Energy's route permit application, along with other documents relevant to this project, can be viewed on the Department's energy facility permitting webpage: http://mn.gov/commerce/energyfacilities/Docket.html?Id=33013, and on the eDockets website: https://www.edockets.state.mn.us/EFiling/search.jsp (enter the year "12" and the number "1151").

Environmental Review

Applications for transmission line route permits are subject to environmental review conducted by EFP staff (Minn. Rule 7850.3700). Projects proceeding under the alternative permitting process require the preparation of an environmental assessment (EA). An EA is a document which describes the potential human and environmental impacts of the proposed project and potential mitigative measures. The

[4] Notification of Intent to File a Route Permit Application Pursuant to the Alternative Permitting Process for the Kohlman Lake to Goose Lake Rebuild from 115 kV Single Circuit to 115/115 kV Double Circuit Transmission Line Project, October 22, 2012, eDockets Number 201210-79763-01.

Department of Commerce determines the scope of the EA. The Department may include alternative routes suggested by the public in the scope of the EA if such alternatives will assist in the Commission's decision on the route permit. The EA must be completed and made available prior to the public hearing for the project.

On April 23, 2013, Commission staff and EFP staff held a joint public information and environmental assessment scoping meeting in White Bear Lake, Minn. The purpose of the meeting was to provide information to the public about the proposed project, to answer questions, and to allow the public an opportunity to suggest impacts and alternatives that should be considered in the environmental assessment for the project. Four members of the public attended the meeting. One citizen expressed concern about the electric and magnetic fields that would be produced by the project. Another citizen, a representative from the Metropolitan Council, related concerns of the Council regarding sewer lines in the project area.

A comment period followed the public meeting and was open through Friday, May 10, 2013. Three comment letters were received by the end of the comment period. The Metropolitan Council commented that Xcel Energy's proposed route runs very near existing wastewater sewers ("interceptors"), and requested that Xcel Energy coordinate with the Council on placement of new transmission line structures. The Minnesota Department of Natural Resources (DNR) commented that a threatened species – the Blanding's Turtle – is present in the project area and that mitigative measures should be taken to protect this species.

The Minnesota Department of Transportation (MnDOT) commented that road crossing permits, consistent with MnDOT's utility accommodation policy, would be required for the project. MnDOT requested that Xcel Energy coordinate with MnDOT staff on final design of all crossings. MnDOT also noted that Highway 61 is a house moving route and that appropriate transmission line clearances would be required to accommodate this purpose.

After consideration of the route permit application, public comments received, and the Commission's review of the scoping process, the deputy commissioner of the Department of Commerce issued a scoping decision on June 26, 2013. The scoping decision is included in **Appendix A**.

Public Hearing

Upon completion of the EA, a public hearing will be held in the project area (Minn. Rule 7805.3800). The hearing will be presided over by an administrative law judge (ALJ) from the Office of Administrative Hearings. Members of the public will have an opportunity to speak at the hearing, present evidence, ask questions, and submit comments. The ALJ will provide a report from the hearing including findings of fact, conclusions of law, and a recommendation to the Commission on the issuance of a route permit.

Comments received during the hearing on the environmental assessment become part of the record in the proceeding. EFP staff will respond to comments on the EA during the hearing comment period, but staff is not required to revise or supplement the EA document. Upon completion of the environmental review and hearing process, the record compiled for the route permit application will be presented to the Commission for a final decision. A decision by the Commission on a route permit for the Kohlman Lake to Goose Lake project is anticipated by December 2013.

Permit Decision

The Commission is obligated to choose routes that minimize adverse human and environmental impacts while ensuring continuing electric power system reliability and integrity.[5] Route permits issued by the Commission include a permitted route and anticipated alignment, as well as conditions specifying construction and operation standards. An example route permit is included in **Appendix C**; a generic route permit temple is included in **Appendix D**.[6]

Minnesota Statute Section 216E.03, subdivision 7(b) identifies 12 considerations that the Commission must take into account when designating transmission lines routes.[7] Minnesota Rule 7850.4100 lists 14 factors for the Commission to consider when making a decision on a route permit:[8]

A. effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services;

B. effects on public health and safety;

C. effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;

D. effects on archaeological and historic resources

E. effects on the natural environment, including effects on air and water quality resources and flora and fauna;

F. effects on rare and unique natural resources;

G. application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity;

H. use or paralleling of existing right-of-way, survey lines, natural divisions lines, and agricultural field boundaries;

I. use of existing large electric power generating plant sites;

J. use of existing transportation, pipeline, and electrical transmission systems or rights-of-way;

K. electrical systems reliability;

L. costs of constructing, operating, and maintaining the facility which are dependent on design and route;

M. adverse human an natural environmental effects which cannot be avoided; and

N. irreversible and irretrievable commitments of resources.

[5] Minnesota Statute 216E.02, https://www.revisor.mn.gov/statutes/?id=216E.02.
[6] Generic High Voltage Transmission Line Route Permit Template, Minnesota Public Utilities Commission, July 23, 2013, eDockets Number 20137-89451-01.
[7] Minnesota Statute 216E.03, Subd. 7, https://www.revisor.mn.gov/statutes/?id=216E.03.
[8] Minnesota Rule 7850.4100, https://www.revisor.mn.gov/rules/?id=7850.4100.

The Commission must make specific findings that it has considered locating a route for a new high voltage transmission line along an existing high voltage transmission line route or parallel to existing highway right-of-way and, to the extent these are not used for the route, the Commission must state the reasons why.[9] At the time the Commission makes a final decision on a route permit, the Commission must determine whether the EA and the record created at the public hearing address the issues identified in the scoping decision.[10]

The Commission is charged with make a final decision on a route permit within 60 days after receipt of the ALJ's report.[11] A final decision must be made within six months after the Commission's determination that an application is complete. The Commission may extend this time limit for up to three months for just cause or upon agreement of the applicant.[12]

If issued a route permit by the Commission, Xcel Energy may exercise the power of eminent domain to acquire land for the Kohlman Lake to Goose Lake project.[13]

2.3 Other Permits

A route permit from the Commission is the only state permit required for the routing of the Kohlman Lake to Goose Lake project. The Commission's route permit supersedes local planning and zoning and binds state agencies.[14] Thus, state agencies are required to participate in the Commission's permitting process to aid the Commission's decision-making and to indicate routes that are not permittable.[15]

This said, various local, state, and federal permits may be required for activities related to the construction and operation of the project. All permits subsequent to the Commission's issuance of a route permit and necessary for the project (commonly referred to as "downstream permits") must be obtained by a permittee. **Table 1** includes a list of downstream permits that may be required for the Kohlman Lake to Goose Lake project.

2.4 Applicable Codes

The Kohlman Lake to Goose Lake project must meet the requirements of the National Electrical Safety Code (NESC).[16] The code is designed to protect human health and the environment. It also ensures that the transmission line and all associated structures are built from high quality materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment, provided that routine maintenance is performed.

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

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[9] Minnesota Statute 216E.03, Subd. 7, https://www.revisor.mn.gov/statutes/?id=216E.03.
[10] Minnesota Rule 7850.3900, https://www.revisor.mn.gov/rules/?id=7850.3900.
[11] Id.
[12] Id.
[13] Minnesota Statute 216E.12, https://www.revisor.mn.gov/statutes/?id=216E.12.
[14] Minnesota Statute 216E.10, https://www.revisor.mn.gov/statutes/?id=216E.10.
[15] Id.
[16] National Electrical Safety Code, http://standards.ieee.org/about/nesc/#q1.

2.5 Issues Outside the Scope of the Environmental Assessment

In accordance with the scoping decision for this EA (**Appendix A**), the following topics are not addressed in this document:

- No-build alternative.
- Issues related to the project need, size, type, or timing.
- Any route or substation alternative not specifically identified in the scoping decision.
- Policy issues surrounding whether utilities or local governments should be liable for the cost to relocate utility poles when roadways are widened.
- The manner in which landowners are paid for transmission right-of-way easements.

Table 1. Potential Permits and Approvals[17]

Permit	Jurisdiction
Federal Approvals	
Clean Water Act, Section 404 Permit	USACE
State of Minnesota Approvals	
License to Cross Public Waters and Public Waters Work Permit	DNR
Utility Crossing Permit	MnDOT
NPDES/SDS Stormwater Construction Permit	MPCA
Local Approvals	
Road Access Permit	County, Township, City

[17] Route Permit Application, Section 7.4.

3.0 Proposed Project

Xcel Energy proposes to replace an existing single circuit 115 kilovolt (kV) transmission line with a new double circuit 115 kV line between the Kohlman Lake substation and the Goose Lake substation in northeast Ramsey County.[18] The proposed route for the project is approximately 2.8 miles in length and follows an existing transmission line and railroad corridor. Xcel Energy proposes to build the new double circuit 115 kV line on the same alignment as the existing line which it will replace.

One circuit of the new double circuit 115 kV line (circuit #1) will proceed from the Kohlman Lake substation northward to structure 124, just south of the Goose Lake substation (see maps in **Appendix B; Maps B-1** thru **B-7**).[19] The second circuit (circuit #2) will proceed from the Kohlman Lake substation to the Goose Lake substation proper.[20] Circuit #2 includes a span of single circuit 115 kV line between structure 124 and structure 629 (**Map B-7**). Circuit #2, near the Goose Lake substation, will pick up (underbuild) existing distribution lines.[21] The project also includes the reconductoring of a span of circuit #1 between structure 124 and structure 123 (**Map B-7**).

In addition to the new double circuit 115 kV line, the Kohlman Lake and Goose Lake substations will be modified and new equipment installed. New 115 kV breakers and associated disconnects and controls will be installed at both substations (**Maps B-8** and **B-9**).[22] All modifications will occur within the existing footprint of the substations.[23]

3.1 Route and Right-of-Way

When it issues a route permit, the Minnesota Public Utilities Commission (Commission) approves a route, a route width, and an anticipated alignment within that route width. The route width is typically larger than the actual right-of-way needed for the transmission line (**Figure 2**). This additional width provides flexibility in constructing the line, yet is not of such an extent that the placement of the line is undetermined. The route width and anticipated alignment are intended to provide flexibility and predictability.

Xcel Energy has requested a route width of 200 feet for the new double circuit 115 kV line.[24] Xcel Energy has existing rights-of-way (easements) associated with the single circuit 115 kV line being replaced, including a license agreement with the Burlington Northern Santa Fe (BNSF) railroad.[25] Xcel Energy proposes to use a mix of existing rights-of-way and new right-of-way for the project. Where new right-of-way is necessary, Xcel Energy has requested a right-of-way (ROW) of 75 feet for the project (37.5 feet on each side of the transmission line).[26] Xcel Energy anticipates that new right-of-way for the project will be needed along the west side of Otter Tail Road near the Goose Lake substation and along the Bruce Vento Trail near the Kohlman Lake substation (**Map B-10**). Xcel Energy indicates that the requested ROW width is required to maintain National Electrical Safety Code clearances for the

[18] Route Permit Application, Section 3.2.
[19] Id.
[20] Id.
[21] Id.
[22] Route Permit Application, Section 4.3.
[23] Id.
[24] Route Permit Application, Section 4.2.
[25] Route Permit Application, Section 4.1.
[26] Route Permit Application, Section 4.2.

proposed transmission line structures and spans.[27] The new ROW required for the project is typically acquired by easement agreements with landowners (see Section 4.1)

The proposed route for the project exits the Kohlman Lake substation and proceeds northward along a section of the Bruce Vento trail and across I-694 (**Figure 3**, **Map B-2**).

Figure 2. Route Width and Right-of-Way Illustration[28]

Figure 3. Kohlman Lake Substation

[27] Route Permit Application, Section 5.1.
[28] Illustration not to scale.

The route proceeds northward along the eastern edge of a railroad corridor, crossing over County Road E (**Figure 4**, **Maps B-3** thru **B-6**). The route continues northward along the railroad corridor, crossing Highway 61 and paralleling Hoffman Road. The route then jogs westward toward Otter Lake Road, with circuit #1 joining Xcel Energy line 0885 and circuit #2 joining Xcel Energy line 5519 and proceeding along Otter Lake Road to the Goose Lake substation (**Figure 5**, **Map B-7**).

Figure 4. Proposed Route and Existing Single Circuit 115 kV Line along Railroad Corridor[29]

3.2 Route Alternatives

Xcel Energy has proposed a transmission line route proceeding northward from the Kohlman Lake substation, across I-694, parallel to and across Highway 61, to the Goose Lake substation, just north of the intersection of Otter Lake Road and White Bear Parkway (**Figure 1**, **Appendix B**). The proposed route follows, to a great extent, the alignment of the existing single circuit 115 kV line that will be removed. Xcel Energy contends that this route best minimizes potential impacts to residences and natural resources because it utilizes an existing transmission line and railroad corridor, and minimizes new rights-of-way.[30]

[29] View looking north from County Road E.
[30] Route Permit Application, Section 4.2.

Xcel Energy did not consider route alternatives that would create a new transmission line corridor.[31] Any new corridor would create new impacts to landowners and natural resources and would frustrate developments and investments that have been made in the project area. No route alternatives were suggested during the scoping period for this EA. Thus, the only route examined in this EA is the route proposed by Xcel Energy in its route permit application (see **Appendix A**).

Figure 5. Goose Lake Substation

3.3 Structures and Conductors

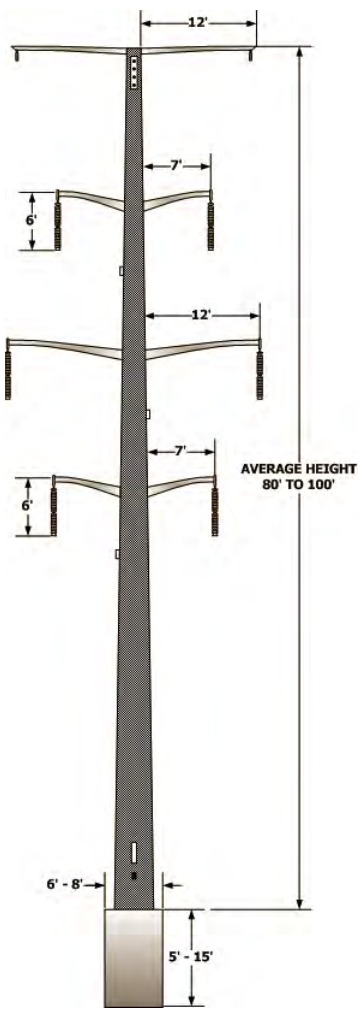
Xcel Energy proposes to use single pole steel structures ranging in height from 80 to 100 feet for the project (**Figure 6**, **Table 2**).[32] The finish of the structures will be galvanized steel or weathering steel. The average span between the new structures will be 300 to 500 feet.[33] Structure height, diameter, and spans will vary depending on topography, existing infrastructure, and changes in route direction (**Table 2**). Structures that facilitate a change in route direction, e.g., turning a corner, must be relatively larger in size in order to maintain proper tension on the transmission line. Such structures are known as "angle" or "dead end" structures.

[31] Route Permit Application, Section 2.5.
[32] Route Permit Application, Section 5.1.
[33] Id.

Table 2. Proposed Structure Characteristics[34]

Structure Type	Approximate Number of Structures Needed for Project	Structure Height (feet)	Foundation Diameter (feet)	Span Between Structures (feet)
Standard, single pole tangent structures	38	80 to 90	6	300 to 500
Single pole angle and dead end structures	4	90 to 100	7 to 8	NA

Figure 6. Double Circuit Davit Arm Structure[35]



[34] Route Permit Application, Section 3.2 and Table 5.
[35] Id.

The double circuit transmission line structures will carry six single conductor phase wires (three conductors on each side of the structure). The conductor wires will be a 795 26/7 aluminum core steel supported (ACSS) conductor or a conductor with similar capacity.[36] This conductor will also be used for the reconductoring of circuit #1 between structure 124 and structure 123.

Transmission line conductors will be suspended by arms – known as "davit arms" – from transmission line structures. The davit arms support the conductors and maintain them at a safe distance from the structure. Davit arms are typically 7 to 12 feet in length (**Figure 6**). The structures and project will be designed to meet all local and state codes, the National Electric Safety Code, and Xcel Energy standards.[37]

Existing Structures and Conductors

The proposed project includes the removal of the existing single circuit 115 kV line between the Kohlman Lake and Goose Lake substations. Xcel Energy indicates that this will entail the removal of approximately 41 existing structures, including 2 lattice tower structures, 39 steel pole structures, several wooden poles, and all associated guy wires, anchors, and poles (**Figure 7** and **Figure 8**).[38] The average height of existing structures is approximately 75 feet.[39] Thus, the new double circuit 115 kV structures will be 5 to 25 feet taller than the existing structures.

3.4 Project Costs

The estimated total cost for the Kohlman Lake to Goose Lake project is approximately $9.3 million dollars (**Table 3**).[40] Xcel Energy's indicates that its final project costs could be up to 30 percent higher or lower than its estimate. Annual operation and maintenance costs for a 115 kV line in the Xcel Energy system are in the range of $300 to $500 dollars per mile of transmission line right-of-way. Transmission line inspections are typically performed by aircraft or helicopter on a regularly scheduled basis. Substation equipment inspections are also performed on a regularly scheduled basis.

Table 3. Estimated Project Costs[41]

Project Item	Estimated Cost (dollars)
Transmission Line Rebuild	$5,400,000
Substation Modifications	$3,900,000
Total Project Costs	$9,300,000

[36] Route Permit Application, Section 5.1.
[37] Id.
[38] Route Permit Application, Section 3.2.
[39] Route Permit Application, Section 5.1.
[40] Route Permit Application, Section 3.5.
[41] Id.

Figure 7. Existing Single Circuit 115 kV Structure[42]

[42] Typical painted steel structure along route; view looking southwest across Hoffman Road.

Figure 8. Existing Single Circuit 115 kV Lattice Tower Structure[43]

[43] Structure 124; view looking east across Otter Lake Road.

4.0 Project Construction

Construction of the Kohlman Lake to Goose Lake project would begin after appropriate federal, state, and local permits and approvals have been issued. Construction is anticipated to begin in early 2014; however, the construction timeline is dependent upon a number of factors including permits, weather, system loads, and the availability of labor and materials.

4.1 Easement Acquisition

Upon issuance of a route permit by the Commission for the Kohlman Lake to Goose Lake project, Xcel Energy will conduct a design survey and engineering analysis to establish a transmission line centerline and right-of-way (ROW) that is consistent with the Commission's permit. This work will be followed by easement acquisition for the required ROW. As the project is proposed to follow an existing transmission line and railroad corridor, Xcel Energy will first determine if existing easements are sufficient for the project or require expansion.[44]

During the easement acquisition process, landowners will be provided a number of easement documents, including a copy of the route permit, complaint procedures, structure designs or photos, a plan showing the transmission line relative to the landowner's property, and an offer of compensation. Landowners and utilities typically negotiate easement terms that reduce negative impacts to a landowner's property and provide just compensation for the utility's use of the easement (see **Appendix E**). In addition to permanent easements for the operation of the transmission line, agreements for the use of temporary work space may be obtained from some landowners.

If a negotiated settlement for an easement cannot be reached, Xcel Energy may use the eminent domain process to reach a settlement (Minn. Stat. 308A, Minn. Stat. 117). In the eminent domain process, three court-appointed commissioners determine the value of the easement, and both the landowner and utility are bound by this determination. If the eminent domain process is used, Xcel Energy must obtain at least one appraisal for the property proposed to be acquired (Minn. Stat. 117.036).

4.2 Construction

Construction of the project would begin after all permits and approvals are obtained, soil conditions are suitable for construction, and the project design is complete.[45]

Vegetation Removal

The initial phase of construction is right-of-way (ROW) clearance. As a general practice, all tall growing vegetation is removed from the ROW. The primary concern regarding vegetation is the potential for vegetation to interfere with the safe operation of the transmission line. Xcel Energy indicates that within the ROW there are two distinct zones of vegetation management, the wire zone and the border zone (**Map B-11**).[46] The wire zone is that area directly underneath the conductors. In this area, only grasses and forbs are allowed to grow (i.e., these grassland species will not be cleared from the ROW, and, as necessary, this zone of the ROW will be replanted with such species). The border zone is that

[44] Route Permit Application, Section 5.1.3.
[45] Route Permit Application, Section 5.1.5.
[46] Route Permit Application, Section 5.1.4.

area of the ROW outside of the wire zone and extending to the edge of the easement. In this area, low-growing woody plants and trees are allowable.[47] Thus, such plants, if they currently exist in the border zone of the ROW will not be cleared, or, if they must be cleared for construction purposes, can be replanted. Xcel Energy may, if such language is included in an easement agreement, trim or remove trees immediately adjacent to the transmission line ROW that have the potential to endanger the line by falling on it (commonly known as "hazard trees" or "danger trees") (**Map B-11**).

Xcel Energy indicates that it will utilize a number of techniques, beyond the wire zone / border zone strategy, to minimize vegetation clearing impacts, including:[48]

- Limiting construction access and activities to the transmission line ROW and select accessways;
- Limiting traffic within the ROW to a single access path to the extent practicable;
- Use best management practices to minimize the potential for spills and leaks from construction equipment;
- Limiting staging and laydown areas to previously disturbed areas where practicable.

Structure Placement

The new double circuit 115 kV line will be constructed at or near the existing grade along the proposed route. Xcel Energy anticipates using drilled pier concrete foundations.[49] Depending on soil conditions, foundations are anticipated to be 6-8 feet in diameter and 20-40 feet in depth.[50]

The placing of foundations requires drilling with a truck-mounted drill rig and the pouring of concrete, typically delivered by truck. Other construction equipment that may be used for the project includes cranes, backhoes, dump trucks, front end loaders, and flatbed tractor-trailers.[51] Staging areas will be used to store equipment and materials. To the extent feasible, equipment access to the transmission line ROW will be made from existing roads and trails.[52]

Once foundations are placed, the steel structures (poles) for the line will be attached. Poles may be assembled in place or assembled in a staging area and brought to the construction site in one piece. Hardware and insulators are typically attached to the poles prior to their placement on foundations.

Once structures have been erected for the line, conductors are strung. During this process, temporary guard or clearance poles will be used at crossings to provide adequate clearance over roads and other potential obstructions. Stringing activities will commence only after notifications have been provided and permissions obtained such that potential impacts to traffic flow and other activities in the project area are mitigated.

[47] Id. "Low-growing" being plants and trees that at mature height do not encroach on minimum clearances required for safe operation of the transmission line.
[48] Id.
[49] Route Permit Application, Section 5.1.5.
[50] Id.
[51] Id.
[52] Id.

Xcel Energy indicates that construction will follow best management practices, as developed by Xcel Energy and required by permit.[53] Xcel Energy indicates that it will employ soil erosion control measures as identified in the Minnesota Pollution Control Agency's (MPCA) stormwater best management practices manual.[54] Xcel Energy notes that it will use a number of techniques to minimize and mitigate construction impacts, including:[55]

- Minimizing rutting by performing work on firm or frozen ground that can support the equipment used;
- Minimizing soil disturbances in steeply slope areas to the extent practicable;
- Locating, building, and maintaining accessways to minimize erosion and sedimentation;
- Spanning wetlands as possible and using construction mats as needed;
- Controlling soil erosion with: (1) erosion control blankets, (2) silt fences, (3) hay bales, (4) hydro seeding, and (5) new plantings.

4.3 Restoration

As construction is completed on various section of the route, Xcel Energy notes that it will restore these sections to their original condition to the maximum extent practicable.[56] Xcel Energy indicates that right-of-way agents will contact property owners after construction is completed to determine whether damage has occurred during construction of the project.[57] Xcel Energy notes that it will restore damaged areas and/or fairly reimburse landowners for damages.[58] Xcel Energy suggests that resilient species of grasses and shrubs typically reestablish quickly after construction; however, in areas with significant soil compaction and disturbance, restoration measures will be required to reestablish vegetation.[59] Restoration requirements and measures are standard HVTL route permit conditions (see **Appendices C** and **D**).

4.4 Maintenance

Xcel Energy will use its transmission line right-of-way to perform inspections, maintenance, and repairs. Inspections are typically conducted by air, e.g., by use of an aircraft or helicopter. Regular inspections of transmission lines are required to ensure reliable electrical performance. Substation equipment maintenance and repair will occur periodically and will occur within the footprints of the Kohlman Lake and Goose Lake substations.

Xcel Energy will conduct periodic vegetation surveys and will remove, in accordance with applicable easement agreements, vegetation that would interfere with the operation of the transmission line. Right-of-way clearing practices include mechanical and hand clearing, along with the use of herbicides (where allowed and in accord with applicable easement agreements).

[53] Id.
[54] Route Permit Application, 6.5.2.
[55] Route Permit Application, Sections 5.1.4 and 5.1.6.
[56] Route Permit Application, Section 5.1.6.
[57] Id.
[58] Id.
[59] Id.

5.0 Potential Impacts and Mitigation Measures

The construction of a transmission line involves both short and long-term impacts. Short-term impacts are generally associated with the construction phase of the project and can include noise, dust, and soil compaction. Long-term impacts can exist for the life of the project and may include aesthetic impacts, health impacts, economic impacts, and land use restrictions or modifications. Mitigation measures are measures that could be implemented to reduce, minimize, or eliminate potential impacts.

Potential impacts and mitigation measures for the Kohlman Lake to Goose Lake project are discussed in this section. Potential impacts to human settlements and activities are avoided, to a great extent, by the location of the project – within an existing transmission line and railroad corridor. Thus, impacts to human settlements, public health, public services, and land-based economies are anticipated to be minimal. Aesthetic impacts – i.e., impacts resulting from taller structures and more conductors in the project area – are anticipated to be incremental and minimal. Potential impacts to sewer lines in the area can be mitigated by coordination between Xcel Energy and the Metropolitan Council.

Because the project will be located in a highly developed urban area, impacts to water resources, soils, flora, fauna, and rare and unique natural resources are anticipated to be minimal. Impacts to water resources and soils can be mitigated by construction best management practices. Potential impacts to the one identified rare species in the project area – the Blanding's Turtle – can be mitigated by several strategies.

The Commission, when it issues a route permit for the Kohlman Lake to Goose Lake project, can require Xcel Energy to follow a specific route and alignment for the project and to use specific mitigation measures or require that certain mitigation thresholds or standards be met through permit conditions (see **Appendices C** and **D**).

5.1 Environmental Setting

The Kohlman Lake to Goose Lake project area lies within the Eastern Broadleaf Forest Province in east central Minnesota.[60] The project traverses two ecological subsections with features that are the result of extensive glaciation – the Anoka Sand Plain in the northern end of the project area and the St. Paul-Baldwin Plains and Moraines in the southern end of the project area.[61] These subsections have well drained soils which, prior to settlement, supported a variety of flora including grasses, brush, maples, basswood, bur oaks, and pin oaks.[62]

The project area is currently a highly developed urban area with small patches of pre-settlement flora remaining – primarily in and around wetlands and lakes which are poorly suited for development (**Map B-12**). The project is within Ramsey County and the cities of Maplewood, White Bear Lake, Vadnais Heights, and White Bear Township. Ramsey County was established in 1849; White Bear Township was formed in 1858. The city of White Bear Lake, initially a resort area for citizens of the city of St. Paul, was incorporated in 1881. The cities of Maplewood and Vadnais Heights are relatively newer post World

[60] Eastern Broadleaf Forest Province, http://www.dnr.state.mn.us/ecs/222/index.html. See also Route Permit Application, Section 6.1.
[61] Id.
[62] Anoka Sand Plain Subsection, http://www.dnr.state.mn.us/ecs/222Mc/index.html; St. Paul-Baldwin Plains and Moraines Subsection, http://www.dnr.state.mn.us/ecs/222Md/index.html.

War II communities, with both cities incorporating in 1957.[63] As a result of urban development, the project area, excepting wetlands and lakes, is zoned for residential, commercial, and industrial uses (**Map B-13**).[64] In support of these uses, the project area has extensive infrastructure including I-694, Highway 61, a variety of county roads, and a BNSF railroad corridor.

5.2 Socioeconomics

According to 2010 census data, the minority population in the project area, as a percentage of residents, is slightly less than the average for the State of Minnesota in the northern portion of the project area (cities of White Bear Lake and Vadnais Heights and White Bear Lake Township) and greater than the state average in the southern portion of the project area (Ramsey County, city of Maplewood) (**Table 4**). The project area has a per capita income which is approximately equal to the average for the State of Minnesota (**Table 4**).

Table 4. Socioeconomic Characteristics of Project Area[65]

Location	Population	Minority Population (percent)	Per Capita Income (dollars)	Population / Families Below Poverty Level (percent)
Minnesota	5,303,925	14.7	$29,582	10.6
Ramsey County	508,640	27.4	$28,956	15.8
City of Maplewood	38,018	24.5	$29,499	10.6
City of White Bear Lake	23,797	9.9	$31,129	6.9
City of Vadnais Heights	12,302	5.1	$36,328	7.2
White Bear Lake Township	10,949	3.0	$28,847	2.8

Approximately 20 to 25 workers will be employed during construction of the Kohlman Lake to Goose Lake project.[66] The project will take two to three months to complete. No additional permanent jobs are anticipated as a result of the project.

Potential Impacts

Socioeconomic impacts resulting from the project will be primarily positive with an influx of wages and expenditures at local businesses during the construction of the project. Communities near the project should experience short-term positive economic impacts through the use of hotels, restaurants, and

[63] The city of Vadnais Heights incorporated as a village in 1957 and became a city in 1974, Vadnais Heights History, http://www.cityvadnaisheights.com/About-the-City/History.aspx.
[64] Route Permit Application, Section 6.2.2.
[65] Route Permit Application, Section 6.2.7, Table 13.
[66] Route Permit Application, Section 6.2.7.

other services by the various workers. Expenditures for equipment, fuel, and other supplies and services will benefit businesses in the project area. Indirect positive impacts will accrue due to the improved reliability of the electrical system.

Potential negative socioeconomic impacts are anticipated to be minimal. Disruptions of local business due to construction and operation of the Kohlman Lake to Goose Lake project are anticipated to be minimal. Though the minority population in Ramsey County and Maplewood, as a percentage of residents, is relatively greater than the state average, no minority or low-income population is anticipated to be negatively and differentially impacted by the project.

Mitigation
Socioeconomic impacts resulting from the Kohlman Lake to Goose Lake project are anticipated to be primarily positive; thus, no mitigative measures are proposed.

5.3 Human Settlements

Transmission lines have the potential to negatively impact human settlements through a variety of means. Transmission structures could change the aesthetics of the project area, introduce new noise sources, displace homes, and lower property values.

Impacts to human settlements resulting from the Kohlman Lake to Goose Lake project are anticipated to be minimal. No residences or businesses will be displaced by the project; no adverse impacts to property values are anticipated. Aesthetic impacts resulting from the project are anticipated to be incremental and minimal. The project will introduce relatively taller structures and more conductors into the project area, but these introductions will minimally impact investments and expectations related to aesthetics in the area. Impacts related to construction of the project are anticipated to be minimal and temporary.

Impacts to human settlements can be minimized by prudent routing, i.e., by choosing routes and alignments that avoid residences and businesses. Impacts can also be mitigated by limiting the project's aesthetic impacts to structures, and by the use of structures which are, to the extent possible, harmonious with human settlements and activities.

Aesthetics
The proposed Kohlman Lake to Goose Lake project traverses a highly developed urban area. The project area is zoned for residential, commercial, and industrial uses (**Map B-13**).[67] The project area contains extensive infrastructure including I-694, Highway 61, a railroad corridor, and supporting utilities (water, electricity).

The proposed route for the project follows the alignment of the existing single circuit 115 kV line between the Kohlman Lake and Goose Lake substations. This line consists primarily of painted, single pole steel structures approximately 75 feet in height (**Figure 7**).[68] These structures will be removed and replaced with single pole steel structures ranging in height from 80 to 90 feet, with some structures up to 100 feet tall (**Table 2**).

[67] Route Permit Application, Section 6.2.2.
[68] Route Permit Application, Section 5.1.

There are 48 residences and 51 commercial buildings within 300 feet of the anticipated alignment for the project (**Table 5**, **Appendix B**). There is one residence and four commercial buildings within the proposed route for the project, i.e., within 100 feet of the anticipated alignment of the transmission line. There are no residences or commercial buildings within the anticipated right-of-way for the project, i.e., within 37.5 feet of the anticipated alignment.

Table 5. Distance of Structures from Anticipated Alignment[69]

Structure Type	0 to 50 feet	51 to 100 feet	101 to 150 feet	151 to 200 feet	201 to 250 feet	251 to 300 feet
Residences	0	1	15	23	4	5
Commercial Buildings	0	4	18	21	4	4

The closest residence to the Kohlman Lake substation is approximately 320 feet southeast of the substation; the closest commercial building is approximately 300 feet northwest of the substation.[70] The closest residences to the Goose Lake substation are approximately 300 feet from the substation; the closest commercial building is 42 feet north of the substation.[71]

The aesthetic value of the project area – the natural landscape and human modifications to the landscape – is somewhat a subjective matter and depends upon the perception of the viewer. This said, landscapes which are, for the average person, harmonious in form and use are perceived as having greater aesthetic value. Infrastructure which is not harmonious with a landscape or negatively impacts existing elements of a landscape could negatively affect the aesthetics of the area.

Potential Impacts

Aesthetic impacts due to the Kohlman Lake to Goose Lake project are anticipated to be minimal. The structures for the new double circuit 115 kV line will be 5 to 15 feet taller than the existing single circuit structures. Approximately four structures (angle and dead end structures) will be 5 to 25 feet taller than existing structures (see **Table 2**). Additionally there will be six wires (conductors) on the structures instead of the existing three. The additional structure height and the additional wires will make the new line relatively more visible in the project area. However, the change in visibility is an incremental change, i.e., a change from one transmission line to another rather than the introduction of a new transmission line. Additionally, the new transmission is fairly harmonious with the landscape as it is replacing an existing transmission line in a railroad corridor. Thus, the proposed double circuit 115 kV line minimally impacts investments and expectations related to aesthetics in the project area.

Finally, in some areas of the route, the new structures will likely be an aesthetic improvement, e.g., the replacement of lattice tower structures with monopole structures (see **Figure 8**), and the replacement of painted structures (where the paint is peeling) with galvanized or self-weathering structures.

[69] Revised Table 9 from the Route Permit Application, Xcel Energy, Personal Communication, May 22, 2013, eDockets Number 20138-90501-01 [hereinafter Xcel Energy Additional Project Information].
[70] Route Permit Application, Section 6.2.2.
[71] Route Permit Application, Section 6.2.2 and Figure B-7.

All proposed modifications at the Kohlman Lake and Goose Lake substations will occur within the existing footprints of these substations. Thus, aesthetic impacts due to these modifications are anticipated to be minimal.

Mitigation
Aesthetic impacts resulting from the Kohlman Lake to Goose Lake project are anticipated to be minimal. The primary strategy for minimizing aesthetic impacts is prudent routing, i.e., choosing routes where a transmission line is most harmonious with the landscape. To a great extent, Xcel Energy's proposed route implements this strategy – the proposed route follow an existing transmission line and railroad corridor. As this corridor has been part of the landscape for many years (see discussion of property values, below) and has included a transmission line, a rebuilding of this line, albeit with slightly taller structures, is harmonious with the project area landscape.

Adverse impacts can also be mitigated by ensuring that the aesthetic impacts of the project are limited to project structures. Thus impacts can be mitigated by ensuring that damage to natural landscapes during construction is minimized, e.g., minimizing vegetation removal. Impacts can also be mitigated by plantings that minimize visual exposure of structures and foundations. Aesthetic impacts can also be mitigated by the choice/use of specific transmission line structures and finishes. For example, relatively shorter structures with a self-weathering finish might be less visible to persons in the project area (and more harmonious with the environment), as compared with taller, galvanized structures.

Finally, aesthetic impacts can also be mitigated through inclusion of specific conditions in individual easement agreements with landowners along the route, e.g., compensation or new plantings / landscaping.

Noise
Noise can be defined as unwanted sound. Noise is measured in units of decibels (dB) on a logarithmic scale. The A weighted decibel scale (dBA) corresponds to the sensitivity range for human hearing. A noise level change of 3 dBA is barely perceptible to average human hearing while a 5 dBA change in noise level is noticeable.

All noises produced by the project must be within Minnesota noise standards (**Table 6**). These standards are promulgated by the Minnesota Pollution Control Agency (MPCA). The standards are organized by the type of environment where the noise occurs (Noise Area Classification, NAC) and the time of day. The noise standards are expressed as a range of permissible dBA within a 1-hour period; L50 is the dBA that may be exceeded 50 percent of the time within an hour, while L10 is the dBA that may be exceeded 10 percent of the time within 1 hour.

The primary noise receptors in the project area would be residences and commercial buildings. Residences are in noise area classification one (NAC 1). Noise receptors could also include citizens using recreational facilities in the project area, e.g., parks and trails.

Potential Impacts
Potential noise impacts from the Kohlman Lake to Goose Lake project can be grouped into three categories: (1) noise due to construction, and noise due to operation of the (2) transmission line and (3) substations. For each of these categories, noise impacts are anticipated to be minimal.

Construction Noise

Construction noise is expected to occur during daytime hours as the result of heavy equipment operation and increased vehicle traffic associated with the transport of construction personnel and supplies. Any exceedances of the MPCA daytime noise limits would be temporary in nature and no exceedances of the MPCA nighttime noise limits are expected for the project.

Table 6. Minnesota Noise Standards[72]

Noise Area Classification (NAC)	Daytime		Nighttime	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

Transmission Line Noise

Noise from transmission lines (electrical conductors) is due to small electrical discharges which ionize surrounding air molecules. This phenomenon is known as corona. The level of noise from these discharges depends on conductor conditions, voltage levels, and weather conditions. Noise emissions are greatest during heavy rains, when conductors are consistently wet. However, during heavy rains, the background noise level is usually greater than the noise from the transmission line and few people are in close proximity to the transmission line in these conditions. As a result, audible noise is not noticeable during heavy rains.

In foggy, damp, or light rain conditions, transmission line may produce audible noise higher than background levels. During dry weather, noise from transmission lines is an imperceptible, sporadic crackling sound. Xcel Energy modeled and estimated noise levels for the Kohlman Lake to Goose Lake project (**Table 7**).[73] This modeling indicates that noise levels from the new double circuit 115 kV line will be approximately 22 dBA at the edge of the transmission line ROW. These noise levels are within Minnesota noise standards (i.e., < 50 dBA). The noise level from the double circuit line will be approximately 4 dBA greater than that produced currently by the existing single circuit 115 kV line (**Table 7**).

[72] Minnesota Rules 7030.0040, https://www.revisor.leg.state.mn.us/rules/?id=7030.0040. Standards expressed in dBA. Day time is 7:00 a.m. – 10:00 p.m.; night time is 10:00 p.m. – 7:00 a.m.
[73] Route Permit Application, Section 6.2.4.

Table 7. Estimated Transmission Line Noise Levels at Edge of Right-of-Way[74]

Transmission Line	L_5 (dBA)	L_{50} (dBA)
Double Circuit 115 kV Line (Proposed)	25.1	21.6
Single Circuit 115 kV Line (Existing)	20.9	17.4

Substation Noise

Noises associated with a substation result from the operation of transformers and switchgear. Transformers produce a consistent humming sound, resulting from magnetic forces within the transformer core. This sound does not vary with transformer load. Switchgear produces short-term noises during activation of circuit breakers. These activations are infrequent.

The Kohlman Lake to Goose Lake project proposes modifications to the Kohlman Lake and Goose Lake substations – primarily, the installation of additional circuit breakers. No new transformers will be installed. As a result, the noise levels produced by each substation will not change as a result of the project. There will be no incremental noise level increase.

Xcel Energy has modeled and estimated noise levels from the Kohlman Lake and Goose Lake substations (**Table 8**). Noise levels at 50 feet from the substations' fencelines are estimated to be in the range of 36 to 49 dBA. These noise levels are within Minnesota noise standards (i.e., < 50 dBA), although the estimated upper end of the noise range at the Goose Lake substation is very near 50 dBA.

Table 8. Estimated Substation Noise Levels at 50 feet from Fenceline[75]

Substation	L_{50} (dBA range)
Kohlman Lake	42.8 – 46.3
Goose Lake	36.7 – 49.5

Mitigation

Noise impacts from the Kohlman Lake to Goose Lake project are anticipated to be minimal; thus, no mitigative measures are proposed. Construction noise levels are anticipated to be within Minnesota noise standards. Transmission line operation noise levels will increase slightly due to the project, but are predicted be well within Minnesota noise standards. Substation operation noise levels will not change as a result of the project and are predicted to be within Minnesota noise standards. Route permits issued by the Commission require compliance with these standards (see **Appendices C** and **D**).

Displacement

Displacement is the removal of a residence or building to facilitate the operation of a transmission line. In general, no residences or buildings are allowed within the right-of-way (ROW) for a transmission line.

[74] Route Permit Application, Table 12. Estimates calculated using the Bonneville Power Administration corona and fields effect program.
[75] Route Permit Application, Section 6.2.4.

The ROW is established to ensure safe operation of the line. Displacements are relatively rare and are more likely to occur in densely populated areas.

One residence and four commercial buildings are within the proposed route for the project, i.e., within 100 feet of the anticipated alignment of the transmission line (**Table 5**). There are no residences or commercial buildings within the anticipated right-of-way for the project, i.e., within 37.5 feet of the anticipated alignment.

Potential Impacts
As there are no residences or commercial buildings within the anticipated right-of-way for the project, no displacements are anticipated as a result of the Kohlman Lake to Goose Lake project.

Mitigation
No displacements are anticipated as a result of the Kohlman Lake to Goose Lake project; thus, no mitigation measures are proposed.

Property Values
The placement of infrastructure near human settlements has the potential to impact property values. The impacts can be positive and negative. The type and extent of impacts depends on the relative location of the infrastructure and existing land uses in the project area. For example, a new highway may increase the value of properties anticipated to be used for commercial purposes, but decrease the value of nearby residential properties.

Potential impacts to property values due to transmission lines are related to three main concerns: (1) potential aesthetic impacts of the line, (2) concern over potential health effects from electric and magnetic fields (EMF), and (3) potential interference with agriculture or other land uses. Research on the relationship between property values and proximity to transmission lines has not identified a clear cause and effect relationship. Rather, the presence of a transmission line is one of many factors that affect the value of a specific property. The research has revealed trends which are generally applicable to properties near transmission lines:[76]

- When negative impacts on property values occur, the potential reduction in property values is in the range of 1 to 10 per cent.
- Impacts on property values decrease with distance from the line. Thus, impacts on the sale price of smaller properties are usually greater than impacts 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.
- Negative impacts appear to diminish over time.
- The value of agricultural property is likely to decrease if the power line poles are placed in an area that inhibits farming operations.

[76] Appendix D; see also the Final Environmental Impact Statement, Arrowhead–Weston Electric Transmission Line Project, Volume I, Public Service Commission of Wisconsin Docket 05-CE-113, October 2000, p. 212-215.

Interviews with residents along existing transmission lines show that a high proportion of residents were aware of the lines at the time they purchased their home and between one-half and three-fourths expressed concerns about the lines. The concerns were related to health effects, aesthetics, and effects on property values. Despite the concerns expressed, 67 to 80 percent of survey respondents with negative feelings about transmission lines reported that their decision to purchase the property and the price they offered to pay was not affected by the lines.[77]

Potential Impacts

Impacts to property values due to the Kohlman Lake to Goose Lake project are anticipated to be minimal. Any property value impacts from the project would be incremental – the project proposes to replace an existing single circuit 115 kV line. The new double circuit line will introduce taller structures and more conductors, and these elements will slightly change the aesthetics in the project area. It is not anticipated that this change in aesthetics will appreciably impact property values.

The proposed route for the project follows an existing transmission line and railroad corridor. As best can be determined the railroad line was built in the early 1900s and the single circuit 115 kV transmission line in 1969.[78] Substantial urban development has occurred in the intervening forty-some years since the transmission line was built, such that property values in the project area already incorporate this corridor and its uses.[79] The proposed project does not change these uses. The project minimally impacts investments and expectations related to aesthetics and property values in the project area.

Mitigation

Impacts to property values are generally mitigated by choosing routes and alignments that place transmission lines away from residences and commercial buildings, and by routing along existing corridors, e.g., roads, railroads, property boundaries. Xcel Energy's proposed route does just this – i.e., it follows an existing transmission line and railroad corridor. Property value impacts can also be mitigated through inclusion of specific conditions in individual easement agreements with landowners along the route.

Electronic Interference

Transmission lines have the potential to interfere with the normal operation of electronic devices. Interference can result from electromagnetic noise created by the ionization of air molecules surrounding conductors. This ionization is commonly known as corona. Interference can also result from transmission line poles which block line-of-sight communications.

No impacts to electronic devices are anticipated as a result of the Kohlman Lake to Goose Lake project. Interference due to electromagnetic noise is not anticipated. Interference due to line-of-sight obstruction is not anticipated and can be mitigated. Xcel Energy indicates that should electronic interference occur as a result of the project, it will work with affected landowners to restore reception to pre-project quality.[80]

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[77] Chalmers, James A. and Frank A. Voorvaart, "High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects," The Appraisal Journal, Summer 2009, http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/2009_HVTLs_and_Property_Values.pdf.

[78] Xcel Energy Additional Project Information.

[79] Aerial maps of growth and development in the project area over time are available on Ramsey County's Map Ramsey website: https://maps.co.ramsey.mn.us/SilverlightViewer_1_9/index.html?Viewer=MapRamsey.

[80] Route Permit Application, Section 6.2.5.

Radio Interference

Corona from transmission line conductors can generate electromagnetic noise in the radio frequency range. This noise may cause interference with radio communications. Amplitude modulation (AM) radio interference typically occurs immediately under a transmission line and dissipates rapidly on either side. If radio interference from transmission line corona does occur, satisfactory reception from AM radio stations can be restored by appropriate modification of the receiving antenna system.[81]

Frequent modulation (FM) radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise decreases in magnitude with increasing frequency and is quite small in the FM broadcast band (88-108 megahertz, MHz). Additionally, the interference rejection properties inherent in FM radio systems make them virtually immune to electromagnetic noise.[82]

Two-way radios used for emergency services typically operate at frequencies greater than 150 MHz.[83] Minnesota is currently moving to a statewide emergency communications system that operates at 800 MHz.[84] Corona-generated electromagnetic noise is minimal at these frequencies.

Potential Impacts

Impacts to radios due to the Kohlman Lake to Goose Lake project are anticipated to be minimal.

Mitigation

Impacts to AM radio reception can be mitigated by distance and antenna modifications.

Television

Potential interference with television broadcasts depends on how broadcasts are transmitted and received, e.g., analog, digital, satellite, cable.

Analog and digital television transmissions occur at frequencies greater than 54 MHz.[85] These frequencies are high enough to avoid interference with corona-generated electromagnetic noise. Additionally, digital transmissions are not dependent on waveforms to transfer broadcast content, but rather on packets of binary information, which, in general, are less susceptible to corruption and can be corrected for errors. Analog transmissions can be subject to multipath reflections that result in a ghosting effect. Digital transmissions are susceptible to freezing and pixelation due to multipath reflections and/or low signal strength.

Satellite television is transmitted in the K_u band of radio frequency (12-18 GHz) and is not susceptible to corona-generated noise.[86] Satellite television is susceptible to line-of-sight obstruction. Even minor obstructions, e.g., rain, can cause loss of signal. If the obstruction is removed, the signal interference will be removed and the broadcast unaffected.

[81] Id.
[82] Id.
[83] Emergency Medical Services Regulatory Board, EMS Radio Project, http://www.emsrb.state.mn.us/comm.asp.
[84] Id.
[85] North American Broadcast Television Frequencies, http://en.wikipedia.org/wiki/North_American_broadcast_television_frequencies.
[86] Satellite Television, http://en.wikipedia.org/wiki/Satellite_television.

Cable is a redistributed form of satellite broadcast and is generally not susceptible to interference due to the use of shielded coaxial cable. Cable broadcasts can suffer interference if the satellite broadcast suffers interference, e.g., line-of-sight obstruction.

Potential Impacts
Impacts to television broadcasts due to the Kohlman Lake to Goose Lake project are anticipated to be minimal. Transmission frequencies are higher than those of corona-generated noise, which makes interference highly unlikely. Multipath reflections due to steel transmission line structures could occur but are unlikely. Line-of-sight obstructions could occur if a transmission line pole was directly in the path of a transmission signal (e.g., satellite signal)

Mitigation
Potential impacts to television broadcasts can be mitigated through several means. Use of a different antenna or moving an antenna / satellite dish will typically resolve any impacts. Xcel Energy indicates that if television interference occurs because of the project, the company will work with affected parties to mitigate impacts and restore reception to pre-project quality.[87]

Internet and Cellular Phones
Wireless internet and cellular phones use frequencies in the ultra high frequency range (900 MHz and greater). The specific UHF frequency used for a cellular phone would depend on the phone service provider's technology. UHF radio frequencies are high enough that the impacts of corona-generated noise would be negligible. Accordingly no impacts to wireless internet systems and cellular phones are anticipated, and no mitigation measures are proposed.

5.4 Public Health and Safety

Transmission line projects have the potential to negatively impact public health and safety – during construction and operation of the project. As with any project involving heavy equipment and high voltage transmission lines, there are safety issues to consider during construction. Potential health and safety impacts include injuries due to falls, equipment use, and electrocution. Potential health impacts related to the operation of the project include health impacts from electric and magnetic fields (EMF), stray voltage, ozone emissions, and electrocution.

Impacts to public health and safety resulting from the Kohlman Lake to Goose Lake project are anticipated to be minimal. No adverse health impacts due to EMF, stray voltages, or air emissions are anticipated. The new double circuit 115 kV line will have protective devices to safeguard the public from the line if an accident occurred and a structure or conductor fell to the ground.[88] These protective devices are circuit breakers and relays located within connecting substations. The protective equipment would de-energize the transmission line, should such an event occur.

Electric and Magnetic Fields (EMF)
Electric and magnetic fields (EMF) are invisible regions of force resulting from the presence of electricity. Naturally occurring EMF are caused by the earth's weather and geomagnetic field. Man-made EMF are caused by any electrical device and found wherever people use electricity (**Table 9**). EMF are characterized and distinguished by their frequencies, i.e., the rate at which the fields change direction

[87] Route Permit Application, Section 6.2.5.
[88] Route Permit Application, Section 6.2.1.

each second. All electrical lines in the United States have a frequency of 60 cycles per second or 60 Hertz (Hz). EMF at this frequency level are known as extremely low frequency EMF (ELF-EMF).

Electric fields are created by the electric charge (i.e., voltage) on a transmission line. Electric fields are solely dependent upon the voltage of a line (volts), not the current (amps). Electric field strength is measured in kilovolts per meter (kV/m). The strength of an electric field decreases rapidly as the distance from the source increases. Electric fields are easily shielded or weakened by most objects and materials, such as trees and buildings.

Magnetic fields are created by the electrical current moving through a transmission line. The magnetic field strength is proportional to the electrical current (amps). Magnetic field strength is typically measured in milliGauss (mG). Similar to electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases. However, unlike electric fields, magnetic fields are not easily shielded or weakened by objects or materials.

Table 9. Typical Magnetic Fields (milliGauss, mG) of Common Appliances[89]

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
Vacuum Cleaner	300	60	10	1
Color Televisions	NA	7	2	-

Health Studies

A concern related to EMF is the potential for adverse health effects due to EMF exposure. Extremely low frequency EMF do not have the energy to ionize molecules or to heat them. However, they are fields of energy and thus have the potential to produce effects. Electric fields are commonly experienced by the public and easily observable, e.g., static electricity caused by walking across a carpet. Magnetic fields are also commonly experienced, e.g., magnetic fields produced by using a microwave oven or vacuum cleaner, but effects are not readily observable.

In the 1970s, epidemiological studies indicated a possible association between childhood leukemia and EMF levels.[90] Since then, various types of research have been conducted to examine EMF and potential health effects including animal studies, epidemiological studies, clinical studies, and cellular studies. Scientific panels and commissions have reviewed and studied this research data. These studies have

[89] EMF Electric and Magnetic Fields Associated with the Use of Electric Power, National Institute of Environmental Health Sciences, 2002, [hereinafter NIEHS 2002 Summary] http://www.niehs.nih.gov/health/assets/docs_p_z/results_of_emf_research_emf_questions_answers_booklet.pdf.
[90] Id., p. 16.

been conducted by, among others, the National Institute of Environmental Health Sciences (NIEHS)[91], the U.S. Environmental Protection Agency (EPA)[92], the World Health Organization (WHO)[93], and the Minnesota State Interagency Working Group on EMF Issues (MSIWG)[94]. In general, these studies concur that:

- Based on epidemiological studies, there is an association between childhood leukemia and EMF exposure. There is no consistent association between EMF exposure and other diseases in children or adults.
- Laboratory, animal, and cellular studies fail to show a cause and effect relationship between disease and EMF exposure at common EMF levels. A biological mechanism for how EMF might cause disease has not been established.
- Because a cause and effect relationship cannot be established, and yet an association between childhood leukemia and EMF exposure has been shown, there is:

  (1) Uncertainty as to the potential health effects of EMF,
  (2) No methodology for estimating health effects based on EMF exposure,
  (3) A need for further study of the potential health effects of EMF,
  (4) A need for a precautionary approach in the design and use of all electrical devices, including transmission lines.

Regulations and Guidelines

There are currently no federal regulations regarding allowable electric or magnetic fields produced by transmission lines in the United States. Thus, regulation of EMF exposure due to high voltage transmission lines falls under the purview of state utility commissions. A number of states have developed state-specific regulations for electric and magnetic fields due to transmission lines (**Table 10**). Additionally, a number of international organizations have adopted standards for electric and magnetic fields (**Table 11**).

The Minnesota Public Utilities Commission has established a standard that limits the maximum electric field under transmission lines to eight (8) kV/m. All transmission lines in Minnesota must meet this standard. The Commission has not adopted a magnetic field standard for transmission lines. However, the Commission has adopted a precautionary approach in routing transmission lines and, on a case-by-case basis considers and may require (through permits) mitigation strategies for minimizing EMF exposure levels associated with transmission lines (see discussion of mitigation strategies, below).

[91] National Institute of Environmental Health Sciences, Electric and Magnetic Fields, http://www.niehs.nih.gov/health/topics/agents/emf/.
[92] Environmental Protection Agency, Electric and Magnetic Fields (EMF) Radiation from Power Lines, http://www.epa.gov/radtown/power-lines.html.
[93] World Health Organization, Electromagnetic Fields, http://www.who.int/peh-emf/en/.
[94] A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options, Minnesota State Interagency Working Group on EMF Issues, http://energyfacilities.puc.state.mn.us/documents/EMF White Paper - MN Workgroup Sep 2002.pdf [hereinafter MSIWG White Paper on EMF Issues].

Table 10. State Electric and Magnetic Field Standards[95]

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	---	---

[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.

Potential Impacts

No adverse health impacts from electric or magnetic fields are expected for persons living or working near the Kohlman Lake to Goose Lake project. Xcel Energy has modeled and calculated the electric and magnetic fields associated with the project. The calculated electric field for project is 0.77 kV/m at the transmission line centerline and 0.23 kV/m at the edge of the transmission line ROW (**Table 12**). These calculated electric fields are less than the standard prescribed by the Commission (8 kV/m). As a result of phase cancellation between circuits, electric fields associated with the new double circuit 115 kV line be less than those currently produced by the existing single circuit 115 kV line (**Table 12**).

The calculated average magnetic field for the project is 39.50 mG at the transmission line centerline, and 11.66 mG at the edge of the transmission line ROW (**Table 13**). Xcel Energy indicates that 60 percent of the time the current on the proposed line (and thus the magnetic fields produced by the line) would be at or below this average, and the remaining 40 percent of the time, the current would be between average and peak current.[96] The peak current is anticipated to be reached two to three times per year,

[95] NIEHS, Electric and Magnetic Fields Associated with the Use of Electric Power, Questions and Answers, p. 46, http://www.niehs.nih.gov/health/assets/docs_p_z/results_of_emf_research_emf_questions_answers_booklet.pdf
[96] Xcel Energy Additional Project Information.

during hot days during the summer.[97] The calculated peak magnetic field for the project is 65.79 mG at the transmission line centerline, and 19.43 mG at the edge of the transmission line ROW (**Table 13**).

Table 11. International Electric and Magnetic Field Guidelines[98]

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	General Public	Occupational	General Public	Occupational
IEEE	5	20	9,040	27,100
ICNIRP	4.2	8.3	2,000	4,200
ACGIH	---	25	---	10,000/1,000[a]
NRPB	4.2	---	830	4,200

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.

The calculated magnetic field for the project, at the edge of the transmission line ROW and under average loads, is less than 12 mG; for peak loads it is less than 20 mG. These fields are below all state and international standards that have been developed for magnetic fields. Additionally, as a result of phase cancellation between circuits and lower projected currents on the double circuit line, magnetic fields associated with the new double circuit 115 kV line will be less than those currently produced by the existing single circuit 115 kV line (**Table 13**). That is, the incremental impact of the project will be to lower magnetic fields associated with the transmission line in the project area. Accordingly, based on the scientific evidence to date, no adverse health impacts from electric or magnetic fields are expected for persons living or working near the Kohlman Lake to Goose Lake project.

Mitigation

No health impacts due to EMF are anticipated from the Kohlman Lake to Goose Lake project; thus, no mitigation measures are proposed. However, consistent with the Commission's precautionary approach to potential EMF impacts, basic mitigation measures are prudent. Electric and magnetic fields diminish with distance from a conductor. Thus, EMF exposure levels can be minimized by routing transmission lines away from residences and other locations where citizens congregate. EMF exposure levels can also be minimized by conductor configurations than facilitate phase cancellation between circuits.[99]

[97] Id.
[98] Id.; ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz – 100kHv), 2010, http://www.icnirp.org/documents/LFgdl.pdf; NRPB guidelines are the 1998 ICNIRP guidelines. The NRPB became the Health Protection Agency (HPA) in 2004, http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1254510609795?p=1219908766891; ACGIH, Documentation of the Threshold Limit Values for Physical Agents, 7th Edition, http://www.acgih.org/store/ProductDetail.cfm?id=654.
[99] MSIWG White Paper on EMF Issues.

The Kohlman Lake to Goose Lake project employs both of these mitigation strategies – (1) the proposed route for the project follows an existing transmission line and railroad corridor which, though in an urban area, is relatively less populated, and (2) the change to a double circuit configuration causes cancellation of the electric and magnetic fields such that these fields for the new line will be less than those currently produced by the existing single circuit 115 kV line.

Table 12. Calculated Electric Fields (kV/m)[100]
(3.28 feet above ground)

Transmission Line	Distance from Centerline (feet)						
	-100	**-50**	**-37.5**	**0**	**37.5**	**50**	**100**
Double Circuit 115 kV Line (Proposed)	0.02	0.08	0.22	0.77	0.23	0.08	0.02
Single Circuit 115 kV Line – Delta Configuration (Existing)	0.06	0.19	0.31	1.10	0.33	0.21	0.05
Single Circuit 115 kV Line – Linear Configuration (Existing)	0.04	0.04	0.09	1.12	0.03	0.04	0.03

[100] Revised Table 6 from Route Permit Application, Xcel Energy Additional Project Information. A delta configuration has two conductors on one side of the pole; one conductor on the other. See Figure 11. A linear configuration places all three conductors on the same side of the pole. See Figure 7.

Table 13. Calculated Magnetic Fields (mG)[101]
(3.28 feet above ground)

Transmission Line / Loading	Current (amps)	Distance from Centerline (feet)						
		-100	-50	-37.5	0	37.5	50	100
Double Circuit 115 kV Line (Proposed) / Peak	523	1.73	9.28	16.50	65.79	19.43	11.52	2.50
Double Circuit 115 kV Line (Proposed) / Average	314	1.04	5.57	9.90	39.50	11.66	6.92	1.50
Single Circuit 115 kV Line – Delta Configuration (Existing) / Peak	826	7.48	24.73	37.41	100.65	32.01	21.25	6.39
Single Circuit 115 kV Line – Delta Configuration (Existing) / Average	496	4.49	14.85	22.46	60.44	19.22	12.76	3.84
Single Circuit 115 kV Line – Linear Configuration (Existing) / Peak	826	5.72	19.88	30.52	75.9	22.27	15.07	4.84
Single Circuit 115 kV Line – Linear Configuration (Existing) / Average	496	2.81	9.77	15.0	37.30	10.95	7.41	2.38

[101] Revised Table 7 from Route Permit Application, Xcel Energy Additional Project Information.

Implantable Medical Devices

Implantable medical devices such as pacemakers, defibrillators, neurostimulators, and insulin pumps are electromechanical devices and may be subject to interference from electric and magnetic fields. Most of the research on electromagnetic interference and medical devices is related to pacemakers. Implantable cardiac devices (pacemakers) are more sensitive to electric fields than to magnetic fields.[102] In laboratory tests, the earliest interference from magnetic fields in pacemakers was observed at 1,000 mG, a field strength greater than that associated with high voltage transmission lines.[103] Therefore, the focus of research has been on electric field impacts.

Electric fields may interfere with an implanted cardiac device's ability to sense normal electrical activity in the heart. 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 cardioverters/ defibrillators, have indicated that electric fields below six (6) kV/m are unlikely to cause interactions affecting operation of modern bipolar devices. 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.[104]

Potential Impacts

The maximum electric field strength for the Kohlman Lake to Goose Lake project is 0.77 kV/m. This field strength is below the 6 kV/m interaction level for modern, bipolar pacemakers, and below the range of interaction levels for older, unipolar pacemakers. Accordingly, impacts to implantable medical devices and persons using these devices from the Kohlman Lake to Goose Lake project are anticipated to be minimal.

Mitigation

No impacts to implantable medical devices and persons using these devices are anticipated from the Kohlman Lake to Goose Lake project; thus, no mitigation measures are proposed.

Stray Voltage

Stray voltage is an extraneous voltage that appears on metal surfaces in buildings, barns and other structures, which are grounded to earth. This voltage is also called a neutral-to-earth voltage (NEV). Stray voltage is typically experienced by livestock who simultaneously come into contact with two metal objects (e.g., feeders, waterers, stalls). If there is a voltage between these objects, a small current will flow through the livestock. The fact that both objects are grounded to the same place (earth) would seem to prevent any voltage from existing between the objects. However, this is not the case – a number of factors determine whether an object is, in fact, grounded. These include wire size and length, the quality of connections, the number and resistance of ground rods, and the current being grounded.[105] Thus, stray voltage can exist at any business, house, or farm which uses electricity, independent of whether there is a transmission line nearby.

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[102] Electric Power Research Institute (EPRI), 2004, Electromagnetic Interference with Implanted Medical Devices.
[103] Id.
[104] 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 Ltd., Helsinki, Finland.
[105] Stray Voltage, NDSU Extension Publication #108, http://www.ag.ndsu.edu/extension-aben/epq/files/epq108.pdf.

Stray voltage, if prevalent in an agricultural operation, can affect livestock health. Stray voltage has primarily been raised as a concern on dairy farms because of its potential to effect milk production and quality. Stray voltage is by and large an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms.

Potential Impacts

No impacts due to stray voltage are anticipated from the Kohlman Lake to Goose Lake project. The project is a double circuit 115 kV line that does not directly connect to businesses or residences in the area, and does not change local electrical service. However, transmission lines, where they parallel distribution lines can, in the immediate area of the paralleling, cause current to flow on these lines (additional current, as the distribution lines already carry current). For distribution lines and electrical service that are properly wired and grounded, these additional currents are of no matter. However, for distribution lines and electrical service that are not properly wired and grounded, these additional currents could create stray voltage impacts.

For a short length of the Kohlman Lake to Goose Lake project – approximately five structures near the Goose Lake substation – the new double circuit 115 kV line would parallel an existing distribution line, i.e., the distribution would be underbuilt on the poles that carry the 115 kV line (see Section 5.5, **Figure 11**). This arrangement could create additional currents on the distribution line in the immediate area of the paralleling. These currents are not anticipated to cause any stray voltage issues in the project area. If, however, there is not proper grounding or wiring on the distribution system or at a nearby residence, business, or farm, these currents could point up this insufficiency.

Mitigation

No impacts due to stray voltage are anticipated from the Kohlman Lake to Goose Lake project. There are a number of strategies for mitigating stray voltage impacts should they occur, including phase cancellation, separation, and improved grounding.[106] Xcel Energy indicates that if any person has a question or concern about stray voltage on their property they may contact Xcel Energy for information and a site investigation.[107]

Induced Voltage

The electric field from a transmission line can reach a nearby conductive object, such as a vehicle or a metal fence, which is in close proximity to the 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).

[106] Route Permit Application, Section 5.2.3.
[107] Id.

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.

Potential Impacts
No impacts due to induced voltage are anticipated from the Kohlman Lake to Goose Lake project. Route permits issued by the Commission require that transmission lines be constructed and operated to meet NESC standards and the Commission's electric field limit of 8 kV/m (see **Appendices C** and **D**).

Mitigation
No impacts due to induced voltage are anticipated from the Kohlman Lake to Goose Lake project. Any potential impacts will be mitigated by the Commission's standard permit requirements regarding grounding, NESC discharge limits, and the Commission's electric field limit of 8 kV/m (see **Appendices C** and **D**).

Air Quality
Potential air quality impacts due to the Kohlman Lake to Goose Lake project are of two types: (1) emissions of ozone and nitrous oxide during operation, and (2) dust caused by construction activities.

Ozone and Nitrous Oxide
Transmission lines have the potential to produce small amounts of ozone (O_3) and nitrous oxide (NO_X). These compounds are created by the ionization of air molecules surrounding the conductor. Ozone production from a conductor is proportional to temperature and sunlight and inversely proportional to humidity.

Ozone and nitrous oxide are reactive compounds that contribute to smog and can have adverse impacts on human respiratory systems.[108] Accordingly, these compounds are regulated and have permissible concentration limits. The State of Minnesota has an ozone limit of 0.08 parts per million (ppm).[109] The federal ozone limit is 0.075 ppm.[110] Ozone and nitrous oxide emissions from the new double circuit 115 kV line are anticipated to be well below these limits.[111]

Construction Dust
Construction of the Kohlman Lake to Goose Lake project will create dust and cause emissions from construction vehicles, i.e., diesel exhaust. The magnitude of emissions is dependent on weather conditions and the specific construction activity taking place. Any adverse impacts are anticipated to be temporary.

[108] Six Common Air Pollutants, U.S. Environmental Protection Agency, http://www.epa.gov/air/urbanair/.
[109] Minnesota Rules 7009.0800, https://www.revisor.mn.gov/rules/?id=7009.0080.
[110] Ground-level Ozone, U.S. Environmental Protection Agency, http://www.epa.gov/glo/actions.html.
[111] Route Permit Application, Section 6.5.1.

Potential Impacts
No significant impacts to air quality are anticipated from the Kohlman Lake to Goose Lake project. Ozone and nitrous oxide emissions are anticipated to be less than state and federal standards. Emissions of these compounds will increase airborne concentrations of ozone and nitrous oxide in the greater metropolitan area; however, the impact of these emissions will be relatively minor.[112] Impacts due to construction dust are anticipated to be minor and temporary.

Mitigation
No significant impacts to air quality are anticipated from the Kohlman Lake to Goose Lake project; thus, no mitigation measures are proposed. Xcel Energy indicates that it will use best management practices to minimize dust created during the construction of the project.[113]

5.5 Public Services

Transmission line projects have the potential to negatively impact public services, e.g., roads, utilities, and emergency services. These impacts are typically temporary in nature, e.g., the inability to fully use a road or utility while construction is in process. However, impacts can be more long term if they change the project area in such a way that public service options are foreclosed or limited.

Temporary impacts to public services resulting from the Kohlman Lake to Goose Lake project are anticipated to be minimal. Long-term impacts to public services are not anticipated.

Roads and Highways
The proposed route for the Kohlman Lake to Goose Lake project crosses I-694 and Highway 61 (**Figure 9** and **Figure 10**).[114] These crossings will occur on the same alignment as the existing single circuit 115 kV line. Xcel Energy must obtain permits and approvals from the Minnesota Department of Transportation (MnDOT) for these crossings (see **Table 1**). Xcel Energy will also be required to comply with MnDOT's accommodation policy for the placement of utilities along and across state highways.[115]

Highway 61, in the area where the transmission line is proposed to cross, is designated as a house moving route.[116] For such a route, the minimum clearance from the roadway to an aerial crossing is 24 feet.[117] In spanning Highway 61, Xcel Energy will be required to meet this clearance requirement.[118]

The proposed route for the project also crosses four county roadways – County Road D, County Road E, county Road F, and County Road 146.[119] These crossings will occur on the same alignment as the existing single circuit 115 kV line. Xcel Energy indicates that it will work with Ramsey County to obtain

[112] Nitrogen Oxides, http://www.epa.gov/cgi-bin/broker?polchoice=NOX&_debug=0&_service=data&_program=dataprog.national_1.sas (noting the primary sources of nitrogen oxide emissions).
[113] Route Permit Application, Section 6.5.1.
[114] Route Permit Application, Section 6.2.10.
[115] Minnesota Department of Transportation, Utility Agreements and Permits, http://www.dot.state.mn.us/utility/policy/index.html.
[116] Minnesota Department of Transportation, Letter on Scope of Environmental Assessment, May 7, 2013, eDockets Number 20135-86965-01.
[117] Minnesota Department of Transportation, Personal Communication, May 8, 2013.
[118] Id. Clearances for specific roadway designations are included in the utility permit application required by MnDOT for crossing a roadway (see Table 1).
[119] Route Permit Application, Section 6.2.10.

any necessary permits for these county road crossings.[120] The city of Maplewood has road improvement plans for County Road D, just north of the Kohlman Lake substation.[121] Xcel Energy indicates that it will work with the city to ensure that the final alignment for the project will not interfere with the city's road improvement plans.[122]

Potential Impacts

Impact to roads and highways due to the Kohlman Lake to Goose Lake project are anticipated to be minimal and temporary. All road and highway crossings will occur where there is currently already a crossing – i.e., crossings will occur on the same alignment as the existing single circuit 115 kV line, which will be removed as part of the project. Minor, temporary impacts to roads may occur during construction of the project, e.g., due to movement of materials, movement of equipment, temporary traffic redirection. No impacts to roads and highway are anticipated after the project has been constructed.

Mitigation

Impacts to roads and highways can be mitigated through the selection of routes and alignments that minimize interference with these travel corridors. Xcel Energy's proposed route implements this mitigation strategy – the proposed route utilizes an existing transmission line corridor and existing transmission line crossing locations for the project. Impacts to roads and highways due to construction can be minimized by using construction best management practices generally.

[120] Id.
[121] Id.
[122] Id.

Figure 9. Existing Single Circuit 115 kV Crossing of I-694[123]

[123] View looking north across I-694.

Figure 10. Existing Single Circuit 115 kV Crossing of Highway 61

Water Utilities

Potable water is provided in the project area by municipal water supplies, typically municipal wells.[124] Sanitary sewer discharges are handled through the Metropolitan Council sewer and treatment system.[125] There are several Metropolitan Council sewer lines (interceptor lines) in the project area, including a line that roughly parallels Xcel Energy's proposed route (**Map B-14**). This line is a 36 inch pipe that was constructed in 1975 and that conveys approximately 3.5 million gallons per day of sewage from Vadnais Heights, White Bear Lake, White Bear Township, and other municipalities.[126]

Potential Impacts

The Metropolitan Council sewer line that parallels the proposed route, does so on the western edge of the existing railroad corridor (**Map B-14**). The proposed route will proceed along the eastern edge of the corridor; thus, no impacts to the sewer line are anticipated in this area of paralleling.

There are, however, two areas where the proposed route crosses a sewer line – (1) on the southern end of the project, just north of I-694, and (2) on the northern end of the project near Goose Lake (**Map B-14**). In these areas, if a transmission line pole were placed on or near the sewer line, the sewer line

[124] Route Permit Application, Section 6.2.10.
[125] Id. See also Metropolitan Council Wastewater & Water, http://www.metrocouncil.org/Wastewater-Water.aspx.
[126] Xcel Energy Additional Project Information.

could be damaged. Pole foundations will extend 20-40 feet below ground (see Section 4.2). These foundations and the equipment used to place these foundations could damage a sewer line.

Mitigation
Potential impacts to Metropolitan Council sewer lines can be avoided by placing the project's transmission line poles away from these lines. Poles could be sited to avoid sewer lines – e.g., by spanning them or paralleling them at a distance. Construction procedures could be adapted to avoid the use of heavy equipment near sewer lines. The Metropolitan Council has requested that Xcel Energy provide detailed project plans to the Council for review and comment prior to beginning construction of the project.[127]

Electric Utilities
Electrical service in the project area is provided by Xcel Energy. The Kohlman Lake to Goose Lake project proposes to replace an existing single circuit 115 kV transmission line with a new double circuit 115 kV line. There is an electrical distribution line that runs along the western edge of Otter Lake Road, just south of the Goose Lake substation (**Figure 11**). Xcel Energy proposes to place this distribution line on the same poles as the new double circuit 115 kV line (a process known as underbuilding).[128]

Potential Impacts
The electrical transmission system in the project area will change as a result of the project, but no adverse impacts to electrical service are anticipated.

Mitigation
No adverse impacts to electric utilities are anticipated from the Kohlman Lake to Goose Lake project; thus, no mitigation measures are proposed.

Emergency Services
Potential impacts to emergency services in the project area could result from (1) an inability to communicate that there is an emergency or (2) an inability to respond to an emergency.

Potential Impacts
Potential impacts to communications systems due to the Kohlman Lake to Goose Lake project are discussed in Section 5.6. No impacts to communications systems are anticipated; therefore no impacts to the community's ability to communicate regarding an emergency are anticipated. During construction of the project, there may be temporary impacts to roads which could impede responses to an emergency. However, these impacts are anticipated to be minimal (see discussion above). No impacts to emergency services are anticipated once the project is operational.

Mitigation
No impacts to emergency services are anticipated from the Kohlman Lake to Goose Lake project; thus, no mitigation measures are proposed.

[127] Metropolitan Council, Comment Letter on Scope of Environmental Assessment, February 26, 2013, eDockets Number 20135-86965-01.
[128] Route Permit Application, Section 3.2.

Figure 11. Existing Distribution Line Underbuild along Otter Lake Road[129]

5.6 Land-Based Economies

Transmission lines have the potential to impact land-based economies. Transmission lines and poles are a physical presence on the landscape. This presence can prevent or otherwise limit use of the landscape for other purposes. In general, and for safe operation of the line, buildings and tall growing trees are not allowed in transmission line rights-of-way. This limitation can create impacts for commercial businesses and forestry. Additionally, transmission line poles take up space on the ground that could be used for other purposes, e.g., agriculture, mining.

Impacts to land-based economies due to the Kohlman Lake to Goose Lake project are anticipated to be minimal. There are no agricultural, forestry, or mining operations in the project area. Impacts to recreation and tourism are anticipated to be minimal and limited to the aesthetic impacts of the project. Impacts to land-based economies can be minimized by prudent routing, i.e., by choosing routes and alignments that avoid such economies. Impacts can be mitigated by the use of designs and structures which are, to the extent possible, compatible with land-based economies.

Agriculture

Potential impacts to agriculture fall generally into two types – temporary and permanent impacts. Temporary impacts are impacts due to construction activities. Permanent agricultural impacts are

[129] View looking north toward Goose Lake substation.

impacts due to the physical presence of transmission line poles in agricultural fields. This presence can lead to financial impacts, e.g., loss of farming income, decrease in property value.

There are no agricultural operations in the project area.[130] Thus, no impacts to agricultural operations are anticipated and no mitigation measures are proposed.

Forestry

Potential impacts to forestry operations are due to the removal of trees. In general, and for safe operation of the line, tall growing trees are not allowed in transmission line rights-of-way. Removal of trees directly impacts the resource which is being sold by forestry operations.

There are no forestry operations in the project area.[131] Thus, no impacts to forestry operations are anticipated and no mitigation measures are proposed.

Mining

Impacts to mining operations can occur where transmission lines interfere with access to and the ability to remove minerals (or other resources, e.g., aggregate, peat). There are no mining operations and no known mineral or aggregate resources in the project area.[132] Thus, no impacts to mining operations are anticipated and no mitigation measures are proposed.

Recreation and Tourism

Potential impacts to recreation and tourism can occur when transmission lines interfere with natural or man-made resources designed to provide these activities. For example, transmission lines could change the aesthetic or function of a recreational destination such that the number of visitors to the destination decreases.

The Kohlman Lake to Goose Lake project is located in a highly developed urban area where tourism opportunities are relatively few and are limited to recreational resources in the project area.[133] There are a variety of recreational resources in the project area. The Bruce Vento trail – a multi-use recreational trail – is located adjacent to the proposed route for approximately 2,000 feet, just north of the Kohlman Lake substation (**Map B-15, Figure 12**).[134] The trail follows an abandoned railroad corridor from downtown St. Paul northward, past Lake Phalen, to its current terminus just north of I-694.[135] The trail is an asphalt trail used for biking, skating, walking, and skiing. The trail is proposed to be extended northward at some future date, in the same transmission and railroad corridor as the Kohlman Lake to Goose Lake project. Xcel Energy indicates that it has conferred with Ramsey County parks and recreation staff to discuss the county's future plans for the trail.[136]

[130] Route Permit Application, Section 6.3.
[131] Id.
[132] Id.
[133] Route Permit Application, Section 6.2.9. There are tourism opportunities in the Minneapolis – St. Paul area; however, these opportunities are, for the most part, away from the residential and commercial development in the project area. See Minneapolis St. Paul Official Visitors Guide, http://www.visit-twincities.com/.
[134] Id.
[135] Bruce Vento Regional Trail, http://en.wikipedia.org/wiki/Bruce_Vento_Regional_Trail.
[136] Route Permit Application, Section 6.2.9.

Figure 12. Bruce Vento Trail Entrance near Kohlman Lake Substation

Willow Marsh Reserve is located just north of I-694 and the Kohlman Lake substation (**Map B-15**). The reserve is an undeveloped open space with wetlands and interpretive nature trails.[137] The reserve is adjacent to and on both sides of the proposed route for approximately 2,000 feet.[138] Two local parks – McCarty Park and Stellmacher Park – are located approximately 1,500 feet and 1,000 feet respectively east of the proposed route (**Map B-15**).[139] The parks include a number of amenities including playgrounds, picnic tables, and sporting fields.[140] The Gem Lake Hills golf course is located approximately 600 feet west of the proposed route, just south of the Goose Lake substation.[141]

Potential Impacts

Impacts to recreation and tourism as a result of the Kohlman Lake to Goose Lake project are anticipated to be minimal. Construction impacts could occur at recreational resources near the proposed route – the Bruce Vento Trail and the Willow Marsh Reserve. These impacts are anticipated to be minimal and temporary. Long-term impacts – i.e., potential adverse aesthetic impacts due taller structures and more conductors – are anticipated to be minimal. There will be aesthetic impacts related to the project (see

[137] White Bear Lake Parks System, http://www.whitebearlake.org/index.asp?Type=B_BASIC&SEC={1BF519D6-1DF7-4E80-94DF-18AFACA03996} [hereinafter White Bear Lake Parks System].
[138] Route Permit Application, Section 6.2.9.
[139] Id.
[140] White Bear Lake Parks System.
[141] Route Permit Application, Section 6.2.9.

Section 5.3). However, these impacts are not expected to impact recreation decisions made by citizens or their enjoyment of recreational resources in the project area. No long-term impacts are anticipated to the Bruce Vento trail or its possible extension northward.

Mitigation
Impacts to recreation and tourism can be mitigated by selecting routes and alignments that avoid recreational features. Impacts could also be mitigated by limiting the aesthetic impact of structures, such that impacts to recreational activities are minimized – e.g., minimizing impacts to natural landscapes during construction, plantings to minimize visual exposure of foundations/structures, choosing structure heights, where possible, that better blend with the environment, and choosing structure finishes (galvanized vs. self-weathering) that better blend with the environment.

5.7 Archaeological and Historic Resources

Transmission lines have the potential to impact archaeological and historic resources. Archaeological resources can be impacted by the disruption or removal of such resources during the construction of a line. Historic resources can be impacted by the placement of a line in a manner that impairs or decreases the historic value of the resource. No impacts to archaeological or historic resources are anticipated as a result of the Kohlman Lake to Goose Lake project.

Potential Impacts
Xcel Energy has conducted a phase 1A literature review for the Kohlman Lake to Goose Lake project and has conferred with the Minnesota State Historic Preservation Office (SHPO) concerning the probability of cultural resources (archaeological and historic resources) in the project area.[142] The review indicates that there no known archaeological or historic sites within one-half mile of the proposed route.[143] Additionally, because the project will be located in an already highly developed urban area, the potential for unrecorded archaeological resources within the project area is low.[144]

As there are no archaeological or historic sites within the project area, no impacts to these resources are anticipated due to the Kohlman to Goose Lake project.

Mitigation
No impacts to archaeological or historic resources are anticipated and thus no mitigation measures are proposed. Xcel Energy indicates that should archaeological sites or resources be identified during construction of the project, work will be stopped and SHPO staff consulted on how to proceed.[145] Consultation with SHPO concerning resources encountered during construction is a standard HVTL route permit condition (see **Appendices C** and **D**).

5.8 Water Resources

Transmission lines have the potential to impact water resources, primarily though construction activities which move, remove, or otherwise handle vegetative cover and soils. Changes in vegetative cover and soils can change runoff and water flow patterns such that surface waters, groundwater, and wetlands

[142] Route Permit Application, Section 6.4.
[143] Id.
[144] Id; see also Route Permit Application, Appendix H.
[145] Route Permit Application, Section 6.4.

are adversely impacted. Impacts to water resources from the Kohlman Lake to Goose Lake project are anticipated to be minimal.

Surface Waters

The Kohlman Lake to Goose Lake project is located in the Twin Cities Mississippi River watershed of the Upper Mississippi River basin.[146] The project area includes several lakes, formed by glaciation and existing to this day, including Goose Lake, Rice Lake, Gem Lake, and Willow Lake (**Map B-16**). Additionally, there are several drainage ditches which flow from and connect lakes in the project area. These waterbodies are classified by the Minnesota Department of Natural Resources (DNR) as public waters in Minnesota.[147] Public waters are waters of the state – i.e., waters which belong to the state of Minnesota as a whole. Potential impacts to these waters and their uses are regulated by the DNR.[148] To work in public waters or to cross public waters requires a permit from the DNR (see Section 2.3).

Potential Impacts

Impacts to surface waters due to the Kohlman Lake to Goose Lake project are anticipated to be minimal, as there are strategies which can be employed to mitigate potential impacts. During construction of the Kohlman Lake to Goose Lake project, there is potential for adverse impacts to surface waters due to vegetation clearing, ground disturbances, and construction traffic. These activities can speed water flow and expose previously undisturbed soils, increasing erosion and the potential for sediment to reach surface waters. Disturbed soils will generally be limited to pole and substation locations; however, areas outside these locations may be disturbed by construction traffic and by removal of vegetation.

Mitigation

The primary means of mitigating impacts to surface waters is to select routes, alignments, and pole placements that avoid surface waters. To a great extent, Xcel Energy's proposed route avoids surface waters (**Map B-16**).

Potential impacts to surface waters can also be mitigated by using best management practices for construction of the project. Xcel Energy indicates that they will apply erosion control measures identified in the Minnesota Pollution Control Agency's (MPCA) storm water best management practices manual.[149] Xcel Energy indicates that they will minimize and prevent material discharges to surface waters and that disturbed soils will be stabilized upon completion of the construction process.[150] Permittee adherence to MPCA guidance and best management practices is a standard HVTL route permit condition (see **Appendices C** and **D**).

Construction of the project will require a number of permits from state and federal agencies, beyond a route permit from the Commission, e.g., NPDES/SDS stormwater construction permit (see Section 2.3).

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[146] Basins and Major Watersheds in Minnesota, http://www.pca.state.mn.us/index.php/view-document.html?gid=14171.
[147] Route Permit Application, Section 6.5.2; Definition of Public Waters, Minnesota Department of Natural Resources, http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/pw_definition.html.
[148] Public Waters Work Permit Program, Minnesota Department of Natural Resources, http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/index.html.
[149] Route Permit Application, 6.5.2; Stormwater Best Management Practices Manual, Minnesota Pollution Control Agency, http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/stormwater-management/stormwater-best-management-practices-manual.html.
[150] Route Permit Application Section 6.5.2.

Many of these permits and approvals are directed at the prevention and mitigation of water resource impacts.

Floodplains

Small sections of the Kohlman Lake to Goose Lake project are within the 100-year floodplain, as this floodplain is identified by the Federal Emergency Management Agency (FEMA) (**Map B-17**). Federal and state laws require that local governments take the 100-year floodplain into consideration when planning development.[151]

Potential Impacts

Impacts to the 100-year floodplain and related development in the project area due to the Kohlman Lake to Goose Lake project are anticipated to be minimal. The sections of the project within the 100-year floodplain are relatively small and primarily situated near the Kohlman Lake and Goose Lake substations (**Map B-17**). Impacts to the floodplain, if any, would be incremental and are anticipated to be *de minimis*. Xcel Energy indicates that there will no increase in the number of structures due to the project, and that no significant alterations to the local topography will occur.[152]

Mitigation

No impacts to the 100-year floodplain and related development in the project area are anticipated as a result of the Kohlman Lake to Goose Lake project; thus, no mitigation measures are proposed.

Groundwater

The Kohlman Lake to Goose Lake project is located in the metro groundwater province, which is characterized by sand aquifers overlaying sandstone, limestone, and dolomite formations.[153] Groundwater within this province is susceptible to contamination due to urban activities and also to withdrawals in excess of groundwater recharge rates.[154]

Potential Impacts

Impacts to groundwater due to the Kohlman Lake to Goose Lake project are anticipated to be minimal. Potential impacts to groundwater from the project could occur (1) through surface water impacts and (2) impacts directly to groundwater resulting from structure foundations. Impacts to surface waters can lead to impacts to groundwater; thus, concerns are similar – e.g., construction activities which lead to sedimentation, directly or through disturbed soils and vegetation.

Direct impacts to groundwater could occur as a result of the construction and placement of structure foundations. Foundations will require drilling and the placement of concrete to depths of 20-40 feet (see Section 4.2). Some portion of the soluble components of the concrete will leach into groundwater prior to the setting and hardening of the concrete. If dewatering is necessary to place the foundations, the water removed from foundation sites could contain sediments or pollutants that may be introduced into surface waters.

[151] Route Permit Application Section 6.5.2; Minnesota Rules 6120 ("Shoreland and Floodplain Management"), https://www.revisor.mn.gov/rules/?id=6120.
[152] Route Permit Application, Section 6.5.2.
[153] Ground Water Provinces, http://www.dnr.state.mn.us/groundwater/provinces/index.html.
[154] Groundwater: Plan to Develop a Groundwater Monitoring Network for the 11-County Metropolitan Area, http://files.dnr.state.mn.us/publications/waters/groundwater_level_monitoring_report_october_2009.pdf.

Mitigation
Impacts to groundwater can be mitigated by measures to prevent impacts to surface waters (discussed above). Xcel Energy indicates that they will mitigate impacts to surface waters by employing the erosion control measures identified in the MPCA storm water best management practices manual.[155] Direct impacts to groundwater, i.e., leaching from concrete poured at depths where groundwater is present, are anticipated to be minimal due to dewatering efforts and the relatively low solubility of concrete components. A *de minimis* leaching impact cannot be avoided or mitigated.

Wetlands
Wetlands provide valuable ecological services such as floodwater retention, nutrient assimilation, sediment entrapment, and wildlife habitat. Wetlands can be found in a variety of ecoregions and vary with soil, hydrology, and vegetation.[156] They are typically seasonal in their extent. Wetlands in Minnesota are protected federally under Section 404 of the Clean Water Act and by the State of Minnesota under the Wetland Conservation Act.

Wetlands are present in the Kohlman Lake to Goose Lake project area, particularly on the northern end of the project around the Goose Lake substation (**Map B-18**). These wetlands are freshwater emergent wetlands that typically contain perennial grasses, grass-like plants (e.g., cattails), and sedges.[157]

Potential Impacts
Impacts to wetlands due to the Kohlman Lake to Goose Lake project are anticipated to be minimal. Estimates for the extent of wetlands crossed by the proposed route for the project are shown in **Table 14**. The proposed route crosses approximately 11.8 acres of freshwater emergent wetlands.

"Crossing" a wetland does not necessarily mean that the wetland will be impacted, e.g., a wetland could be crossed by spanning it. However, where a wetland is crossed and such crossing requires construction activities within the wetland, there is a strong potential for impacts. Construction of transmission line structures typically includes vegetation clearing, movement of soils, and construction traffic. These activities could impair the functioning of wetlands. Even small changes in hydrology (e.g., periods of inundation, changes in flow, sedimentation) can impair the functioning of wetlands.

Table 14. Estimated Wetlands Extent within Proposed Route[158]

Township	Range	Section	Wetland Acres Within Route Width (200 ft.)
T30N	R22W	22	1.23
T30N	R22W	27	2.72
T30N	R22W	34	7.89
		TOTAL	**11.84**

[155] Route Permit Application, 6.5.2.
[156] Types of Wetlands, http://www.dnr.state.mn.us/wetlands/types.html.
[157] Classification of Wetlands and Deepwater Habitats of the United States, Emergent Wetland, http://www.fws.gov/wetlands/Documents/classwet/emergent.htm.
[158] Route Permit Application, Section 6.5.2, Table 14.

Mitigation
Potential impacts to wetlands can be mitigated by selecting routes, alignments, and pole placements that avoid wetlands. If wetlands cannot be avoided, impacts can be mitigated by a variety of strategies including: use of stabilization mats, constructing during winter months when the ground is frozen, and transporting equipment, to the extent possible, over improved roads and via routes which minimize transit over wetlands.

To a great extent, Xcel Energy's proposed route avoids wetlands (**Map B-18**). Xcel Energy anticipates that judicious pole placement within the route will facilitate the spanning of wetlands such that no permanent impacts to wetlands occur as a result of the project.[159]

5.9 Soils

Transmission lines have the potential to impact soils directly by moving them, or indirectly by removing vegetative cover such that they are more susceptible to movement by wind and/or water. Impacts to soils due to Kohlman Lake to Goose Lake project are anticipated to be minimal and temporary.

Soils in the project area have been formed by glaciation and alluvial deposits in the Mississippi River valley.[160] The project area includes three geomorphic regions - the St. Paul sand flats, the North Ramsey mounds, and the Anoka sand plain.[161] Soils are primarily glacial deposits and are typically characterized as loams and sandy loams.[162]

Potential Impacts
Impacts to soils as a result of the Kohlman Lake to Goose Lake project are anticipated to be minimal and temporary. Construction activities will move and handle soils to place transmission line poles. Vegetation will be cleared to facilitate construction of the project. This clearing will temporarily expose soils to the elements, which could cause soil erosion. Loss of soils during construction could adversely impact water resources in the area.

Mitigation
Potential impacts to soils can be mitigated by using best management practices for construction of the project. Xcel Energy indicates that they will apply soil erosion control measures identified in the MPCA storm water best management practices manual.[163] Common mitigation measure employed for transmission line projects include:

- Seeding to establish temporary and permanent vegetative cover on exposed soil.
- Using mulch 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 fence.

[159] Route Permit Application, Section 6.5.2.
[160] Route Permit Application, Section 6.1.2.
[161] Id.
[162] Id.
[163] Route Permit Application, 6.5.2.

- 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.

Soil erosion mitigation measures are standard HVTL route permit conditions (see **Appendices C** and **D**).

5.10 Flora

Transmission lines have the potential to impact flora through the removal or disturbance of vegetation during construction. Additionally, flora may be impacted by the possible introduction of non-native species, or by changes in habitat (e.g., soils, water flows) that adversely impact plant growth. Potential impacts to flora due to the Kohlman Lake to Goose Lake project are anticipated to be minimal.

The majority of the land in the project area – including that area along the proposed route – is developed with urban and suburban land uses (**Map B-12**).[164] Flora is limited primarily to parks in the project area and to residential and commercial landscaping.[165] The proposed route follows an existing transmission line and railroad corridor. The right-of-way for the existing transmission line has been cleared and maintained for the safe operation of the line and thus contains a minimum of flora.[166]

Potential Impacts
Impacts to flora due to the Kohlman Lake to Goose Lake are anticipated to be minimal. The proposed route for the project follows an existing transmission line right-of-way which contains a minimum of flora. Any removal or trimming of flora would be an incremental impact and minimal in nature.

Mitigation
The primary means of mitigating impacts to flora is to avoid flora, particularly trees, through prudent routing. To a great extent, Xcel Energy's proposed route does just this – it avoids impacts to flora by following an existing transmission line right-of-way.

If impacts cannot be avoided, they can be mitigated by a number of strategies, including: (1) choosing alignments that parallel and share right-of-way with existing infrastructure, e.g., roads, (2) constructing during fall and winter months to limit plant damage, (3) leaving compatible plants in the buffer zone of the transmission line ROW (see Section 4.2), (4) replanting on the transmission line ROW with low growing, native species, and (5) avoiding the introduction of invasive species – on equipment or through mulches. Xcel Energy indicates that it will minimize the introduction of invasive species through best management practices, e.g., inspecting and cleaning construction vehicles.[167] Finally, impacts to flora can be mitigated by providing compensation to individual landowners through negotiated easement agreements. Mitigation and restoration measures for impacts to flora are standard HVTL route permit conditions (see **Appendices C** and **D**).

[164] Route Permit Application, 6.5.3.
[165] Id.
[166] Id.
[167] Route Permit Application, Section 6.5.5.

5.11 Fauna

Transmission lines have the potential to impact fauna through a variety of means including temporary displacement, habitat loss, and, for avian species, collision with transmission line conductors. Potential impacts to fauna due to the Kohlman Lake to Goose Lake project are anticipated to be minimal.

The Kohlman Lake to Goose Lake project area is a highly developed urban area with commercial and residential land uses. Consequently, habitat in the project area is relatively poor. The habitat in the northern portion of the project area is relatively better than that in the southern portion due to nearby lakes and wetlands (**Map B-18**). Wildlife in the area consists primarily of deer, small mammals, waterfowl, raptors, and songbirds.[168] Reptiles in the project area include a variety of turtles and snakes; amphibians include frogs and toads. Fish species in area lakes include bass, bullheads, northern pike, and bluegill.[169]

Potential Impacts
Impacts to fauna as a result of the Kohlman Lake to Goose Lake project are anticipated to be minimal. In general, fauna within the project area are anticipated to have the ability to remove themselves from the potential dangers of project construction and to exist while temporarily displaced from the area. Potential impacts due to construction and displacement are anticipated to be minimal. Construction of the line is not anticipated to affect waterbodies in the project area; thus, impacts to fish that inhabit these waterbodies are anticipated to be minimal.

Avian species could be impacted by the Kohlman Lake to Goose Lake project through collision with transmission line conductors.[170] Collisions are more likely for large-bodied birds with long wing spans such as swans, geese, and ducks. Frequency of collision depends upon the number of birds crossing through the project area and the likelihood that they will utilize the area, e.g., for food, water, resting. Large avian species could also be impacted by electrocution.[171] If the wingspan of a species is of sufficient size that the species can simultaneously contact two conductors or a conductor and a grounding wire, the species could be electrocuted.[172]

Because of the relatively poor habitat for avian species in the project area, impacts to avian species are anticipated to be minimal. There are lakes in the project area which provide habitat for waterfowl, but these lakes are relatively smaller in size, with the largest, White Bear Lake, being near but northeast of the northern terminus of the proposed route, Goose Lake substation. Impacts due to electrocution could occur, but these impacts are also anticipated to be minimal, as there are common strategies which can be used to mitigate these impacts.

Mitigation
Potential impacts to fauna, particularly avian species, due to the project can be mitigated through several strategies. The primary strategy for mitigating impacts is to place routes away from areas known to contain high quality habitat or which serve as migratory corridors or resting areas. Xcel Energy's proposed route applies this strategy – the route, because it proceeds through a highly urbanized area,

[168] Route Permit Application, Section 6.5.4.
[169] East Metro Fishing Lakes, White Bear Lake, Minnesota Department of Natural Resources, http://www.dnr.state.mn.us/areas/fisheries/eastmetro/lakes/whitebear.html.
[170] Route Permit Application, Section 6.5.4.
[171] Id.
[172] Id.

does not contain high quality habitat. The route does not appear to be a migratory corridor. The lakes in the project area could serve as resting areas for birds, particularly waterfowl.

Avian impacts can also be mitigated by diverting bird flights away from (over) transmission lines. Flights can be diverted through the use of bird diverters placed on the static lines above transmission line conductors.[173] Xcel Energy is currently not planning to install bird diverters along the project, as Xcel Energy estimates the potential for avian impacts to be fairly low.[174] However, Xcel Energy notes that it will work with the DNR and USFWS to reevaluate the need for bird diverters as the design for the project is finalized.[175]

Impacts to avian species caused by electrocution can be mitigated by the use of best practices for conductor spacing and shielding.[176] Xcel Energy employs such practices as part of its avian protection plan for the State of Minnesota.[177] The plan incorporates standards suggested by the Avian Power Line Interaction Committee (APLIC).[178] Adherence to these standards is a standard HVTL route permit condition (see **Appendices C** and **D**).

5.12 Rare and Unique Natural Resources

Potential impacts to rare and unique natural resources (flora and fauna) from the Kohlman Lake to Goose Lake project could result from ecosystem changes due to construction, introduction of invasive species, habitat loss, and, for avian species, collision with transmission line conductors. Potential impacts to rare and unique natural resources due to the Kohlman Lake to Goose Lake project are anticipated to be minimal.

Flora

A review of natural resource databases indicates that there are no rare and unique plant communities in the project area.[179]

Fauna

A review of natural resource databases indicates that there is one rare and unique animal species in the project area – the Blanding's turtle. Blanding's turtles utilize wetlands and upland areas during their life cycle. They prefer marshes and wetlands with slow-moving water.[180]

Potential Impacts

Impacts to rare and unique species due to the Kohlman Lake to Goose Lake project are anticipated to be minimal. This is due to the fact that such species, with the exception of the Blanding's Turtle, are not found in the project area.

[173] Id.
[174] Id. The existing single circuit 115 kV line from the Kohlman Lake substation to Goose Lake substation does not utilize bird flight diverters.
[175] Id.
[176] Id.
[177] Id.
[178] Id. See also Avian Power Line Interaction Committee, http://www.aplic.org/.
[179] Route Permit Application, Section 6.6 and Appendix C.5.
[180] Route Permit Application, Appendix C.5.

Mitigation
The primary means of mitigating impacts to rare and unique natural resources is to avoid them through prudent routing. Xcel Energy's proposed route does just this – there is only one rare and unique species within the project area (Blanding's Turtle), and it is uncertain if this species will be found within the proposed route.

Potential impacts to rare animal species can be mitigated by avoiding, to the extent possible, the habitat for these species. Impacts can also be mitigated by constructing during fall and winter months to avoid nesting and migration seasons. Impacts to Blanding's turtles can be mitigated through a variety of strategies:[181]

- Providing a Blanding's turtle identification flyer to all construction personnel (see **Appendix F**)
- Moving turtles, by hand, when identified as being in imminent danger
- Leaving turtle nests undisturbed; using erosion control measures, e.g., silt fencing, to minimize impacts to nests and to keep turtles out of construction areas;
- Avoiding wetlands and avoiding impacts to wetlands
- Using mechanical vegetation management for rights-of-way (as opposed to chemical controls); scheduling management for fall through spring (after October 1st and before June 1st).

Xcel Energy indicates that it will construct the project consistent with DNR recommendations for minimizing impacts to the Blanding's turtle.[182]

5.13 Zoning and Land Use Compatibility

Transmission lines have the potential to adversely impact existing land uses and to be incompatible with future land uses. Impacts to existing and future land uses as a result of the Kohlman Lake to Goose Lake project are anticipated to be minimal.

The proposed route for the Kohlman Lake to Goose Lake project crosses four municipalities – the cities of Maplewood, Vadnais Heights and White Bear Lake and White Bear Lake Township – and a variety of zoning classifications, including lands classified for residential, commercial, and industrial uses (**Map B-13**).[183] The Kohlman Lake substation is located on land zoned as light manufacturing; the Goose Lake substation is located on land zoned as light industrial.[184]

The proposed route follows a transmission line and railroad corridor within a highly developed urban area. The proposed route parallels and crosses Highway 61. The city of White Bear Lake's 2030 comprehensive plan has a Highway 61 overlay area to guide land use along the highway.[185] The plan describes that area of Highway 61 south of Goose Lake as "auto-oriented [with] some industrial uses."[186]

[181] Id.
[182] Route Permit Application, Section 6.6.
[183] Route Permit Application, Section 6.2.2.
[184] Id.
[185] City of White Bear Lake 2030 Comprehensive Plan, Chapter 2 Land Use, p.38, http://www.whitebearlake.org/index.asp?Type=B_BASIC&SEC=%7B3B5DBE03-8C89-499D-9A79-56C7BC3E4A0F%7D.
[186] Id.

The plan envisions possible other uses of the railroad corridor proposed to be followed by the Kohlman Lake to Goose Lake project, including bicycle paths, light-rail transit, and private development.[187]

Potential Impacts

Impacts to existing land uses due to the Kohlman Lake to Goose Lake project are anticipated to be minimal. The project is compatible with current land uses – it is compatible with a transmission line and railroad corridor. The project is also compatible with future land uses; it is compatible with those uses envisioned under comprehensive plans adopted by municipalities in the project area, e.g., bicycle path.

Mitigation

Impacts to current and future land uses due to the Kohlman Lake to Goose Lake project can be mitigated by selecting routes and alignments that are compatible, to the extent possible, with zoning and land use plans. Land use impacts can also be mitigated by minimizing aesthetic impacts of the project, to the extent that zoning and land use plans address aesthetics, e.g., landscaping. The proposed route for the project is compatible with current and future land uses in the project area, thus no additional mitigation measures are proposed.

Use of Existing Rights-of-Way

The Kohlman Lake to Goose Lake project makes extensive use of existing rights-of-way. The project uses an existing transmission line (100 percent of the proposed route) and railroad corridor (approximately 90 percent of the proposed route). These corridors have been in existence for some time – the railroad line was built in the early 1900s and the single circuit 115 kV transmission line in 1969 (see Section 5.3). The project endpoints are existing substations. These substations will be modified with new equipment as part of the project, but all modification will occur within the existing footprint of the substations.

[187] Id.

6.0 Unavoidable Impacts and Irreversible Commitments of Resources

Adverse impacts due to the Kohlman Lake to Goose Lake project which cannot be avoided are anticipated to be few and minimal. Aesthetic impacts – due to relatively taller structures and more conductors – cannot be avoided. Temporary, construction-related impacts (e.g., noise, dust, traffic diversion) cannot be avoided. Impacts to soils due to the placement of new structures cannot be avoided. The project follows an existing transmission line and railroad corridor; thus, impacts to flora are anticipated to be minimal. However, some impacts to flora (e.g., tree trimming) may be necessary for construction and safe operation of the line.

There are few commitments of resources associated with the Kohlman Lake to Goose Lake project that are irreversible and irretrievable; these few resources are associated with construction of the project. Construction resources, such as concrete, steel, and hydrocarbon fuels, will be irreversibly and irretrievably committed to the project.

7.0 Application of Routing Factors

The Power Plant Siting Act requires the Commission to locate transmission lines "in an orderly manner compatible with environmental preservation and the efficient use of resources" that minimizes "adverse human and environmental impact[s]" while ensuring electric power reliability.[188] Minnesota Statute Section 216E.03, subdivision 7(b) identifies considerations that the Commission must take into account when designating transmission lines routes.[189]

Minnesota Rule 7850.4100 lists 14 factors for the Commission to consider in its route permitting decisions, including effects on human settlements, effects on public health and safety, and effects on the natural environment (see Section 2.2).[190] In this section, the information gathered by EFP staff during the environmental review process, as presented in the preceding chapters of this EA, is applied to these factors.

7.1 Factors for Which Impacts are Anticipated to be Minimal

There are several routing factors for which adverse impacts of the project are anticipated to be minimal. These are:

- Effects on human settlement, including the factor elements – aesthetics, noise, displacement, property values, electronic interference, and public services;
- Effects on public health and safety, including the factor elements – electric and magnetic fields, implantable medical devices, stray voltage, induced voltage, and air quality;
- Effects on land based economies, including the factor elements – agriculture, forestry, mining, and recreation and tourism;
- Effects on archaeological and historic resources;
- Effects on the natural environment, including the factor elements – flora, fauna, and air and water quality.

7.2 Factors for Which Impacts, Through the Use of Mitigation Strategies, are Anticipated to be Minimal

There are three routing factors (or factor elements) for which impacts are anticipated to be minimal if mitigation strategies are employed:

(1) Effects on public services, specifically, potential impacts to sewer lines in the project area,

(2) Effects on soil and water resources, and

(3) Effects on rare and unique natural resources, specifically, potential impacts to Blanding's turtles.

[188] Minnesota Statute 216E.02, https://www.revisor.mn.gov/statutes/?id=216E.02.
[189] Minnesota Statute 216E.03, Subd. 7, https://www.revisor.mn.gov/statutes/?id=216E.03.
[190] Minnesota Rule 7850.4100, https://www.revisor.mn.gov/rules/?id=7850.4100.

Public Services – Metropolitan Council Sewer Lines
There are several Metropolitan Council sewer lines in the project area, including a line that roughly parallels Xcel Energy's proposed route (see Section 5.5). There are also two areas where the proposed route crosses a sewer line. If a transmission line pole were placed on or too near a sewer line, the sewer line could be damaged. Impacts to Metropolitan Council sewer lines can be avoided by siting the project's transmission line poles away from the sewer lines (e.g., spanning the sewer lines). Impacts might also be avoided through construction procedures that curtail the use of heavy equipment in specific areas near the sewer lines. These mitigation strategies would likely best be developed and implemented through coordination between the Metropolitan Council and Xcel Energy. The Metropolitan Council has requested that Xcel Energy provide detailed project plans to the Council for review and comment prior to beginning construction of the project.

Soil and Water Resources
Construction of the Kohlman Lake to Goose Lake project will entail the moving and handling of vegetative cover and soils, and the placement of foundations in existing soils. These activities could adversely impact soil and water resources in the project area (see Sections 5.8 and 5.9). These impacts can be avoided and mitigated by the use of best management practices for construction of the project. Xcel Energy indicates that they will apply erosion control measures identified in the Minnesota Pollution Control Agency's (MPCA) storm water best management practices manual. Permittee adherence to MPCA guidance and best management practices is a standard HVTL route permit condition (see **Appendices C** and **D**).

Rare and Unique Natural Resources – Blanding's Turtle
One rare species has been identified in the project area – the Blanding's turtle (see Section 5.10). Construction activities could disturb the habitat for this turtle or could impact turtle directly. Impacts to Blanding's turtles can be mitigated through a variety of strategies including construction scheduling, education, and erosion control measures. Xcel Energy indicates that it will construct the project consistent with DNR recommendations for minimizing impacts to the Blanding's turtle.

7.3 Factors Which are Well Met

There are four routing factors that do not describe an effect or impact but rather indicate the State's interest in efficient design and use of resources, particularly the State's limited land resources. For the Kohlman Lake to Goose Lake project, these factors are well met:

- Application of design options, including the factor elements – maximizing energy efficiencies, mitigating environmental effects, and accommodating expansion;
- Use or paralleling of existing rights-of-way, including the factor elements – survey lines, natural division lines, and agricultural boundaries;
- Use of existing infrastructure rights-of-way, including the factor elements – transportation, pipelines, and electrical transmission systems; and
- Costs that are route and design dependent, including the factor elements – construction, operation, and maintenance.

With the Kohlman Lake to Goose Lake project, Xcel Energy proposes to replace an existing single circuit 115 kV transmission line with a new double circuit 115 kV line (see Section 3). The proposed route for the project follows an existing transmission line and railroad corridor for nearly the entirety of its length

(see Section 5.13). Xcel Energy proposes to build the new double circuit 115 kV line on the same alignment as the existing line which it will replace. In sum, Xcel Energy's proposed project is a design that makes efficient use of resources, uses existing rights-of-way, and limits costs with its relative simplicity.

7.4 Factors Relating to Unavoidable Impacts and Irreversible Commitments of Resources

There are two routing factors which reflect the State's interest in the unavoidable impacts of the project – (1) those human and environmental impacts which cannot be avoided, and (2) the irreversible and irretrievable commitments of resources associated with the project. These factors are discussed in Section 6.0. The unavoidable impacts of the project and the irreversible commitments of resources are anticipated to be few and minimal.