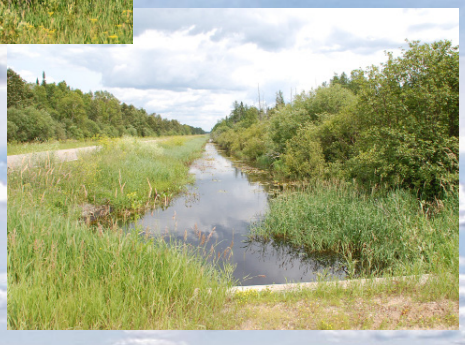
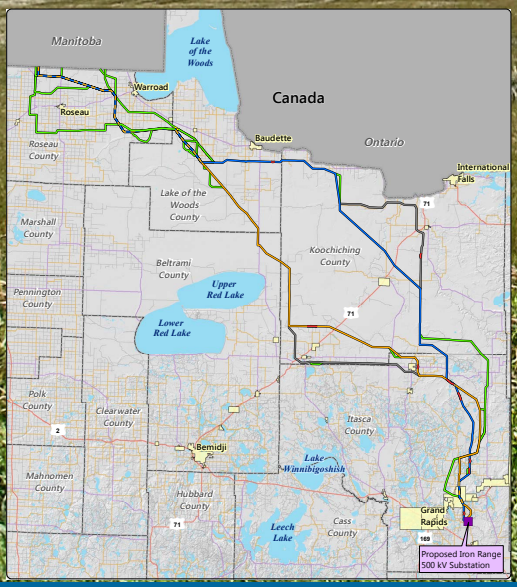
Great Northern Transmission Line Project

Final Environmental Impact Statement Summary





DOE/EIS-0499
U.S. Department of Energy
Office of Electricity Delivery and Energy Reliability
Washington D.C.

E015/TL-14-21
Minnesota Department of Commerce
St. Paul, Minnesota

October 2015

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Great Northern
Transmission Line Project
Final Environmental Impact Statement

Summary

U.S. Department of Energy
Office of Electricity Delivery
and Energy Reliability

Minnesota
Department of Commerce

Cooperating Agencies

U.S. Environmental Protection Agency
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
Red Lake Band of Chippewa Indians, Minnesota

October 2015

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COVER SHEET - ABSTRACT

DOE/EIS-0499

RESPONSIBLE FEDERAL AGENCY: U.S. Department of Energy (DOE), Office of Electricity Delivery and Energy Reliability

RESPONSIBLE STATE GOVERNMENTAL UNIT: Minnesota Department of Commerce–**Energy Environmental Review and Analysis (DOC-EERA)**

COOPERATING AGENCIES: U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (EPA), and **Red Lake Band of Chippewa Indians, Minnesota**

TITLE: Great Northern Transmission Line Project Final Environmental **Impact Statement** (DOE/EIS-0499)

LOCATION: Roseau, Lake of the Woods, Koochiching, Beltrami, and Itasca counties in Minnesota

The DOE and **DOC-EERA have** jointly **prepared this** EIS for the proposed Project.

CONTACTS: For additional information on this EIS contact:

U.S. Department of Energy
Julie Ann Smith, PhD, Electricity Policy Analyst
DOE NEPA Document Manager
National Electricity Delivery Division (OE-20)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585
202-586-7668
JulieA.Smith@hq.doe.gov

For general information on the DOE NEPA process, please write or call:

Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance (GC-54)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585
askNEPA@hq.doe.gov
Telephone: (202) 586-4600 or Leave a message at (800) 472-2756

Minnesota Department of Commerce
William Cole Storm, Environmental Review Manager
Energy Environmental Review and Analysis
85 7th Place East, Suite 500
Saint Paul, Minnesota 55101
(651) 539-1844
bill.storm@state.mn.us

Project Applicant
Minnesota Power, an operating division of ALLETE
30 West Superior Street
Duluth, Minnesota 55802

Project Representatives

David Moeller	Mike Donahue	Jim Atkinson
Senior Attorney	Project Manager	Environmental Manager
218) 723-3963	(218) 355-2617	(218) 355-3561
dmoeller@allete.com	mdonahue@mnpower.com	jbatkinson@mnpower.com

Abstract

On April 15, 2014, Minnesota Power (the Applicant) applied to the U.S. Department of Energy (DOE) for a Presidential permit to construct, operate, maintain, and connect an approximately 220-mile-long, 500-kilovolt (kV) overhead, single-circuit, alternating current (AC) electric transmission system that would cross the international border between the Canadian Province of Manitoba and Roseau County, Minnesota (Minnesota Power 2014, reference (1)). On the same date, the Applicant also applied to the Minnesota Public Utilities Commission (MN PUC) for a Route Permit under the Minnesota Power Plant Siting Act (PPSA) (Minnesota Power 2014, reference (1)).

On October 29, 2014, the Applicant submitted an amendment to their Presidential permit and Route Permit applications to DOE and the MN PUC, respectively, as a result of new information. The amended Presidential permit application changed the location of the proposed international border crossing under DOE's consideration.

The Great Northern Transmission Line Project, as amended (proposed Project), would run from the Applicant's proposed international border crossing in Roseau County, Minnesota, to the **proposed Iron Range 500 kV Substation located just east of the existing Blackberry Substation** near Grand Rapids, Minnesota. It would be located on all new 200-foot-wide right-of-way with a wider area required for certain spans at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. The transmission towers would be steel lattice structures for the majority of the route, with the exact type of structure in any given location dependent on land type, land use, and potential effect on the surrounding landscape. Tower heights would range from approximately 100 feet to about 170 feet. In some instances, such as where the proposed Project crosses an existing transmission line, taller structures would be required. The Applicant is also proposing to construct a **new Iron Range 500 kV Substation,** a new 500 kV Series Compensation Station, regeneration stations, permanent access roads, temporary access roads, laydown areas, and fly-in sites.

Public Comments

In preparing this Final EIS, DOE and DOC-EERA solicited comments during the scoping period (June 27, 2014 through August 11, 2014) and public comment period on the Draft EIS (June 26, 2015 through August 10, 2015). DOE and DOC-EERA held nine federal public hearings/ state information meetings on the Draft EIS: in Red Lake, Minnesota, on July 14, 2015; Roseau and Baudette, Minnesota, on July 15, 2015; Littlefork and International Falls, Minnesota, on July 16, 2015; Kelliher and Bigfork, Minnesota, on July 21, 2015; and two meetings in Grand Rapids, Minnesota, on July 22, 2015.

DOE and DOC-EERA considered all comments, including late comments, during the preparation of this Final EIS. Appendix Y in Volume II of this Final EIS contains the comments received on the Draft EIS and DOE's and DOC-EERA's responses to these comments. This Final EIS contains revisions and new information based in part on comments received on the Draft EIS. The notable changes in the Final EIS include providing the results of air quality modeling in Section 5.2.1.3 and Appendix W, the Biological Assessment in Appendix R, and the draft Programmatic Agreement in Appendix V. Vertical bars in the margins indicate locations of revisions and new information. Deletions are not indicated.

The EIS analyzes the potential human and environmental impacts of DOE issuing a Presidential permit for the proposed international border crossing for the GNTL project and for the MN PUC's decision on the Route Permit for the proposed 220-mile transmission line in the state of Minnesota. DOE's preferred alternative is to grant a Presidential permit to the Applicant for its proposed international border crossing at latitude 49° 00' 00.00" N and longitude 95° 54' 50.49" W, roughly 2.9 miles east of Highway 89 in Roseau County, Minnesota. DOE and DOC-EERA are using this EIS to ensure that the agencies have the information needed for informed decision-making. Copies of the Final EIS are available for public review at 14 public libraries as noted in Appendix Z of this Final EIS or a copy can be requested from the respective federal and state contacts listed above. The EIS is also available on the proposed GNTL Project EIS Web site (http://www.greatnortherneis.org), the DOE NEPA Web site (http://energy.gov/nepa), and on http://mn.gov/commerce/energyfacilities/Docket.html?Id=33847.

DOE will announce its decision on its Proposed Action in a Record of Decision (ROD) in the Federal Register no sooner than 30 days after EPA publishes the Notice of Availability of the Final EIS and not before the MN PUC's Route Permit Decision. MN PUC's decision on a final route determination is expected in the first quarter of 2016.

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Acronyms

AC	alternating current
AIMP	Agriculture Impact Mitigation Plan
ALJ	administrative law judge
APE	area of potential effect
BMP	best management practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
DOC-EERA	Department of Commerce – Energy Environmental Review and Analysis
DOE	Department of Energy
EIS	environmental impact statement
EMF	electric and magnetic fields
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FR	Federal Register
GAP	gap analysis program
GHGs	greenhouse gases
ICDs	implantable cardioverter defibrillators
kV	kilovolt
kV/m	kilovolts per meter
MBS	Minnesota Biological Survey
mG	milliGauss
MISO	Midcontinent Independent System Operator
MnDNR	Minnesota Department of Natural Resources
MnDOT	Minnesota Department of Transportation
MN PUC	Minnesota Public Utilities Commission
MPCA	Minnesota Pollution Control Agency
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NHIS	Natural Heritage Information System
NHPA	National Historic Preservation Act
NLCS	National Landscape Conservation System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NOA	Notice of Availability
NOI	Notice of Intent
OAH	Office of Administrative Hearings
OE	Office of Electricity Delivery and Energy Reliability
PA	programmatic agreement
PEM	palustrine emergent wetland
PFO	palustrine forested wetland
PPSA	Power Plant Siting Act
PSS	palustrine shrub wetland
PWI	Public Water Inventory
ROC	Record of Decision
ROW	right of way
SNA	scientific and natural area
SPCC	spill prevention, control, and countermeasures
TCP	traditional cultural property
USACE	U.S. Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WMA	wildlife management area
WPA	watershed protection area

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S.1 Background

Minnesota Power, a regulated utility division of ALLETE, Inc. (Applicant), proposes to construct and operate the Great Northern Transmission Line, which is an approximately 220-mile long, 500 kilovolt (kV) overhead, single-circuit, alternating current (AC) transmission line. The proposed Great Northern Transmission Line would cross the international border from Canada into the United States in Roseau County, Minnesota, and it would connect to **the proposed Iron Range 500 kV Substation that would be located** adjacent to the existing Blackberry Substation near Grand Rapids, Minnesota (Map S-1).

On April 15, 2014, the Applicant applied to the U.S. Department of Energy (DOE) for a Presidential permit to cross the U.S./Canadian border in Roseau County, Minnesota.[1] On the same date, the Applicant also applied to the Minnesota Public Utilities Commission (MN PUC) for a Route Permit under the Minnesota Power Plant Siting Act (PPSA).[2]

On October 29, 2014, the Applicant submitted an amendment to their Presidential permit and Route Permit applications to DOE and the MN PUC, respectively. The amended Presidential permit application changed the location of the proposed international border crossing under DOE's consideration **approximately 4.3 miles east** to cross the U.S./Canadian border at latitude 49° 00' 00.00" N and longitude 95° 54' 50.49" W, which is approximately 2.9 miles east of Highway 89 in Roseau County.

The Great Northern Transmission Line Project, as amended (proposed Project), would be located on all new 200-foot wide right-of-way(ROW) with a wider area required for certain spans at angle and corner structures, for guyed structures, or for areas where special design requirements are dictated by topography. The transmission towers would be steel lattice structures for the majority of the route, with the exact type of structure in any given location dependent on land type, land use, and potential effect on the surrounding landscape. Tower heights would range from approximately 100 feet to about 170 feet. In some **locations**, such as where the proposed Project crosses an existing transmission line, taller structures would be required. As a part of its proposal, the Applicant would **construct a new Iron Range 500 kV Substation near the existing 230 kV/115 kV Substation,** a new 500 kV series compensation station, regeneration stations, permanent access roads, temporary access roads, laydown areas, and fly-in sites.

Transmission lines that cross an international border with the United States require a Presidential permit from the DOE.[3] DOE's National Electricity Delivery Division, in the Office of Electricity Delivery and Energy Reliability, is responsible for issuing Presidential permits for such cross-border electric transmission facilities. If issued, a Presidential permit would allow for the construction, operation, maintenance, and connection of the U.S. portion of the proposed Project at the international border.

DOE has determined that the potential issuance of a Presidential permit for the proposed Project would constitute a major Federal action and that an Environmental Impact Statement (EIS) is the appropriate level of review under the National Environment Policy Act of 1969 (NEPA). DOE issued its Notice of Intent (NOI) to prepare an EIS and to conduct public scoping for the proposed Federal Action in June 2014 (79 **Federal Register (FR)** 36493). This EIS is prepared in compliance with the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations (CFR) Parts 1500-1508) and DOE's NEPA regulations (10 CFR Part 1021), and other applicable federal laws.

Other federal environmental actions being implemented in coordination with the NEPA process include: floodplain and wetlands assessments, in accordance with Executive Orders 11988 and 11990, respectively, and DOE floodplain and wetland **environmental** review requirements at 10 CFR Part 1022; Clean Air Act conformity requirements; Clean Water Act (CWA) permit requirements; threatened and endangered species consultation under the Endangered Species Act (ESA); and consultation under the National Historic Preservation Act (NHPA).

The Minnesota PPSA provides that no person may construct a high voltage transmission line without a Route Permit from the MN PUC. Under the PPSA[4], a high-voltage transmission line includes a transmission line of 100 kV or more and greater than 1,500 feet in length, with associated facilities.[5] As part of the Route Permit, the MN PUC would also list any conditions it will require for constructing, operating, and maintaining the proposed Project.

Applications for transmission line route permits are subject to environmental review conducted by

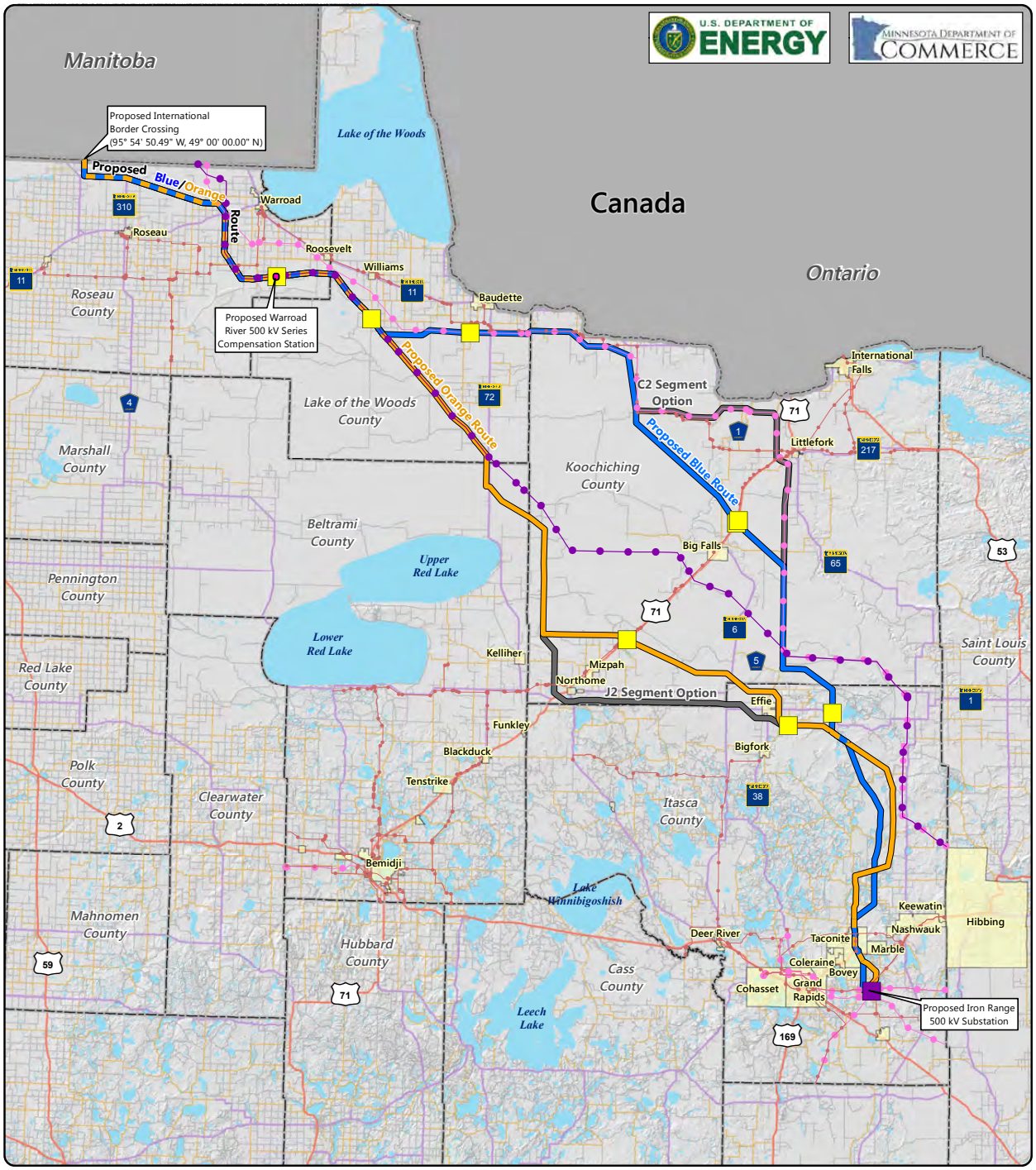
1 The Presidential permit application and application amendment are available at: http://www.greatnorthernеis.org/Home/documents.

2 Available at:http://mn.gov/commerce/energyfacilities//resource.html?Id=33849 (The Route Permit Application is nearly identical to the Presidential permit application).

3 Pursuant to Executive Order (EO) 10485 of 1953, as amended by Executive Order 12038, and 10 Code of Federal Regulations (CFR) Section 205.320.

4 Minnesota Statute, Section 216E.03, subdivision 2.

5 Minnesota Statute, Section 216E.01; subdivision 4.



- Proposed Regeneration Site
- Proposed Series Compensation Station
- Proposed Iron Range 500 kV Substation

Proposed Routes

- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Existing Transmission Lines

- 69 or 115 kV
- 230 kV
- 500 kV
- Municipal Boundary
- County Boundary
- International Boundary

Map S-1

PROPOSED PROJECT
Great Northern Transmission Line
Final Environmental Impact Statement

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the Minnesota Department of Commerce – Energy Environmental Review and Analysis (DOC-EERA) staff (Minnesota Rules, part 7850.2500). Projects proceeding under the full state permitting process, such as this one, require the preparation of a state EIS. A state EIS is a document which describes the potential human and environmental impacts of the project and possible mitigation measures, including route, alignment, and site alternatives.

In order to avoid duplication in environmental review procedures, DOE and DOC-EERA prepared a single EIS to comply with environmental review requirements under NEPA and the Minnesota PPSA. DOE is acting as federal joint lead agency with the DOC-EERA acting as state joint lead agency per 40 CFR 1501.5(b).

DOE and DOC-EERA jointly implemented public involvement and the public comment process on the Draft EIS by holding joint federal and state public hearings and informational meetings on the Draft EIS. DOE and DOC-EERA accepted public comments on the Draft EIS during the 45-day period starting with publication of the U.S. Environmental Protection Agency's (EPA's) Notice of Availability (NOA) in the Federal Register on June 26, 2015 (80 FR 36795) and ending on August 10, 2015. (All comments received, including late comments, were considered in preparation of this Final EIS.) DOE and DOC-EERA held nine federal public hearings/state information meetings on the Draft EIS: in Red Lake, Minnesota, on July 14, 2015; Roseau and Baudette, Minnesota, on July 15, 2015; Littlefork and International Falls, Minnesota, on July 16, 2015; Kelliher and Bigfork, Minnesota, on July 21, 2015; and two meetings in Grand Rapids, Minnesota, on July 22, 2015.

The EIS analyzes the potential human and environmental impacts of DOE issuing a Presidential permit for the proposed international border crossing for the GNTL project and for the MN PUC's decision on the Route Permit for the proposed 220-mile transmission line in the state of Minnesota. DOE's preferred alternative is to grant a Presidential permit to the Applicant for its proposed international border crossing at latitude 49° 00' 00.00" N and longitude 95° 54' 50.49" W, **roughly 2.9 miles east of Highway 89 in Roseau County, Minnesota. DOE and DOC-EERA are using this EIS to ensure that the agencies have the information needed for informed decision-making. Copies of the Final EIS are available for public review at 14 public libraries as noted in Appendix Z of the Final EIS or a copy can be requested from the respective federal and state contacts provided in the Cover Sheet. The EIS is also available on the proposed GNTL Project EIS Web site (http://www.greatnortherneis.org), the DOE NEPA Web site (http://energy.gov/nepa), and on http://mn.gov/commerce/energyfacilities/Docket.html?Id=33847. DOE will announce its decision on its Proposed Action in a Record of Decision (ROD) in the Federal Register no sooner than 30 days after USEPA publishes the NOA of the Final EIS, and not before the MN PUC's Route Permit decision. MN PUC's decision on a final route determination is expected in the first quarter of 2016.**

S.2 Regulatory Framework

S.2.1 DOE's Purpose and Need for Agency Action

The purpose of and need for DOE action is to decide whether to grant the Applicant a Presidential permit. If granted, the Presidential permit for the U.S. portion of the proposed Project (Office of Electricity Delivery and Energy Reliability (OE) Docket Number PP-398) would authorize the Applicant to construct, operate, maintain, and connect the U.S. portion of the proposed Project that would cross the international border between the U.S. and Canada.

If the MN PUC issues a permit for a route with a different border crossing than that currently requested by the Applicant, the Applicant could submit an amended Presidential permit application to DOE that is consistent with the MN PUC route permit decision. DOE would then need to decide what, if any, further environmental review would be necessary, and whether to grant a Presidential permit for the proposed Project at the amended border crossing.

S.2.2 Minnesota Public Utilities Commission Actions

The MN PUC is charged with selecting routes that minimize adverse human and environmental impacts while ensuring continuing electric power system reliability and integrity. Route Permits issued by the MN PUC include a permitted final route and anticipated alignment, as well as conditions specifying construction and operation standards. Under Minnesota law, the Route Permit process does not determine whether the proposed Project is needed. That decision is made as part of a separate process: the certificate of need.

The Applicant filed its certificate of need application for the proposed Project with the MN PUC on October 22, 2013. **In reviewing that application, the MN PUC considered whether there is a need for a**

transmission line, and established the size, type, and required end points of the Proposed Project. Following a formal contested case hearing, the Administrative Law Judge (ALJ) issued a report on March 31, 2015, which concluded that the Applicant satisfied the certificate of need requirements and recommended the MN PUC grant a certificate of need to the Applicant for the construction of the proposed Project and associated facilities. **On June 20, 2015**, the MN PUC granted a certificate of need to the Applicant for the proposed Project.[6]

S.3 Applicant's Objectives

The Applicant's federal and state permit applications state that the purpose of the proposed Project is to efficiently provide the Applicant's customers and the region with energy that will: (a) help meet the region's growing energy demands; (b) advance Minnesota Power's EnergyForward strategy of increasing its generation diversity and renewable portfolio; (c) strengthen electric system reliability; and (d) fulfill the Applicant's obligations under its power purchase agreements with Manitoba Hydro, all in a manner that is consistent with the Applicant's commitment to making a positive impact on communities.

The Applicant has a 250 MW power purchase agreement with Manitoba Hydro. In addition, the Applicant and Manitoba Hydro also recently finalized the critical commercial terms for an additional 133 MW "Renewable Optimization Agreement" that was approved by the MN PUC on January 30, 2015 (MN PUC Docket No. E015/M-14-960). The proposed Project would be able to transmit enough capacity to meet the Applicant's 383 MW requirements as well as an additional 500 MW, up to a total of 883 MW.

S.4 Proposed Project Overview

The Applicant proposes to construct, operate, maintain, and connect a 220-mile, overhead, single-circuit 500 kV AC transmission line between the Minnesota-Manitoba border crossing northwest of Roseau, Minnesota, **and it would connect into the proposed Iron Range 500 kV Substation that would be located near the** existing Blackberry 230/115 kV Substation near Grand Rapids, Minnesota. The Applicant's proposal also includes associated substation facilities and transmission system modifications at the Blackberry Substation site, construction of a new 500 kV series compensation station (a structure which will house the 500 kV series capacitor banks necessary for reliable operation and performance of the proposed transmission line), and necessary access roads, construction lay-down areas and fly-in sites. A new **Iron Range** 500 kV Substation would be required for the proposed Project and would be constructed east of the existing Blackberry 230/115 kV Substation. The proposed Project would carry hydropower generated by facilities operated by Manitoba Hydro, a Canadian electric utility, and would support the regional electric grid. **Sections S4.1 through S4.6 describe the route selection process and the proposed Project, as detailed in the Applicant's permit applications.**

S.4.1 Route Selection

The Applicant underwent a lengthy process to identify route alternatives, and in response to public comment, they identified two route alternatives—the Blue Route and the Orange Route to be submitted as part of their permit applications to both DOE and MN PUC. These two proposed routes are described in detail in Sections 2.4.1 and 2.4.2 of the EIS. In response to comments from agencies and the public, the Applicant also identified four segment options, as described in Section 2.4.3.

S.4.2 Supporting Structures and Right of Way

The proposed GNTL Project would be located on all new ROW that would be approximately 200 feet wide. A wider ROW (250 to 300 feet) would be required for certain spans of the proposed Project, at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. The Applicant is evaluating several steel structure types and configurations, including a self-supporting lattice structure, a lattice guyed-V structure, and a lattice guyed-delta structure. The Applicant estimates that four to five structures would be needed per mile of transmission line.

The structures would typically range in height from 100 to 170 feet, depending on the structure type and the terrain. In some **locations**, such as where the proposed Project crosses an existing transmission line, taller structures may be required. Structures are not anticipated to be taller than 200 feet so they would not be required to meet Federal Aviation Administration (FAA) lighting standards. The structures would be placed approximately 1,000 to 1,700 feet apart, with a maximum span of 1,700 feet.

6 MN PUC Docket No. E015/CN-12 1163, "Certificate of Need Application" is available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={65F60020-4419-41F0-AB43-E4D7F22A6E28}&documentTitle=20153-108775-01.

The Applicant has requested a ROW width of 200 feet and a route width that varies from 650 to 3,000 feet in order to provide flexibility during detailed design and try to accommodate landowner's preferences along the selected route.

S.4.3 Interference and Contingencies

The proposed Project would be designed to minimize interference with radio and television signals and two-way mobile radios. The Applicant would also take into account the possibility that extreme weather events could cause simultaneous outages of both the proposed 500 kV transmission line and the existing 500 kV transmission line. They would also install protective devices such as circuit breakers and relays.

S.4.4 Land Acquisition

The Applicant would have to obtain easement rights for any private property that the 200-foot ROW would cross. An ROW representative would contact the owners who would analyze the property and point out to the landowner where the facilities would be located on their property. The representative would value the property and make an offer for the easement rights. If they cannot agree, the utility can initiate a condemnation proceeding, and a three-person condemnation commission would hold a valuation hearing and finally make an award.

The landowner may then file an appeal, and a jury would decide the outcome. At any point in this process, the case can be dismissed if the parties reach a settlement. Additional land for the proposed **Iron Range 500 kV** Substation has already been secured.

S.4.5 Construction

Once the Applicant has obtained all the necessary permits, they would coordinate with landowners to prepare the ROW and temporary use areas for construction. They would also coordinate with local utilities and transportation authorities, and would then clear the ROW of woody plants, while taking measures to avoid impacts to birds, rare species, and rare ecological communities.

The Applicant would mitigate any possible damage to soils, follow best management practices to avoid introduction of invasive species, and take preventive measure to keep from damaging wetlands. The **Applicant** would also prevent potentially damaging spills by carefully maintaining their vehicles. Any spills that do occur would be treated according to the Applicant's previously determined Spill Prevention, Control, and Countermeasures (SPCC) Plan. **Conditions requiring the use of Best Management Practices (BMPs) would be included in the MN PUC Route Permit. In addition, special conditions may be included in the MN PUC Route Permit to require compliance filings to ensure the Applicant would comply with requirements.**

Construction materials would be hauled either directly to structure sites from the local highway or railroad network, or brought first to material staging areas and then to the structure sites. They would be moved by flatbed trucks, or in the case of reinforced concrete foundations, by large rubber-tired vehicles. The Applicant and its contractors would remove construction waste and scrap on a regular schedule or at the end of each construction phase to minimize short-term visual impacts.

The Applicant would mitigate impacts on watercourses and waterbodies during construction by spanning these resources, placing structures above the normal high water level, restricting vehicular activity within riparian corridors, and minimizing the use of heavy equipment when clearing riparian corridors. Once all construction has been completed, the Applicant would fully restore any areas that have not been permanently altered.

For a summary of Applicant proposed measures to minimize environmental impacts, see Table 2-2 in the EIS.

S.4.6 Cost and Schedule

Based on current information, the estimated cost of the total proposed Project is between **$558 million and $710 million.** The cost for routine operation and maintenance typically ranges from $1,100 to $1,600 per mile, so the annual costs would range from $242,000 to $352,000 for the 220-mile transmission line. Construction is projected to begin in October 2017, and the projected in-service date is June 2020.

S.5 Agency Coordination and Public Involvement

Public participation and interagency coordination are integral elements of the NEPA and state environmental review process under the PPSA and are intended to promote open communication between DOE, DOC-EERA, federal and state regulatory agencies, local governments, American Indian tribes, potential stakeholder organizations, and the public. All individuals and organizations with a potential interest in the proposed Project

were encouraged to participate in the public involvement process.

S.5.1 Cooperating Agencies

DOE invited other federal agencies **and tribes** to participate in the preparation of the EIS as cooperating agencies because of their special expertise or jurisdiction by law (40 CFR Part 1501.6). The cooperating agencies are U.S. Army Corps of Engineers – St. Paul District (USACE), U.S. Fish and Wildlife Service – Twin Cities Ecological Field Office (USFWS), Region 5 of the U.S. Environmental Protection Agency (EPA), and the Red Lake **Band of Chippewa** Indians. (See Section 1.2.4.1 and Appendix A for more information about previous and planned tribal consultation.)

Cooperating agencies submitted comments regarding cultural, biological, and socioeconomic resources including the following: wetlands and wetland function; upland forests and associated wildlife habitat; direct and indirect effects of the transmission line on wildlife, federal and state listed species, migratory bird impacts, USFWS interest lands, air quality, aesthetics, property values, land-use compatibility, land-based economies, archaeological resources, traditional cultural properties, and mitigation measures. Comments generally requested additional information for these resources to more fully analyze impacts. All cooperating agency comments were addressed.

S.5.2 Public Involvement

DOE and DOC-EERA implemented a joint planning and scoping process to encourage agency and public involvement in reviewing the proposed Project, and to identify the range of reasonable alternatives. On June 20, 2014, MN PUC issued a Notice of Public Information and EIS Scoping Meeting. The notice described the proposed Project and provided an overview of the MN PUC process and opportunities for public comment.

On June 27, 2014, DOE published its NOI to Prepare an EIS and to Conduct Public Scoping Meetings; Notice of Floodplains and Wetlands Involvement for the Great Northern Transmission Line (79 FR 36493). The NOI explained that DOE would be assessing potential environmental impacts and issues associated with the proposed Project and the No Action alternative.

During the public scoping period, DOE and DOC-EERA conducted eight joint scoping meetings, and scoping comments were accepted by DOE and DOC-EERA through August 15, 2014. DOE prepared a Scoping Summary Report which is available in Appendix C of this EIS as well as on the EIS Website (http://www.greatnortherneis.org). Comments received during the scoping period were used to identify matters to be addressed in this EIS including resources potentially impacted by the project and alternative route segment and alignment modifications.

In addition, DOC-EERA conducted two citizen Workgroup meetings and consultation with local units of government within the project area in an effort to provide an additional opportunity for local representatives to discuss their concerns, develop potential alternative route segments, and review potential zoning conflicts. Based on the scoping comments, feedback provided by the Workgroup, and discussions with DOE and the cooperating agencies, the DOC-EERA issued a scoping decision for the EIS on January **9**, 2015. **(See document at http://mn.gov/commerce/energyfacilities/documents/33847/Notice%20of%20Scoping%20Decision%20(1-9-15).pdf).** The scoping decision identified the issues to be addressed by DOE and DOC-EERA in the EIS. A description of how public involvement was incorporated into additional alternatives is provided in S.6 and S.7.

The major issues identified during public scoping focused on ways to minimize unavoidable conflicts with forested areas and the associated natural resources, avoiding potential conflicts with airports or seaplane landing areas on nearby lakes, and proposed alternatives to reduce or eliminate visual, health or other impacts on quality of life or their use of their a specific property.

Comments on the Draft EIS were accepted during the 45-day period following publication of the USEPA's NOA in the Federal Register on June 26, 2015 (80 FR 36795. The DOC-EERA also issued its NOA of Draft EIS, State Public Information Meetings, and Federal Public Hearings on June 19, 2015. In preparing this Final EIS, DOE and DOC-EERA considered comments received during the scoping period (June 27, 2014 through August 11, 2014) and public comment period on the Draft EIS (June 26, 2015 through August 10, 2015). Late comments on the Draft EIS that were submitted after the scoping comment period and the Draft EIS comment period were also considered.

During the 45-day public comment period, DOE and DOC-EERA held nine federal public hearings/ state information meetings on the Draft EIS: in Red Lake, Minnesota, on July 14, 2015; Roseau and Baudette, Minnesota, on July 15, 2015;

Littlefork and International Falls, Minnesota, on July 16, 2015; Kelliher and Bigfork, Minnesota, on July 21, 2015; and two meetings in Grand Rapids, Minnesota, on July 22, 2015.

DOE and DOC–EERA responded to written and verbal comments from 208 comment letters. This included five comments from federal government officials or agencies, seven from federally recognized tribes, 12 from state government officials or agencies, 21 from local government officials, agencies, or planning boards, one from a non-governmental organization, 12 from commercial companies, four from the Applicant, one from a Manitoba Justice, and 145 from private citizens. (The comment letters and more detailed responses are included in Appendix Y.) The major issues identified during the Draft EIS comment period, including late comments, include:

Regulatory Process/Public Involvement—Several comments noted that landowners did not receive appropriate public notice, that the meetings were not publicized properly, or that there was not enough opportunity to provide meaningful input into the route selection process.

DOE/DOC response: Notification of the proposed Project was provided in a manner consistent with DOE and MN PUC requirements and outlined in Section 1.4.4 of the EIS. Additionally, as described in Section 2.3.1, the Applicant hosted numerous public involvement meetings throughout the route selection process to provide Project information and solicit feedback from the public.

Purpose and Need—Several comments questioned the need for project from an electrical reliability standpoint and said that the document did not adequately address the need for the project.

DOE/DOC-EERA response: The purpose and need for DOE's action and decision is described in Section 1.2.2, and the MN PUC certificate of need process is discussed in Section 1.3.2 of the EIS. The MN PUC determined that there is a need for the proposed Project in eDocket #12-1163 (certificate of need).

Project Description/Project Design—Several comments questioned various aspects of the project description and project components including the proposed compensation station, substation, access roads, capacity of the line, and other design criteria.

DOE/DOC-EERA response: As discussed in Section 2.9.7 of the EIS, once a route is selected the Applicant will identify the locations for all permanent and temporary access roads, laydown areas, stringing areas, fly-in sites, and structure locations. They will work with the federal and state agencies to develop survey plans, conduct fieldwork, and determine the wetland and other resource impacts for the project. This information will be needed in order to complete the federal and state permitting processes. Until a route is selected, the exact locations of these project components cannot be known.

Alternatives—Several comments suggested that alternative routes or other system and non-transmission alternatives should be evaluated in the Final EIS.

DOE/DOC-EERA response: DOE and DOC-EERA determined that the Draft EIS covered a range of reasonable alternatives and none of the route alternatives presented warranted expanding that range. Non-transmission alternatives were considered but eliminated from detailed analysis because they are outside the scope of the purpose of and need for DOE's federal action, which is to decide whether to issue a Presidential permit. Non-transmission alternatives that are out of scope for this EIS were handled under the state's certificate of need process.

No Action Alternative—Other comments challenged the adequacy of the No Action Alternative analysis and suggested it was slanted in the applicant's favor.

DOE response: The No Action Alternative is discussed in full in Chapter 3 of the EIS. DOE's Federal Action is to decide whether to grant the Applicant a Presidential permit for the international border crossing that is part of the proposed Project. The No Action Alternative is to not issue the requested Presidential permit.

Human Settlement—Several comments expressed concern for displacement and impacts to private farmland and homes near proposed routes and variations. Several comments expressed a preference for the proposed Project to utilize public lands instead of private property. Other comments expressed concerns about the proximity of community spaces, such as fire departments,

churches, and parks, to proposed routes and variations.

DOE/DOC-EERA response: As discussed in Section 1.3.1.4 of the EIS, once a route is selected and a permit is issued, the Applicant would contact landowners to gather information about their property and their concerns and discuss how the ROW would best proceed across the property.

Noise and Vibration—Several comments expressed concern regarding audible noise from operation of the proposed Project, including noise from corona discharges. Another comment requested that the predicted noise levels for the compensation station be provided in the EIS along with a discussion of infrasound and explanation of whether additional modeling is necessary. One comment provided additional noise modeling for operation of the proposed Project.

DOE/DOC-EERA response: Noise is discussed in Section 5.2.1.2 of the EIS and provides an analysis of audible noise from operation of the proposed Project, particularly in rainy conditions, when corona noise would be at its highest. This analysis of operational noise also provides estimates for the proposed substation, compensation station, and associated sources (transformers, reactors, and capacitor banks). No additional noise modelling was performed because it was not deemed necessary to adequately characterize impacts.

Air quality/GHG—A comment requested that the EIS include an estimate of total emissions from construction, operation, maintenance, and emergency repair of the proposed Project and that the Applicant pursue more opportunities to use clean diesel equipment and other emission reduction strategies. A comment also requested quantification of the greenhouse gas emission reductions as result of operation of the proposed Project and subsequent reduction of fossil fuels.

DOE/DOC-EERA response: Employment of additional emission reduction strategies during construction of the proposed Project will be dependent on the Applicant to implement as the proposed Project is not expected to result in long-term adverse criteria pollutant or climate change and GHG emissions which would allow for regulatory agency enforcement of emission reduction strategies. Additional emissions estimates are provided in Section 5.2.1.3.

Socioeconomics—Several comments expressed concern about the proposed Project's potential negative impacts on property values and requested more information. Two comments expressed concern about the validity of the property value impact analysis in the EIS.

DOE/DOC-EERA response: A discussion about the potential effects of transmission lines on property values is included in the EIS in Section 5.2.1.4. This includes a summary of the potential range of property value effects attributed to transmission lines. Further, Appendix J, Property Values Supplement provides a summary of the literature regarding the relationship between transmission lines and property values used to develop the property values analysis in Section 5.2.1.4.

Recreation and Tourism—Several comments expressed concern that the proposed Project would negatively impact recreation and tourism activities such as hunting. One comment expressed concerns that if the Cedar Bend WMA Variation is selected, a recreational business could be affected.

DOE/DOC-EERA response. Discussion of impacts on Recreation and Tourism resulting from the proposed Project is in Section 5.2.1.9. The EIS discussion for Recreation and Tourism is limited to activities on public lands. Impacts to landowners as a result of the proposed Project are discussed relative to Displacement in Section 5.2.1.1 and Land Use Compatibility in Section 5.3.1.2.

Public Health and Safety—Several comments expressed concern regarding the impacts of induced voltage on workers and recreational hunting. One comment expressed concern that the effects of induced voltage were incorrectly reflected in the EIS. Other comments expressed concern for high voltage transmission lines and the unknown potential effects on humans. A comment also expressed concern regarding the potential effect of the proposed Project on implantable medical devices. One comment expressed concern if the proposed Project is in proximity to gravel pits, that corona discharges could result in the Henshaw effect, affecting human health. Several comments expressed concern for health impacts due to electric and magnetic fields (EMF). One comment provided updated magnetic field calculations for the proposed Project.

DOE/DOC-EERA response: 5.2.2.4 in the EIS discusses induced voltage. Section 5.2.1.2 of the EIS presents the estimated audible noise levels from the proposed 500 kV transmission lines under rainy conditions (worst case scenario for noise generated from corona effect). Section 5.2.2.8 of the EIS discusses public safety hazards

associated with the proposed Project including electrical shocks.

***Aesthetics*—**One comment requested viewshed maps be prepared and viewshed analyses be conducted for Bass Lake Park, Larson Lake Campground, Wolf Lake-Wasson Lake Bog, and established campgrounds and trails in these areas. A few comments expressed concern for the adequacy of using the 1,500-foot distance as the buffer for the ROI to assess aesthetic impacts. One comment requested analyses of visual impacts at each proposed crossing of a scenic byway, identification of any specific mitigation to reduce visual impacts, and investigation of any scenic easements in the vicinity of scenic byways.

DOE/ DOC-EERA response: Chapters 5 and 6 in the EIS provide analyses sufficient to characterize aesthetic impacts from the proposed Project to sensitive receptors, which are fully enumerated and accounted for in the analysis. Photo simulations for key observation points are provided in Appendix N and provide sufficient simulations to adequately characterize aesthetic impacts from the Project.

***Land Use and Ownership*—**Comments expressed general concerns about the amount of private land impacted by the proposed Project routes and variations and the evaluation of those impacts. Other comments expressed concern about potential impacts on existing uses and potential future uses of private land. Several comments expressed preference for avoiding conservation lands and USFWS Interest Lands. One comment requested that all impacts to USFWS Interest Lands be avoided or minimized by selecting a route that does not impact USFWS Interest Lands, using other areas within the ROW to avoid USFWS Interest Lands, and alternative routes be investigated to avoid impacts to USFWS Interest Lands, and after a thorough evaluation, if USFWS Interest Lands are impacted, unavoidable impacts to USFWS Interest Lands may require mitigation.

DOE/DOC-EERA response: As discussed in Section 1.3.1.4 of the EIS, once a route is selected and a permit is issued, the Applicant would contact landowners to gather information about their property and their concerns and discuss how the ROW would best proceed across the property. The Applicant will work with USFWS to determine if permits can be obtained to cross USFWS interest lands. The need for these permits will be determined once the final route is selected by the MN PUC.

***Land Use*—**Agricultural resources and airstrips. Several comments expressed concern regarding potential impacts to agricultural land and farming operations including those outside the ROW. One comment requested that an Agricultural Impact Mitigation Plan (AIMP) be included as part of the EIS. Several comments expressed concern for potential proposed Project impacts to aerial spraying operations. Other comments expressed concern that transmission lines in close proximity to airstrips and public airports could pose potential hazards to takeoffs and landings.

DOE/DOC-EERA response: Impacts to agricultural land use are addressed in Sections 5.3.2.1, 6.2.2.2, and 7.3.3.1. Impacts to airports and airstrips are discussed in Section 5.2.1.6 and alternatives are not expected to impact either public airports or private airstrips.

***Cultural resources*—**Comments requested that cultural resources investigations are conducted for all disturbance areas for the proposed Project and that cultural resources and historic properties are evaluated with respect to effects from the proposed project. Comments requested that DOE consider the perspectives of federally recognized Indian tribes and include traditional cultural properties (TCPs) when conducting cultural resources investigations and involve federally recognized Indian tribes in the identification and evaluation efforts of TCPs, as well as consult with federally recognized Indian tribes to ensure that visual impacts on visually sensitive lands owned by the tribes are mitigated adequately or measures are taken to reduce those visual impacts.

DOE/DOC-EERA response: DOE has conducted government-to-government consultation with federally recognized Indian tribes pursuant to Section 106 of the NHPA, as amended. The discussion of DOE's tribal consultation is presented in Section 5.3.3.1 Archaeology and Historic Architectural Resources of the EIS. Further documentation of ongoing consultation with the federally recognized Indian tribes is provided in Appendix A of the EIS.

***Wetlands and Water Quality*—**Several comments requested that the proposed Project avoid, minimize, and mitigate wetland impacts. A few comments expressed concern that the proposed Project could impact water resources.

DOE /DOC-EERA response: Specific wetland impacts will be quantified upon selection of a project alignment and project design. A mitigation plan for unavoidable wetland impacts is not

available at this time. Once DOE and MN PUC issue permits for the Project, a wetland mitigation plan will be developed by the Applicant in coordination with USACE, Board of Water and Soil Resources, and appropriate local units of government as part of the environmental permitting process.

***Biological Resources*—**Several comments requested that the proposed Project avoid and minimize impacts to a number of biological resources including vegetation, wildlife, rare species, and rare communities. Several comments expressed concern that the proposed Project could increase the spread of noxious weeds and invasive species. Several comments expressed concern that the proposed Project may impact migratory birds and/or that the Applicant should develop an Avian Protection Plan. Several comments expressed concern and requested that the selected alternatives avoid adverse and unnecessary impacts to wildlife habitats and rare communities.

DOE/DOC-EERA response: As discussed in Section 2.11.1 of the EIS, the Applicant would incorporate industry best practices to minimize impacts to migratory birds, which are consistent with the Avian Powerline Interaction Committee (APLIC's) 2012 guidelines. In addition, the MN PUC route permit could require that the Applicant develop and implement an Avian Protection Plan. The Applicant would coordinate with the Minnesota Department of Natural Resources (MnDNR) and other appropriate agencies in the development of an Avian Protection Plan. Impacts to vegetation are discussed in Chapters 5 and 6 of the EIS. Chapter 6 of the EIS identifies that the MN PUC Route Permit could also require the development of a Vegetation Management Plan as a permit condition, which could include plant surveys along the permitted ROW, incorporate vegetation clearing, and management of invasive species. The MN PUC typically requires the Applicant to prepare a vegetation management plan in coordination with the MnDNR as a condition of the Route Permit.

All comments, including late comments, were considered during the preparation of this Final EIS. Appendix Y in Volume II of this EIS contains the comments received on the Draft EIS and DOE's and DOC-EERA's responses to these comments. This Final EIS contains revisions and new information based in part on comments received on the Draft EIS. Vertical bars in the margins marking changed text indicate locations of these revisions and new information. Deletions are not indicated.

The Minnesota Office of Administrative Hearings (OAH) conducted Public Hearings on the Applicant's Route Permit application. These hearings were held on August 5, 2015, in Roseau, Minnesota; on August 6, 2015, in Baudette and Littlefork, Minnesota; on August 12, 2015, in Kelliher and Bigfork, Minnesota; and on August 13, 2015, in Grand Rapids, Minnesota. The hearings were presided over by Administrative Law Judge Ann C. O'Reilly from the OAH. Notices of the hearings were published in local newspapers and mailed to persons on the project mailing list.

Judge O'Reilly will submit a report to the MN PUC following publication of this Final EIS, which will include findings of fact, conclusions of law, and recommendations on the Applicant's Route Permit application (Minnesota Statutes, section 2l6E.03, subdivisions 6 and 9 and Minnesota Rules, part 7850.2600). MN PUC will consider the ALJ's report and recommendation and determine which route alternative to permit and what conditions to include in the permit.

S.6 Alternatives Analyzed

The EIS addresses the No Action alternative, DOE's Proposed Action, the Applicant's preferred alternative (proposed Project), four alternative border crossings, 22 route segment alternatives, and nine alignment modifications. **The border crossing alternatives are included in the scope of the EIS for purposes of the analysis supporting the MN PUC's Route Permit decision (see Section S.7).**

S.6.1 No Action Alternative

CEQ and DOE **NEPA** regulations require consideration of a No Action alternative. The No Action alternative serves as a baseline against which the potential environmental impacts of a proposed action can be evaluated. Under the No Action alternative, DOE would not issue a Presidential permit for the proposed Project, the transmission line would not be constructed as proposed, and none of the potential environmental impacts associated with the project would occur.

If the proposed Project were not constructed, future wind generation options could be adversely impacted. According to the *Midcontinent Independent System Operator (MISO) Manitoba Hydro Wind Synergy Study*[7], a new 500 kV interconnection with Manitoba would provide

7 Available at: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CB4QFjAAahUKEwj_h5XtlMPIAhULxoAKHeAHDhM&url=https%3A%2F%2Fwww.misoenergy.org%2F_layouts%2FMISO%2FECM%2FDownload.aspx%3FID%3D160821&usg=AFQjCNGZxZvRrDELHEJkJ1nnNoKh_hWTRA&sig2=U83nVSqD5Xe9rC7_n2qJQw.

benefits to the entire MISO footprint, including substantial reductions in wind curtailments and better use of both wind and hydro resources, resulting in increased efficiency for the energy supply system as a whole.

S.6.2 DOE's Proposed Federal Action and Preferred Alternative

DOE's proposed federal action is the granting of the Presidential permit to authorize the construction, operation, and maintenance of the proposed Project at the Applicant's proposed international border crossing. DOE's Presidential permit decision is solely for the international border crossing, while the proposed construction, operation, maintenance, and connection of the portion of the transmission line within the United States is a connected action to DOE's proposed action.

DOE's preferred alternative is to grant a Presidential permit for the Applicant's proposed international border crossing at latitude 49° 00' 00.00" N and longitude 95° 54' 50.49" W, approximately 2.9 miles east of Highway 89 in Roseau County, Minnesota.

S.6.3 Applicant's Preferred Alternative

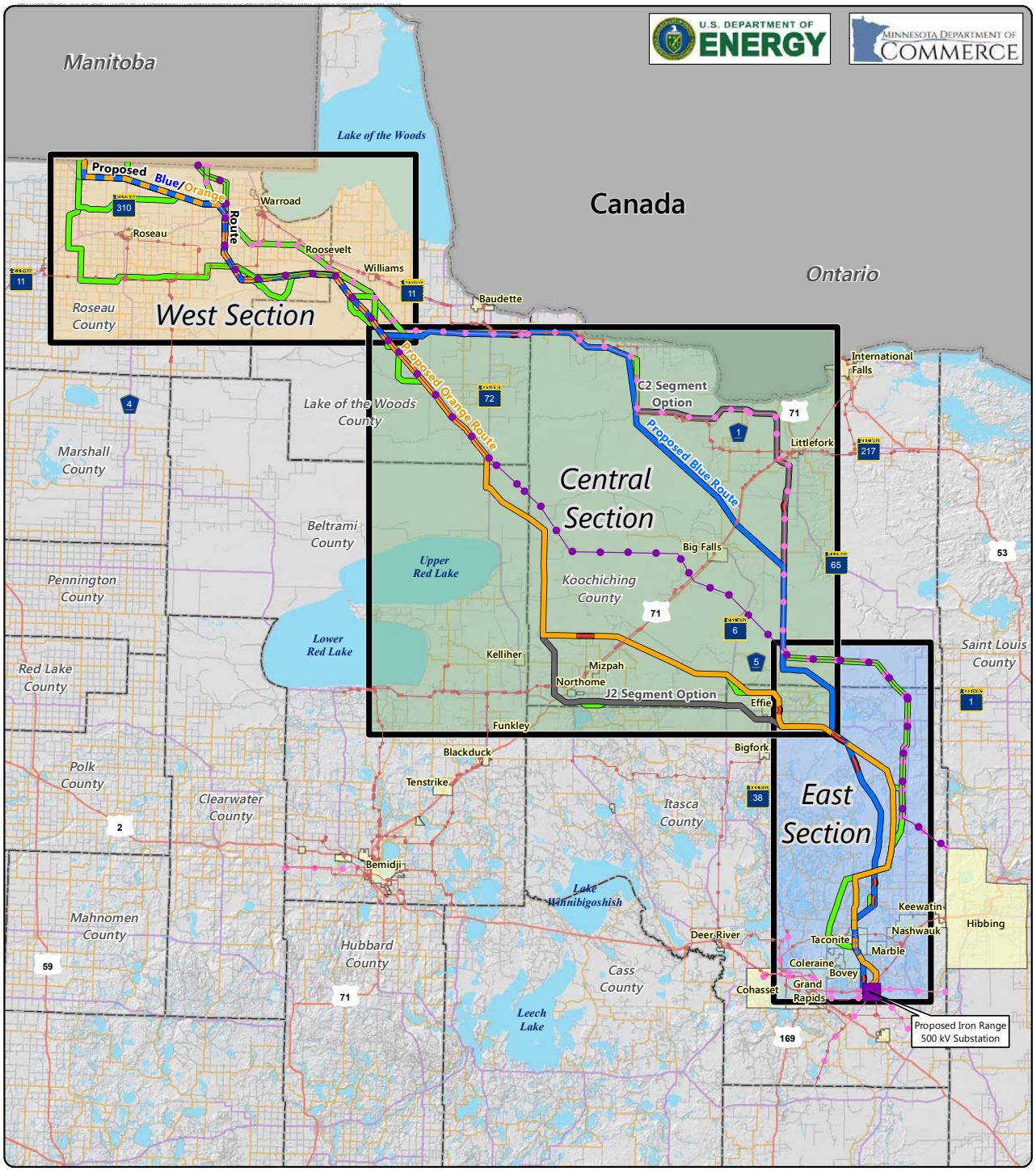
The Applicant's preferred alternative is referred to as the Blue Route in the EIS Map S-1 and would originate at the Minnesota-Manitoba border roughly 2.9 miles east of Highway 89 in Roseau County, Minnesota. It would proceed southeast 0.5 miles to 410th Street, approximately 0.16 of a mile from the intersection of 410th Street and County Road 3. The proposed Project would travel south 2 miles to 390th Street and turn east following 390th Street for 10.5 miles (where 390th street then turns into County Road 118). At 0.25 miles from Highway 310 the proposed transmission line would turn southeast and continue for another 12 miles. At 0.5 miles from 510th Avenue the proposed transmission line would again turn and travel 2.3 miles east to join the existing Minnkota Power 230 kV transmission line. The proposed Project would parallel the existing Minnkota Power 230 kV transmission line southeast for 1.8 miles and then turn south where it would meet the existing Xcel 500 kV transmission line. Beginning at a tenth of mile north of US Highway 11, the proposed transmission line would parallel the existing Xcel 500 kV transmission line route for 36 miles after which it would turn east, leaving the Xcel 500 kV transmission line 2 miles southeast of the intersection of Faunce Forest Road and 19th Street Southwest in Lake of the Woods County (the Proposed Blue Route enters the Central Section in this location).

This alternative would proceed east for 5.8 miles and then turn northeast to rejoin the existing Minnkota Power 230 kV transmission line at its intersection with Pitt Grade Trail. The proposed transmission line would then parallel this existing 230 kV transmission line in an easterly direction for 31 miles to a point 1.5 miles west of the County Road 86 in Koochiching County where it would then proceed southeast for 8.3 miles and then south for 1.8 miles. At this point, the proposed Project would be roughly 1.5 miles south from the intersection of County Road 32 and County Road 36 in Koochiching County. The transmission line would then continue southeast for 21.3 miles and intersect Highway 71 roughly 4.5 miles northeast of Big Falls, where it would continue an additional 9.6 miles to the southeast where it would rejoin the existing Minnkota Power 230 kV transmission line, following the existing transmission line in a southerly direction for 12.3 miles.

The proposed Project would continue south for 3 miles following Deer River Line Road (also called County Road 62). The transmission line would turn east for 3.5 miles and then turn southeast again and travel 5 miles to Itasca County near the intersection

Table S-1 Sections and Corresponding Variation Areas

Sections	Variation Areas	
West Section	Border Crossing Variation Area	Beltrami North Variation Area
	Roseau Lake WMA Variation Area	Beltrami North Central Variation Area
	Cedar Bend WMA Variation Area	
Central Section	Pine Island Variation Area	C2 Segment Option Variation Area
	Beltrami South Central Variation Area	J2 Segment Option Variation Area
	Beltrami South Variation Area	Northome Variation Area
	North Black River Variation Area	Cutfoot Variation Area
East Section	Effie Variation Area	Dead Man's Pond Variation Area
	East Bear Lake Variation Area	Blackberry Variation Area
	Balsam Variation Area	



Proposed Iron Range 500 kV Substation

Project Section

Proposed Routes

Blue/Orange Route

Blue Route

Orange Route

Segment Option

Alternatives

Route Variation

Route Variation Hop

Alignment Modification

Existing Transmission Lines

69 or 115 kV

230 kV

500 kV

Municipal Boundary

County Boundary

International Boundary

Map S-2

PROJECT SECTIONS OVERVIEW

Great Northern Transmission Line

Final Environmental Impact Statement

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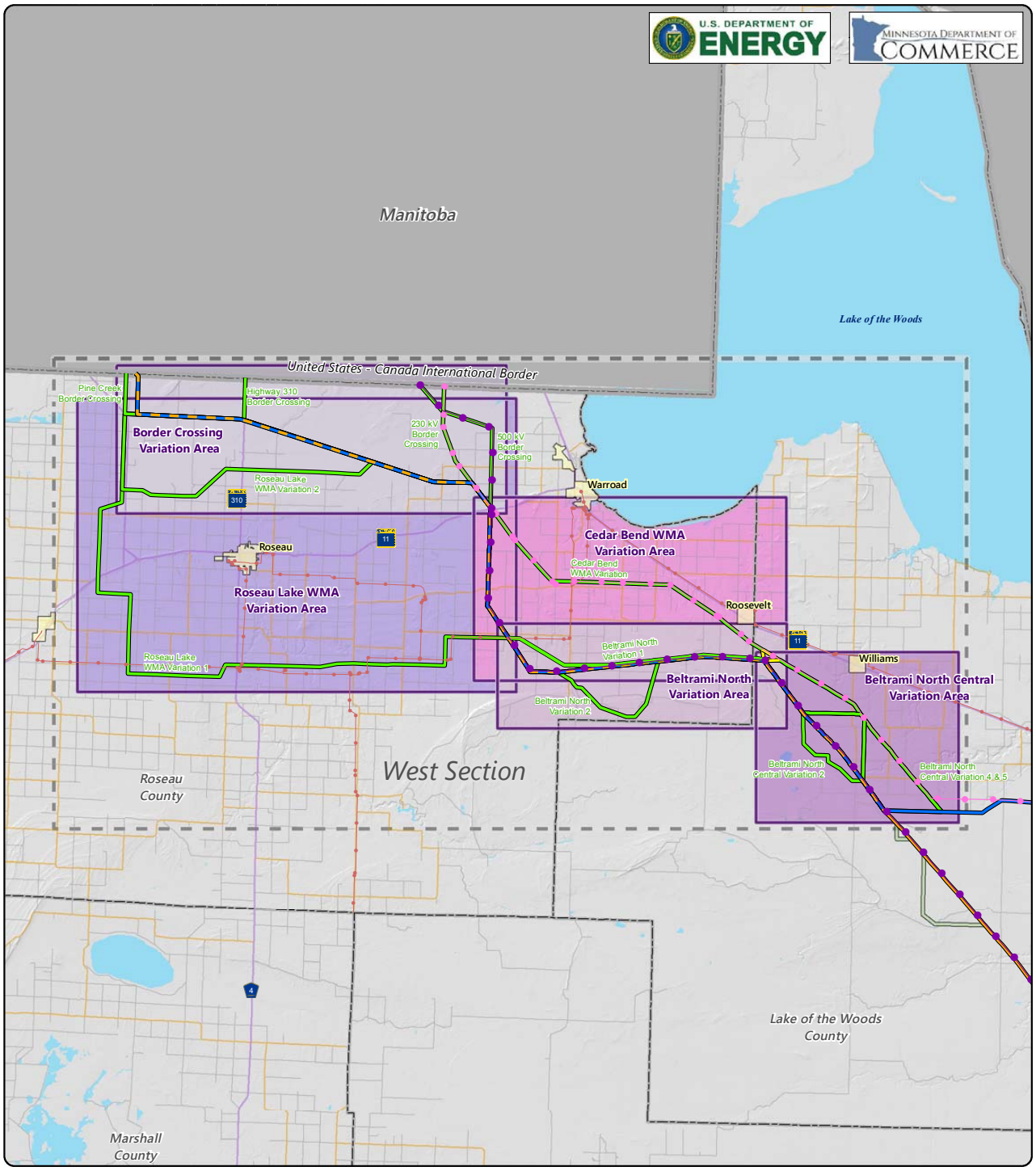

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives
- Route Variation
- Route Variation Hop

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Municipal Boundary
- County Boundary
- International Boundary

Map S-3

WEST SECTION OVERVIEW
Great Northern Transmission Line
Final Environmental Impact Statement

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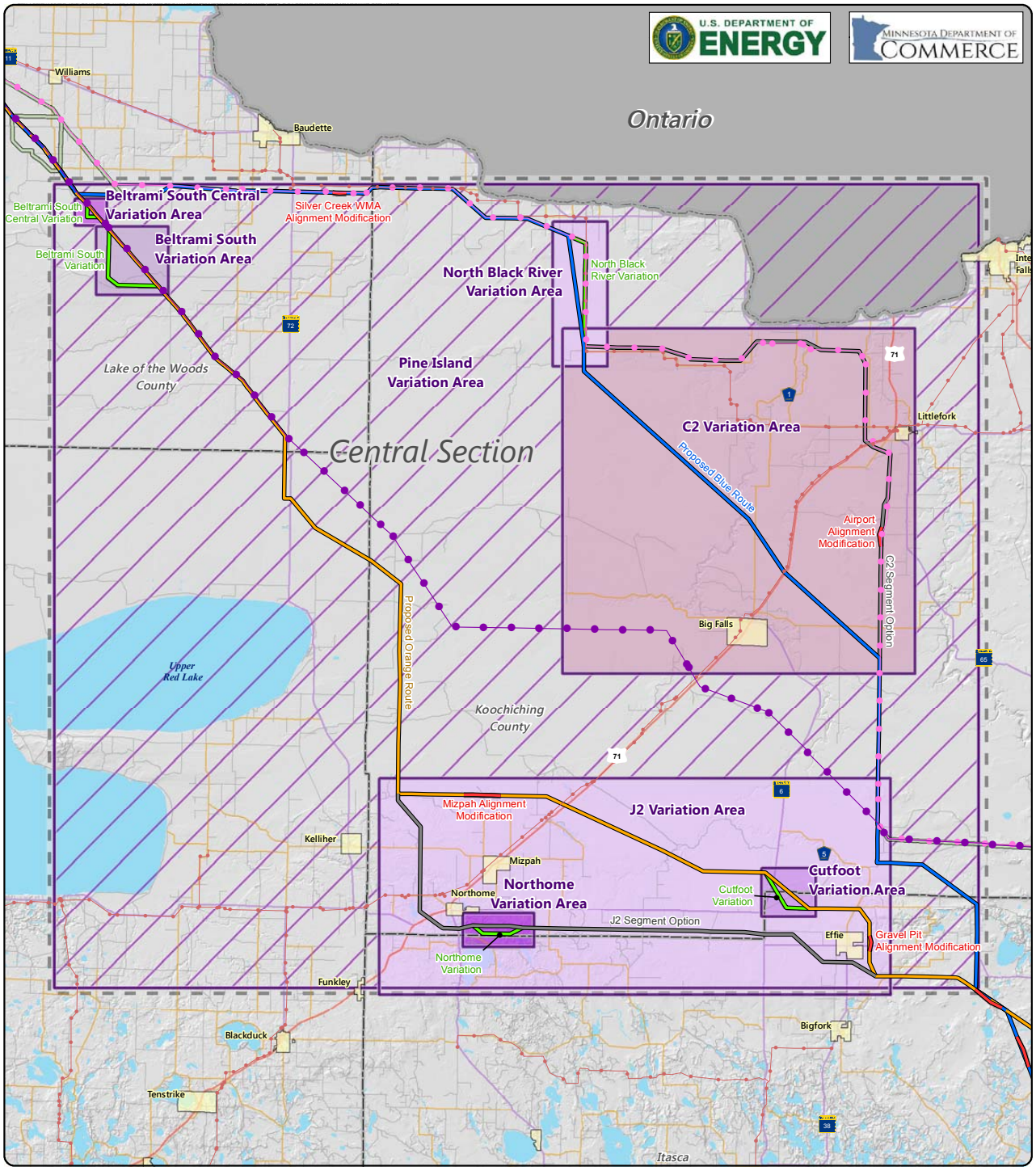

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification
- Variation Area

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Municipal Boundary
- County Boundary
- International Boundary

Map S-4

CENTRAL SECTION OVERVIEW
Great Northern Transmission Line
Final Environmental Impact Statement

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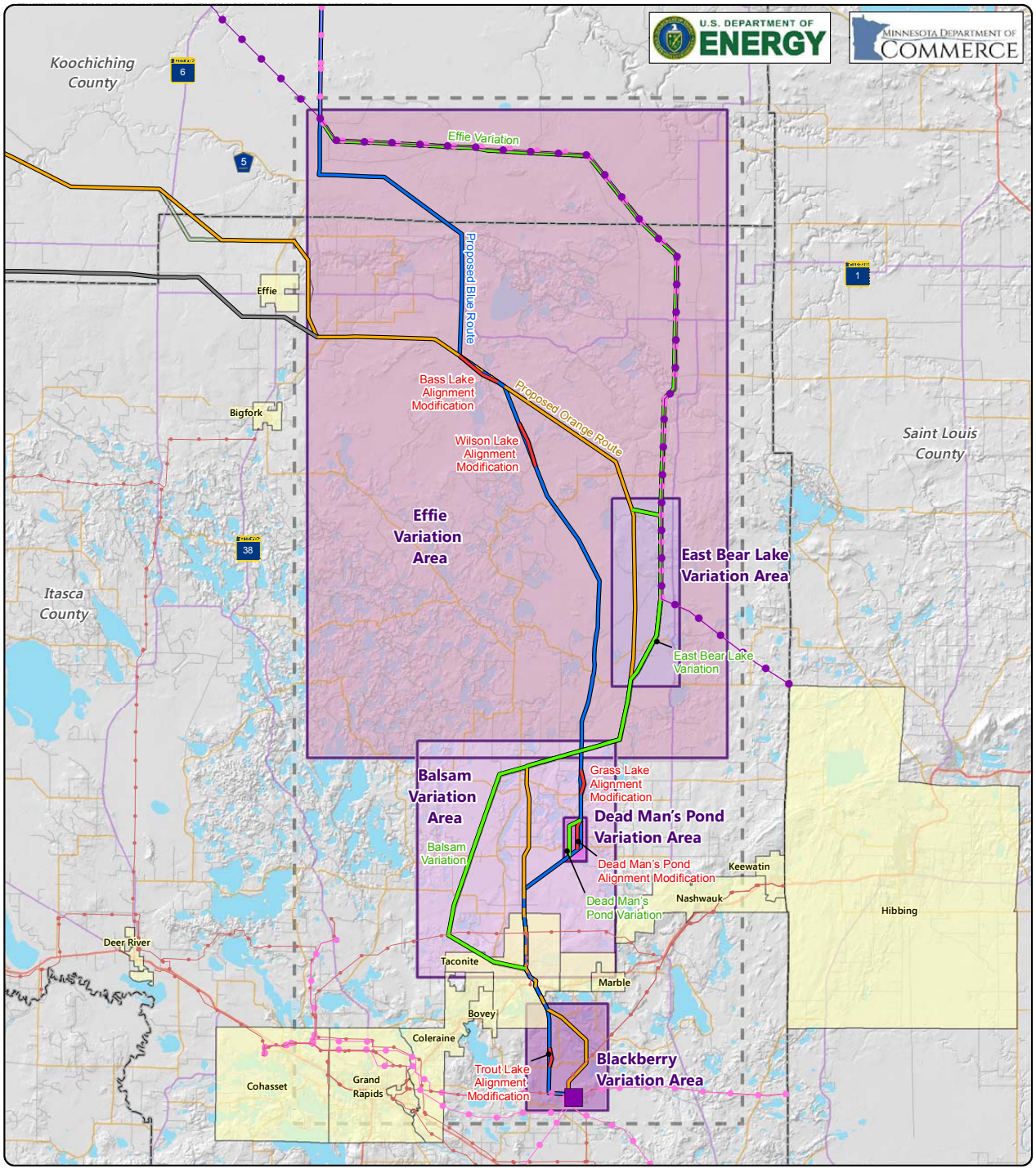


Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

- Proposed Iron Range 500 kV Substation
- Variation Area

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Municipal Boundary
- County Boundary

Map S-5

EAST SECTION OVERVIEW
Great Northern Transmission Line
Final Environmental Impact Statement

Miles 0 7

of County Road 523 and South Lofgrin Forest Road (the Proposed Blue Route enters the East Section in this location). The proposed transmission line would extend south for 6.4 miles, turning slightly southeast for another 2.8 miles, and then head south for 11.5 miles. At 2.8 miles north of Scooty Lake, the proposed Project would continue to travel 7.5 miles south to County Road 530, where it would cross the West Fork Prairie River. At County Road 530, the proposed transmission line would again turn south and continue 6.5 miles to County Road 57. The transmission line would turn southwest for 3.7 miles, and then head south for 3.8 miles to Diamond Lake Road. The route then heads south, southeast for 2.7 miles. At the Swan River, the proposed Project heads south for 4.4 miles where it would meet the existing Minnesota Power 230 kV transmission line, paralleling it for 1 mile to the proposed **Iron Range** 500 kV Substation near Grand Rapids, Minnesota. The Proposed Blue Route is 220 miles in length.

S.6.4 Border Crossing, Route, and Alignment Alternatives

For the purposes of understanding the environmental settings associated with the proposed Great Northern Transmission Line Project, and to facilitate the analysis in the EIS, the transmission line route was divided into three geographical sections: West, Central, and East (Map S-2). These sections are shown on Map S-3, Map S-4, and Map S-5, respectively. Within each section, multiple variation areas were developed by DOE and DOC-EERA to address local issues (Table S-1).

"Variation areas" are smaller geographic areas that allow evaluation and comparison of local issues, such as wildlife management areas or colocation of transmission lines, across alternatives. Each variation area includes the Applicant's proposed routes and local route alternatives or "variations." The EIS evaluates the local issues within each variation area, progressing from west to east across each section.

The "variations' analyzed are specific combinations of segments within a variation area designed to avoid specific local issues. These variations were developed from alternative route segments identified during the scoping process, as described in Chapter 1. The EIS evaluates the potential environmental impacts and presents the results for the variation(s) and the proposed route(s) within each variation area.

The connector segments, or "hops", connect the end of one variation to the beginning of another variation. These hops generally connect variations from west to east from one variation area to a

Table S-2 Proposed Route and Variations in the West Section

Variation Area	Name in the EIS	Name(s) in the Scoping Decision Document	Length (mi)
Border Crossing	Proposed Border Crossing-Blue/ Orange Route	Blue/Orange Shared	25.0
	Border Crossing Pine Creek Variation	Pine Creek Border Crossing Alternative Route Segment	25.7
	Border Crossing Hwy 310 Variation	Hwy 310 Border Crossing Alternative Route Segment	18.6
	Border Crossing 500 kV Variation	500 kV Border Crossing Alternative Route Segment	10.1
	Border Crossing 230 kV Variation	230 kV Border Crossing Alternative Route Segment	8.2
Roseau Lake WMA	Proposed Blue/Orange Route	Blue/Orange Shared Route	30.7
	Roseau Lake WMA Variation 1	Roseau Lake WMA Alternative Route Segment 1	44.1
	Roseau Lake WMA Variation 2	Roseau Lake WMA Alternative Route Segment 2	37.5
Cedar Bend WMA	Proposed Blue/Orange Route	Blue/Orange Route	24.7
	Cedar Bend WMA Variation	Cedar Bend WMA Alternative Route Segment	19.6
Beltrami North	Proposed Blue/Orange Route	Blue/Orange Route	16.5
	Beltrami North Variation 1	Beltrami WMA Alternative Route Segment 1 North	15.8
	Beltrami North Variation 2	Beltrami WMA Alternative Route Segment 2	19.7
Beltrami North Central	Proposed Blue/Orange Route	Blue/Orange Route	11.6
	Beltrami North Central Variation 1	Beltrami WMA Alternative Route Segment 4 & 5	13.7
	Beltrami North Central Variation 2	Beltrami WMA Alternative Route Segment 3	12.6
	Beltrami North Central Variation 3	Beltrami WMA Alternative Route Segment 1 South & 5	12.2
	Beltrami North Central Variation 4	Beltrami WMA Alternative Route Segment 1 South	13.5
	Beltrami North Central Variation 5	Beltrami WMA Alternative Route Segment 4 & 1 South	15.0

Table S-3 Proposed International Border Crossing in the West Section

Variation Area	Name in the EIS	Location of International Border Crossing	
		Latitude (degrees, minutes, seconds)	Longitude (degrees, minutes, seconds)
Border Crossing	Proposed Border Crossing-Blue/Orange Route	49° 00' 00.00" N	95° 54' 50.49" W
	Border Crossing Pine Creek Variation	49° 00' 00.00" N	95° 55' 35.79" W
	Border Crossing Hwy 310 Variation	49° 00' 00.00" N	95° 46' 8.82" W
	Border Crossing 500 kV Variation	49° 00' 00.00" N	95° 32' 23.96" W
	Border Crossing 230 kV Variation	49° 00' 00.00" N	95° 30' 26.18" W

Table S-4 Proposed Route Alternatives, Variations, and Alignment Modifications in the Central Section

Variation Area	Name in the EIS	Name(s) in the Scoping Decision Document	Length (mi)
Pine Island	Proposed Blue Route	Blue Route	109.8
	Proposed Orange Route	Orange Route	105.4
	Silver Creek WMA Alignment Modification	Silver Creek WMA Alignment Modification	1.0
	Proposed Blue Route	Blue Route	1.0
Beltrami South Central	Proposed Orange Route	Orange Route	1.2
	Beltrami South Central Variation	Beltrami WMA Alternative Route Segment 7	1.7
Beltrami South	Proposed Orange Route	Orange Route	5.6
	Beltrami South Variation	Beltrami WMA Alternative Route Segment 8	7.5
North Black River	Proposed Blue Route	Blue Route	8.4
	North Black River Variation	North Black River Alternative Route Segment	9.2
C2 Segment Option	Proposed Blue Route	Blue Route	32.8
	C2 Segment Option Variation	C2 Proposed Alternative	46.0
	Airstrip Alignment Modification	Airstrip Alignment Modification	1.5
	C2 Segment Option Variation	C2 Proposed Alternative	1.5
J2 Segment Option	Proposed Orange Route	Orange Route	42.2
	J2 Segment Option Variation	J2 Proposed Alternative	45.2
	Mizpah Alignment Modification	Mizpah Alignment Modification	2.8
	Proposed Orange Route	Orange Route	2.8
	Gravel Pit Alignment Modification	Gravel Pit Alignment Modification	1.2
	Proposed Orange Route	Orange Route	1.2
Northome	J2 Segment Option Variation	J2 Proposed Alternative	3.7
	Northome Variation	Northome Alternative Route Segment	4.0
Cutfoot	Proposed Orange Route	Orange Route	4.2
	Cutfoot Variation	Cutfoot Alternative Route Segment	4.8

different variation area. The exception is one hop that connects the end of a variation from east to west in order to allow additional flexibility for a complete route alternative. The EIS uses the hops to develop complete route alternatives.

"Alignment modifications" are minor adjustments of the transmission line alignment (centerline and associated ROW) within the proposed routes that are analyzed in the EIS. During the scoping process, commenters developed and proposed these alignment modifications. **During the Draft EIS comment period, no commenters provided additional alignment modifications.** The purpose for each alignment modification is to provide a potential alternative for analysis that avoids a specific issue raised by commenters (e.g., sensitive lands, residences, airstrips, etc.). The EIS evaluates issues identified during the scoping process and presents the results for the alignment modification

Table S-5 Proposed Routes, Variations, and Alignment Modifications in the East Section

Variation Area	Name in the EIS	Name(s) in the Scoping Decision Document	Length (mi)
Effie	Proposed Blue Route	Blue and Blue/Orange Routes	41.1
	Proposed Orange Route	Blue, Blue/Orange, and Orange Routes	44.6
	Effie Variation	Effie Alternative Route Segment	49.8
	Bass Lake Alignment Modification	Bass Lake Alignment Modification	2.5
	Proposed Blue/Orange Route	Blue/Orange Route	2.4
	Wilson Lake Alignment Modification	Wilson Lake Alignment Modification	2.4
	Proposed Blue Route	Blue Route	2.4
East Bear Lake	Proposed Orange Route	Orange Route	8.9
	East Bear Lake Variation	East Bear Lake Alternative Route Segment	10.5
Balsam	Proposed Blue Route	Blue and Blue/Orange Routes	12.9
	Proposed Orange Route	Orange and Blue/Orange	13.7
	Balsam Variation	Balsam Alternative Route Segment 1	17.8
	Grass Lake Alignment Modification	Grass Lake Alignment Modification	1.3
	Proposed Blue Route	Blue Route	1.3
Dead Man's Pond	Proposed Blue Route	Blue Route	2.2
	Dead Man's Pond Variation	Dead Man's Pond Alternative Route Segment	2.3
	Dead Man's Pond Alignment Modification	Dead Man's Pond Alignment Modification	1.6
	Proposed Blue Route	Blue Route	1.6
Blackberry	Proposed Blue Route	Blue Route	5.4
	Proposed Orange Route	Orange Route	6.1
	Trout Lake Alignment Modification	Trout Lake Alignment Modification	1.0

and the comparable segment of the Applicant's proposed route alternative.

There are five variation areas within the West Section: Border Crossing, Roseau Lake WMA, Cedar Bend WMA, Beltrami North, and Beltrami North Central. In addition, there are five connector segments, or hops, that connect variations between the Cedar Bend WMA, Beltrami North, and Beltrami North Central variation areas (Table S-2).

In addition, there are five proposed international border crossings within the Border Crossing Variation Area of the West Section as identified in Table S-3. These alternatives include the proposed Border Crossing Blue/Orange Route Variation, the Border Crossing Pine Creek Variation, Border Crossing Hwy 310 Variation, Border Crossing 230 kV Variation, and the Border Crossing 500 kV Variation alternatives.

There are eight variation areas within the Central Section: Pine Island, Beltrami South Central, Beltrami South, North Black River, C2, J2, Northome, and Cutfoot identified in Table S-4. In addition, there are four alignment modifications within the proposed routes, Section 4.2): Silver Creek WMA, Airstrip, Mizpah, and Gravel Pit.

There are five variation areas within the East Section: Effie, East Bear Lake, Balsam, Dead Man's Pond, and Blackberry. In addition, there are five alignment modifications: Bass Lake, Wilson Lake, Grass Lake, Dead Man's Pond, and Trout Lake (Table S-5).

S.7 Alternatives Considered but Eliminated from Detailed Analysis

A few scoping comments focused on the potential effects of the proposed Project on Canadian resources and First Nations. Consistent with Executive Order 12114, Environmental Effects Abroad of Major Federal Actions (January 4, 1979), this issue was determined by DOE and DOC-EERA to be outside of the scope of the EIS. Implementation of the proposed Project would require construction of a transmission line and other infrastructure in Canada. An environmental review of potential impacts from the portion of the proposed transmission line project in Manitoba will be developed and submitted as part of Canada's authorization process associated with the facilities

to be constructed in the province. NEPA does not require an analysis of environmental impacts that occur within another sovereign nation that result from actions approved by that sovereign nation. For that reason, potential environmental impacts in Canada are not addressed in this EIS.

During the public scoping period, five border crossing alternatives, 40 new alternative route segments, and nine alignment modifications were suggested by the public and agencies for detailed study in the EIS. Four of these border crossing alternatives were determined by DOE as potentially reasonable alternatives and are included in the scope of the EIS. The fifth border crossing alternative was not included because it was proposed to cross a restricted MnDNR Scientific and Natural Area (SNA) and was thereby determined by DOE to be infeasible. **The border crossing alternatives are included in the scope of the EIS for purposes of the analysis supporting the MN PUC's Route Permit decision. It is important to note that the DOE is only currently considering the alternative border crossings as action alternatives to its consideration of the international border crossing proposed by Minnesota Power at latitude 49° 00' 00.00" N and longitude 95° 54' 50.49" W (roughly 2.9 miles east of Highway 89 in Roseau County, Minnesota) in its Amended Presidential permit application to DOE (October 2014).**

Non-transmission alternatives were proposed during the public comment period on the Draft EIS. DOE and DOC-EERA determined that the DEIS covered a range of reasonable alternatives and none of the route alternatives presented warranted expanding that range. Non-transmission alternatives were considered but eliminated from detailed analysis because they are outside the scope of the purpose of and need for DOE's federal action, which is to decide whether to issue a Presidential permit. Non-transmission alternatives that are out of scope for this EIS were handled under the state's certificate of need process.

With respect to the new route alternatives, the DOC-EERA is charged with including alternatives which will "assist in the [Commission's] decision on the permit application."[8] When route alternatives are proposed during the scoping process, the DOC-EER analyzes them using a set of criteria, which include considerations related to timing, justification for inclusion in the EIS (i.e., does it mitigate a potential impact from the proposed Project?), jurisdictional restrictions, and feasibility. The DOC-EERA Scoping Decision, determined in coordination with DOE, specifies that the EIS will evaluate 22 new alternative route segments and all nine new alignment modifications. The DOC-EERA Scoping Decision document articulates in detail the agencies' rationale for eliminating each of the 11 alternative route segments from analysis in this EIS[9].

8 Minnesota Rule 7850.2500, Subp. 3.

S.8 Summary of General Impacts Common to All Alternatives

General impacts that are common to all alternatives are provided in Chapter 5 and are discussed below.

S.8.1 Human Settlement

The proposed Project could potentially result in displacement, noise, air quality, property value, electronic interference, and transportation and public service impacts.

Displacement. There are no residences, churches, schools, day-care centers, or nursing homes within the 200-foot ROW or within 1,500 feet of the proposed Project's anticipated alignment. Therefore, none of these structures would be displaced during construction, operation, or maintenance of the proposed Project. A limited number of non-residential structures (e.g., farm structures and animal sheds) are located within the ROW, however as the proposed routes and variations cross relatively sparsely populated areas, adequate space is generally available to allow the alignment of the transmission line to be adjusted so that no buildings would ultimately be located within the ROW. Minor structures, such as farm structures and animal sheds may be displaced. Owners will be consulted and made a land acquisition offer as described in Section S.4.4.

Noise. Potential noise associated with the proposed Project could result from machinery used for constructing and operating the transmission line and the **proposed Iron Range 500 kV** Substation, 500 kV series compensation station, or regeneration stations.

Since noise impacts are a function of the transmission line and equipment, predicted noise levels would not vary by proposed route or variation. The proposed routes and variations cross relatively sparsely populated areas and only a few sensitive receptors (schools, day cares, and nursing homes) could be impacted and those noise levels would be expected to be below Minnesota noise standards for any proposed route or variation. Construction noise at any proposed Project location would occur on a temporary, intermittent, and localized basis during daytime hours. In addition, noise from operating,

9 Available at:https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={CA030A65-41EF-411E-AE8C-B571A9E2350C}.

maintaining, and making emergency repairs to the transmission line would be expected to be limited.

Air Quality. Air quality conditions relative to National Ambient Air Quality Standards (NAAQS) in the State of Minnesota are assessed at the county level. EPA designates Roseau, Lake of the Woods, Beltrami, Koochiching, and Itasca Counties as being in attainment or unclassifiable (to be considered in attainment) for all NAAQS (EPA 2015, reference (2)). Therefore, DOE's proposed action is exempt from the General Conformity Rule requirements of the Clean Air Act.

Constructing and operating the proposed Project would result in direct and indirect emissions of criteria air pollutants and greenhouse gases (GHGs). These emissions would be short-term and localized **and would not affect the attainment status in the region**. In addition, the proposed Project would reduce indirect criteria pollutants and GHGs because it would reduce the need for coal-fired generation in Minnesota by replacing it with wind and hydroelectric generation (for detailed information on air quality, see Section 5.2.1.3).

Property Values. The precise relationship between property values and proximity to high voltage transmission lines is difficult to quantify, since numerous interrelated factors impact property values. Based on the trends identified in numerous property value studies (Weber and Jensen 1978, reference (3); Jensen and Weber 1982, reference (4); Jackson and Pitts 2010, reference (5), the impacts from the proposed Project would be expected to be minimal.

Electronic Interference. Potential electronic interference impacts would be expected to be minimal for the proposed Project and would be similar for all proposed routes and variations. No communication towers have been identified within the ROW, and electromagnetic noise from the proposed Project would not be expected to interfere with television, radio, or cell phone transmissions.

Transportation and Public Services. Due to relatively low existing traffic volumes, impacts on local roadways would be short-term and localized. Use of oversized or heavy vehicles would be approved in advance by the Minnesota Department of Transportation (MnDOT), and the Applicant would repair any damage.

Similarly, the proposed Project would not be expected to impact either public airports or private airstrips. All airports are located more than a mile from the proposed Project, and the Applicant would abide by all FAA guidelines. The Applicant has already developed alignment modifications to eliminate potential impacts on unregulated private airstrips.

The proposed Project would not be expected to impact public electric, gas or water utilities, although it could impact existing electric transmission and distribution lines when it would pass over them. Design of the proposed Project would minimize such potential interference.

Emergency Services. The proposed Project would not be expected to impact police, fire, or emergency medical services, and impacts would not be expected to vary by proposed route or variation. The Applicant would coordinate temporary road closures with local authorities and would provide safe access for emergency vehicles. During construction and operation of the proposed Project, some emergency services might also be required. However, existing emergency services are equipped to handle such situations.

Environmental Justice. Analysis indicates that no minority or low-income groups would be exposed to disproportionate impacts from the proposed Project. In addition, many of the impacts would be short-term and localized and would not be expected to differ between the proposed routes and variations considered.

Socioeconomics. During construction, an average of 120 construction workers would be employed annually, with a peak as high as 213 workers. Jobs would also be created in service sectors that support construction and workers. No full- or part-time workers would be expected to be hired during operation and maintenance of the proposed Project.

The proposed Project would also have positive tax benefits. The estimated tax and revenue impacts of the proposed Project would not differ by proposed route or variation considered. Taxes would be collected at the local, county, and state levels and tax rates would be set independently in each jurisdiction.

During the pre-development and construction phases, the proposed Project would generate approximately $28 million in state and local taxes through compensation, business, household, and corporate taxes. Direct and indirect expenditures during construction would total approximately $839 million.

Housing demand would also not differ by proposed route or variation considered. Given the available temporary housing supply in each geographic

section of the proposed Project, the short-term construction period, and the movement of workers along the route, impacts to temporary housing would be expected to be limited. The proposed Project would also bring economic benefits to proprietors of the hotels, motels, and RV campgrounds rented by temporary workers.

Recreation and Tourism. Recreational resources within 1,500 feet of the proposed centerline include state forests, state parks, scenic byways, state trails, and snowmobile and water trails. Further, state trails, forests, scenic byways, and snowmobile and water trails all cross the ROW for the proposed routes and variations.

State forests, for example, offer opportunities for camping, hunting, bird watching, hiking, canoeing/kayaking, picnicking, horseback riding, snowmobiling, boating, and fishing. State parks offer opportunities for wildlife and bird watching, hiking, mountain biking, cross country skiing, snowmobiling, camping, fishing, and swimming.

Impacts to recreation and tourism during construction would be expected to be short-term and local, lasting only for the duration of construction. Once constructed, project components, such as the overhead transmission line, could have long-term aesthetic impacts that could detract from the setting of nearby recreational activities. **Once a route is selected and a permit is issued, the Applicant would contact the relevant state agencies to gather information about their property and their concerns and discuss how the ROW would best proceed across the property in order to minimize these impacts.**

The proposed Project could result in long-term indirect impacts to recreation and tourism. While potential impacts to recreation and tourism could occur, they would not be expected to vary by proposed route or variation considered, as the proposed Project would cross state forests and have a similar impact wherever it is visible.

S.8.2 Public Health and Safety

Public health and safety concerns from the proposed Project include EMFs, implantable medical devices, stray voltage, induced voltage, intentional destructive acts, and environmental contamination.

Electric and Magnetic Fields. Human-made EMFs are caused by electrical devices and are characterized by their wavelength, amplitude (strength), and the frequencies at which they alternate. Electric fields are produced by voltage and increase in strength as the voltage increases.

Electric field strength is measured in kilovolts per meter (kV/m), and 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 or buildings.

Magnetic fields result from the flow of electrical current (measured in amps) moving through wires or electrical devices. The strength of a magnetic field is proportional to the electrical current, and it is typically measured in milliGauss (mG). As with electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases. Unlike electric fields, however, magnetic fields are not easily shielded or weakened by objects or materials.

A concern related to EMF is the potential for adverse health effects due to EMF exposure. Laboratory, animal, and cellular studies fail to show a cause and effect relationship between disease and EMF exposure at common EMF levels and a biological mechanism for how EMF might cause disease has not been established. Epidemiological studies, however, indicate that there is an association between childhood leukemia and EMF exposure, but there is no consistent association between EMF exposure and other diseases in children or adults.

The Applicant modeled and calculated EMF with two transmission line structure configurations (stand-alone 500 kV transmission line and 500 kV transmission line paralleling existing transmission lines). The extensive modeling and analysis showed that potential public-health effects of EMFs are not expected from the proposed Project. EMF levels are predicted based on the proposed Project components rather than the surrounding environment. Therefore, EMF levels within the ROW would remain below the Minnesota standard regardless of the proposed route or variation considered.

Implantable Medical Devices. Implantable medical devices, such as pacemakers, implantable cardioverter defibrillators (ICDs), neurostimulators, and insulin pumps may be subject to interference from EMFs, which could mistakenly trigger a device or inhibit it from responding appropriately.

A 2005 theoretical study evaluated the risk for a patient with a unipolar cardiac pacemaker under worst-case and real-life conditions under a high voltage overhead transmission line(Scholten 2005, reference (6)). This study concluded that beneath

high voltage overhead transmission lines a life-threatening situation for cardiac pacemaker patients is unlikely because if a cardiac device is affected, it is typically a temporary asynchronous pacing (i.e., fixed rate pacing), and the device returns to its normal operation when the person moves away from the source of EMFs. An interference between the implant and the electromagnetic fields, however, cannot be excluded.

There are no residences, businesses, or sensitive receptors such as hospitals or nursing homes located nearby, so the regular presence of implantable medical devices within the ROW would not be expected.

Electric field strength levels decrease with distance, and maximum levels at the edge of the ROW are anticipated to be less than 2 kV/m, and, in most instances, less than 1 kV/m; manufacturers indicate that electric fields below 6.0 kV/m are unlikely to affect most implantable medical devices (Electric Power Research Institute 2004, reference (7)). In the event that a cardiac device is affected, the effect is typically a temporary asynchronous pacing, and the device returns to its normal operation when the person moves away from the source of EMFs.

Accordingly, potential impacts to implantable medical devices and their users would be expected to be minimal, regardless of the proposed route or variation considered.

Stray Voltage. Stray voltage can arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, or from faulty wiring or faulty grounding of conducting objects in a facility. Therefore, stray voltage could exist at any business, residence, or farm which uses electricity, independent of whether there is a transmission line nearby. Factors that could influence the intensity of stray voltage include wire size and length, the quality of connections, the number and resistance of ground rods and the current being grounded.

The proposed 500 kV transmission line would not directly connect to businesses, residences, or farms in the area, so impacts from stray voltage would not be expected from operating the transmission line. All proposed routes and variations, however, would at some point parallel existing distribution lines, so in those locations additional currents could occur on the distribution line. These currents would not be expected to result in stray voltage in the proposed Project area. If there is not proper grounding or wiring on the distribution system or at a nearby residence, business, or farm, however, these currents could result in a small amount of current flowing through people or livestock, resulting in involuntary muscle contractions and/or pain.

Induced Voltage. The electric field from a transmission line can couple with any object, like a vehicle or metal fence, capable of conducting electrical energy.

If the objects upon which a voltage is induced 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 might be accompanied by a spark discharge and mild shock. For metallic objects where effective grounding is more difficult to achieve, impacts such as mild shock could occur.

The primary means of minimizing this potential impact would be to avoid exiting and entering machinery directly under a transmission line and adhering to MN PUC and National Electric Safety Code (NESC) standards on electric field-limit and line-to-ground clearances. That being the case, induced voltage resulting from the proposed Project would be expected to be minimal and would not vary by proposed route or variation.

Intentional Destructive Acts. While the likelihood for intentional destructive acts to the proposed Project is difficult to predict, it is unlikely that such acts would occur, based on past experience along the thousands of miles of electrical transmission lines in the U.S.

Far more likely would be mischievous or criminal acts of theft or vandalism, which would generally pose lower safety risks. Although the possibility of some theft or vandalism is considered likely, related health and safety effects on workers or the public from the proposed Project would be expected to be minimal and do not vary by proposed route or variation.

Environmental Contamination. During construction, spills may occur or excavation may uncover existing contamination, which could pose a safety or health risk to construction workers, the public, wildlife, botanical habitats, soil and sediment, and water resources.

The Applicant is currently developing an SPCC Plan, which is required to prevent discharge of oil into navigable waters of the U.S., if the above-ground storage capacity for the substance is greater than 1,320 gallons and there is a reasonable expectation of a discharge.

Constructing and maintaining any transmission line involves using hazardous materials and

generating waste. If handled improperly, the public or the surrounding environment could be adversely impacted. For all the proposed routes and variations, soil would be disturbed and, as a result, any existing contaminated soil or groundwater could be mobilized.

Four active investigation and cleanup sites and three active hazardous waste sites are located within approximately 2,000 feet of the proposed routes and variations. If contamination is identified during construction activities, the construction would be discontinued in that location until further evaluation of the conditions is performed.

One contaminated site has been identified within a proposed ROW (J2 Segment Option Variation in the J2 Segment Option Variation Area (see Appendix M). Potential impacts to public health and safety from environmental contamination would be expected to be minimal. Potential impacts from the proposed Project would not be expected to vary by proposed route or variation.

Worker Health and Safety. Constructing transmission lines and related structures is relatively dangerous. Accidents that could occur at construction sites would include heavy equipment and commuting vehicle accidents, electrocution, personal accidents (e.g., slips, trips, and falls), hazardous materials spills, construction-induced fires, and accidents from using watercraft, aircraft, or driving equipment on the ice in winter.

The Applicant and its contractors would comply with Occupational Safety and Health Administration regulations and with other federal, state, and local regulatory requirements and would implement best management practices to safeguard workers and the public from construction and operational hazards. Construction activities would also be similar at all locations and would not vary by route or variation.

To minimize dangers from lightning strikes, the Applicant would also incorporate safety measures, including the use of shield wires, circuit breakers, and relays, into design plans.

S.9 Summary of Route-Specific Impacts Associated with the Project

Impacts that are unique to a specific alternative within the West, Central, and East sections are described below.[10] Impacts are presented geographically (rather than by resource) to assist readers of this EIS in finding information specific to particular areas or locations of interest to them along the length of the proposed Project. The Applicant's proposed route, the Applicant's alternative routes, the 22 alternative route segments, and nine alignment modifications that were proposed by agencies and the public during scoping were analyzed by DOE in coordination with the DOC-EERA, and were jointly determined to be within the scope of this EIS, and therefore studied in detail.

S.9.1 Route-Specific Impacts to West Section

Impacts that are unique to a specific alternative within the West Section are described below.

Human Settlement. Aesthetic, or visual resources, are generally defined as the natural and built features of a landscape that may be viewed by the public and contribute to the visual quality and character of an area.

Much of the West Section is characterized by forest, woodland, brushland, and peatland, with lakes, ponds, streams, and wetlands. Agricultural land is also present within this section.

No county parks, state parks, state forest campgrounds, national parks, or water access points are present within the 200-foot ROW or within 1,500 feet of the anticipated alignment of the proposed routes and variations in the West Section; however residences, historic architectural sites, state forests, national forests, scenic byways, state trails, snowmobile trails, and state water trails are present within 1,500 feet. No residences, state trails, historic architectural sites, national forests, nor state water trails are located within the 200-foot ROW. State forests, scenic byways, snowmobile trails are crossed by the ROW in the West Section.

Constructing and operating the proposed Project could impact views of the landscape, and short-term impacts could be caused by everything from ROW clearing and building access roads to dust from vehicle traffic, the presence of large delivery vehicles, or worker parking. Long-term impacts

10 The EIS evaluates potential impacts to resource areas necessary for the MN PUC Route Permit decision, but that are not typical to DOE Presidential permit EIS's: corridor sharing, electric system reliability, and cost considerations that depend on design and route.

could include transmission line forms, textures, or colors that conflict with natural forms.

Land-Use Compatibility. The predominant land uses in the West Section, crossed by the proposed routes and alternatives, include state forest land, state fee lands, USFWS Interest Lands, and agriculture. **There are two parcels identified as North American Wetland Conservation Act federal aid parcels located within the Roseau Lake WMA.** In addition, a large number of Red Lake Reservation parcels are located throughout the West Section but these parcels are not crossed by the ROW. State forests offer a variety of recreational opportunities.

County and state ordinances and land management plans generally permit, or at least do not prohibit, the construction of transmission lines.

Constructing the transmission line and associated facilities would result in temporary disturbances to land uses within the ROW and surrounding area. Such disturbances would include limiting property access due the presence of construction work areas and equipment.

Operating and maintaining the transmission line would have long-term impacts on land use within the ROW and surrounding area. It would require that all woody vegetation and brush within the ROW be cleared, resulting in long-term change in land cover for forest or shrub land. The conversion from forest land in state fee areas where timber can no longer be harvested would result in a reduction of revenues to the School Trust Land program.

Agricultural land uses would still be allowed in the ROW, but the presence of transmission structures could prevent some farm equipment from accessing land. Transmission towers could also impact private aircraft.

Cultural Values. Cultural values are shared beliefs or attitudes that define what is acceptable or unacceptable and provide a framework for unity and sense of identity for a community, region, or people. The major values within the region include pragmatism, appreciation, and use of natural resources, individualism, political and social conservatism, community pride, and economic well-being. The values of individualism and community pride are tied to the overall quality of life experienced by the area's residents.

Public comments provided during the EIS scoping period raised concerns related to avoiding impacts to agricultural land, an indication of the value placed on preservation of agricultural life.

Impacts to cultural values can be minimized primarily by paralleling existing transmission infrastructure. Although some permanent impacts to cultural values may be felt on a local basis, particularly where transmission lines run close to communities whose values are at odds with the presence of new, large infrastructure projects, at a county-wide or regional level, conflict with cultural values is not expected from the proposed Project.

Land-Based Economies. Constructing and operating the proposed Project could potentially impact land-based economies and could prevent or limit other uses of the land. Transmission line structures could potentially interfere with farming, forestry, or mining operations.

Agriculture is present in the West Section, and the proposed Project could potentially impact farmland, organic farms, livestock, aerial spraying, irrigation system, and precision farming practices.

The proposed Project could interfere with forestry operations by limiting timber harvesting, damaging trees, compacting soil, or causing erosion.

There are no mining resources located within the 200-foot ROW of the proposed routes or variations in the West Section, although there is an aggregate source located within 1,500 feet of the Roseau Lake WMA Variation in the Roseau Lake WMA Variation Area. In addition, the proposed Project could **affect access to mineral resources and EMFs associated with transmission lines may mask or prevent geophysical detection of mineral resources.**

Archaeology and Historic Architectural Resources. Ground-disturbing activities could damage or destroy buried archaeological resources as well as historic architectural sites if they are located within the ROW (direct Area of Potential Effect (APE)). Further, historic architectural sites within one mile of the proposed Project (indirect APE) could be impacted if the proposed Project results in changes to the setting of historic architectural sites if these historic architectural sites are determined to be National Register of Historic Places-eligible (NRHP-eligible) and if the setting is determined to be a character defining feature that contributes to the significance of the resource.

The potential effects of the proposed Project on historic properties, including cultural resources, cannot be fully determined prior to approval of the proposed Project. **DOE will execute a Programmatic Agreement (PA), pursuant to Section 106 of the NHPA** to ensure that stipulations developed to identify cultural resources and historic properties,

determine the effects of the proposed Project on historic properties, and determine measures to avoid, minimize, and mitigate adverse effects on cultural resources and historic properties are implemented. **The PA is being developed in consultation with the Minnesota State Historic Preservation Office, the Advisory Council on Historic Preservation, federally recognized Indian tribes, the Applicant, representatives of local governments, and other consulting parties. Signatories include the Minnesota State Historic Preservation Office, DOE, and USACE. Invited Signatories include the Applicant and the Red Lake Band of Chippewa Indians, Minnesota. The Draft PA is included as Appendix V of this Final EIS. DOE intends to execute the Programmatic Agreement prior to issuance of the Record of Decision or otherwise comply with procedures set forth in 36 CFR Part 800.**

Natural Environment. Water resources include rivers and streams, lakes and ponds, wetlands, floodplains, and groundwater resources. Impacts on water resources may include the potential for soil erosion and subsequent sedimentation of local water resources. Water resources could also become contaminated during construction, due to accidental spilling of fuels or other hazardous substances. Impacts on wetlands may include conversion of wetland types from forested and shrub wetlands to open wetland types. In some cases, the proposed Project may need to cross areas of floodplain and/or wetlands that are too large to span, requiring permanent placement of structures within these areas.

Impacts could be mitigated by using construction matting to traverse wetlands, limiting crossing of watercourses, spanning, timing construction in these areas to take place during frozen conditions, and using low ground pressure equipment to the extent practical. Where permanent placement of structures in floodplains and/or wetlands is unavoidable, these activities would require appropriate permits and approvals.

Vegetation in the West Section consists primarily of herbaceous agricultural vegetation, upland forests, and lowland swamps. Construction activities could impact existing vegetation, and removing vegetation could indirectly impact native vegetation by increasing the potential for the spread of invasive species and noxious weeds, which have potential to dominate and displace native plants and plant communities, permanently altering ecosystem functions.

Wildlife in the West Section includes a wide range of resident and migratory wildlife species. The West Section contains natural wildlife habitat as well as managed wildlife habitat, such as Wildlife Management Areas (WMAs).

During construction, wildlife within the anticipated ROW would temporarily be displaced. Long-term adverse impacts on wildlife could come from the loss or conversion of habitat and habitat fragmentation. Wildlife species previously occupying forested communities in the ROW would be displaced in favor of species that prefer more open vegetation communities. Impacts would be expected to be extensive in areas where new ROW would be created and more localized in situations where an existing ROW is expanded. Species that rely on shrubby or grassland habitats may be less susceptible.

Once the project is built, there would be potential for avian collision and electrocution with transmission conductors.

Rare and Unique Natural Resources. Six federally threatened or endangered species are known to be present in the counties where the West Section is located. Six state threatened or endangered species have been documented within one mile of some the proposed routes and variations in the West Section. In addition, **18** state special-concern species have been documented within one mile of some of the proposed routes and variations in the West Section: **10** vascular plants, four birds, one mammal, two mussels, and one fish.

Several rare communities have been identified within or adjacent to the variation areas in the West Section, many of them located within one of the three state forests in this area.

Construction and operation of the proposed Project could have short- and long-term impacts on rare and unique natural resources. Construction could temporarily displace some rare species or rare communities. Construction could also cause the loss or conversion of habitat and habitat fragmentation. Rare species could also be impacted by the introduction of non-native species, which could alter the quality and function of habitats.

Corridor Sharing. In the West Section, the proposed Project would parallel existing 230 kV and 500 kV transmission lines, roads, field lines, trails, and public land survey sections. By paralleling existing corridors, and thereby reducing the need for new transmission line corridors, potential impacts on human settlements, land-based economies, and the natural environment would be expected to be minimized.

Electric System Reliability. One of the Applicant's stated purposes for the proposed Project is to enhance electrical system reliability and help meet long-term regional needs. All of the proposed routes and variations in the West Section include segments that would run parallel and adjacent to, but not within, the ROW of one of the two existing high voltage transmission lines.

Construction, operation, maintenance, or emergency repairs of the proposed Project would not interfere with the operation of existing transmission lines as the appropriate separation distance would be maintained for clearance and safety. As such, no impacts would be expected as a result of construction, operation, maintenance, or emergency repairs of the proposed Project.

Costs that Depend on Design and Route. Projected costs for the routes and variations in the West Section are provided in Section 5.3.8. These cost estimates are based on an estimated cost per mile for the general structure type planned for each proposed route or variation. Since property acquisition, access costs, or segment-specific design criteria are uncertain, these are not full construction estimates and were developed for comparative purposes only.

S.9.2 Route-Specific Impacts to Central Section

Human Settlement. Much of the Central Section is forested and contains extensive peatlands, and a number of state forests occur in the section.

No county parks, state parks, state forest campgrounds, national parks, or water access points are present within the 200-foot ROW or within 1,500 feet of the anticipated alignment of any of the proposed routes and variations in the Central Section. State trails, state forests, scenic byways, snowmobile and water trails are crossed by the ROW in the Central Section.

General impacts on existing aesthetic resources in the Central Section are similar to those in the West Section. Short-term aesthetic impacts could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations. Long-term impacts on aesthetic resources are most likely to occur once the transmission line is operating.

Land-Use Compatibility. The predominant land use in the Central Section and within the 200-foot ROW is undeveloped forest and swampland, much of which is state forest land and state fee land.

The Central Section also includes some limited concentrations of agricultural land uses near the northern and southern borders of the section. Developed land, including residences, are scattered near the agriculture land and incorporated cities. Several airports and air strips are also located near developed areas, but not within the 200-foot ROW. In addition, there are scattered parcels of USFWS Interest Lands in the northwest part of the Central Section that are crossed by the ROW. Any route crossing USFWS Interest Lands (including easements) would require a right-of-way permit under 50 CFR Part 29. **There are also two federal aid parcels that are within the USFWS Interest Lands and the Silver Creek WMA.**

Impacts from constructing and operating the proposed Project are similar to those discussed for the West Section. (See Land-Use Compatibility discussion in Section S.9.1.)

Cultural Values. Cultural values in the Central Section are in many ways similar to the cultural values in the West Section. Cultural values unique to the Central Section are an individualistic orientation that places value on undisturbed independence in the wilderness. The proposed Project, however, is not expected to result in any unique impacts to designated wilderness areas and cultural values in the Central Section.

Land-Based Economies. Agriculture is limited in the Central Section, although the proposed Project could potentially impact farmland, organic farms, livestock, aerial spraying, irrigation system and precision farming practices.

The proposed Project could interfere with forestry operations by limiting timber harvesting, damaging trees, compacting soil, or causing erosion.

In the Central Section, there are aggregate sources located within the 200-foot ROW of the Proposed Orange Route (2 sites) in the Pine Island Variation Area; the Proposed Orange Route (2 sites) and J2 Segment Option Variation (1 site) in the J2 Segment Option Variation Area; and the Proposed Orange Route (1 site) and the Cutfoot Variation (1 site) in the Cutfoot Variation Area. There are also several aggregate sources located within 1,500 feet of the proposed routes and variations in the Central Section. In addition, the proposed Project could **affect access to mineral resources and EMFs associated with transmission lines may mask or prevent geophysical detection of mineral resources.**

Archaeology and Historic Architectural Resources. Archaeological and historic architectural sites present within the ROW and historic architectural sites located within 1 mile of the anticipated alignment could be impacted by the proposed Project similar to that described for the West Section. **The draft PA is included as Appendix V of this Final EIS.** (See Archaeology and Historic Architectural Resources discussion in Section S.9.1.)

Natural Environment. Water resources include rivers and streams, lakes and ponds, wetlands, floodplains, and groundwater resources. The proposed Project's impacts on water resources are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Vegetation consists primarily of upland forests and lowland swamps. The proposed Project's impacts on vegetation are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Wildlife in the Central Section includes a wide range of resident and migratory wildlife species. The Central Section contains natural wildlife habitat as well as managed wildlife habitat, such as WMAs. The proposed Project's impacts on wildlife are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

*Rare and Unique Natural Resources. S*ix federally threatened or endangered species are known to be present in the counties where the Central Section is located. Six state threatened or endangered species have been documented within one mile of some of the proposed routes and variations in the Central Section. In addition, 13 state-special concern species have been documented within one-mile of some of the proposed routes and variations in the Central Section: seven vascular plants, two birds, one insect, two mussels, and one fish.

Several rare communities have been identified within or adjacent to the variation areas in the Central Section, many of them located within one of the eight state forests in this area. Potential short- and long-term impacts on rare and unique natural resources in the Central Section are similar to those described for the West Section. (See Rare and Unique Natural Resources discussion in Section S.9.1.)

Corridor Sharing. In the Central Section, the proposed Project would parallel existing 230 kV and 500 kV transmission lines, roads, field lines, trails, and public land survey sections. By paralleling existing corridors, and thereby reducing the need for new transmission line corridors, potential impacts on human settlements, land-based economies, and the natural environment would be expected to be minimized.

Electric System Reliability. All of the Applicant's proposed routes and variations in the Central Section include segments that would run parallel and adjacent to, but not within, the ROW of one of the two existing high voltage transmission lines. Impacts associated with construction, operation, maintenance, or emergency repair of the proposed Project in the Central Section are similar to those described for the West Section. (See Electric System Reliability discussion in Section S.9.1.)

Costs that Depend on Design and Route. Projected costs for the routes and variations in the Central Section are given in Section 5.4.8. These cost estimates are based on an estimated cost per mile for the general structure type planned for each proposed route or variation. Since property acquisition, access costs, or segment-specific design criteria are uncertain, these are not full construction estimates and were developed for comparative purposes only.

S.9.3 Route-Specific Impacts to East Section

Human Settlement. Much of the East Section is characterized by forest, wetlands, lakes, and ponds. No state parks, state forest campgrounds, national forests, scenic byways, water trails, or national parks were found within 1,500 feet of the centerline of the proposed routes and variations in the East Section. Although state trails, state forests, and snowmobile trails are crossed by the ROW of various routes and variations in the East Section.

General impacts on existing aesthetic resources in the East Section are similar to those in the West Section. Short-term aesthetic impacts could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations. Long-term impacts on aesthetic resources are most likely to occur once the transmission line is operating.

Land-Use Compatibility. The predominant land uses in the East Section are state forests and fee lands, undeveloped forest, and wetlands. There is also sparsely scattered agriculture and developed land. A large number watercourses and waterbodies are present in the East Section, and there are also a number of private airstrips and airports.

Constructing and operating the proposed Project in the East Section would result in similar impacts

as anticipated in the West Section. (See Land-Use Compatibility discussion in Section S.9.1.)

Cultural Values. Cultural values in the East Section are in many ways similar to the cultural values in the West and Central Sections. Cultural values unique to the East Section are largely tied to the transition to lake and cabin country and, at the south end of the East Section, intersection with the western portion of the Mesabi Iron Range.

The communities in Balsam and Lawrence appear to strongly value the aesthetics of their communities as well the small town, rural atmosphere. The Mesabi Iron Range is characterized by a more industrial, blue collar population.

The proposed Project, however, is not expected to result in any unique impacts to cultural values.

Land-Based Economies. Agriculture is limited in the East Section, although the proposed Project could potentially impact farmland, organic farms, livestock, aerial spraying, irrigation systems, and precision farming systems.

The proposed Project could interfere with forestry operations in the East Section by limiting timber harvesting, damaging trees, compacting soil, or causing erosion.

Several active and abandoned metallic mineral, iron ore, and taconite mining sites are found along the proposed routes and variations in the East Section. These proposed routes and variations cross active state metallic mineral leases in zones having high potential for metallic mineral resources. The Mesabi Iron Range has known iron resources, which have been developed into an economic resource in various locations. **The transmission line structures could affect access to mineral resources and EMFs associated with transmission lines may mask or prevent geophysical detection of mineral resources.**

The construction of the proposed Project could impact future mining operations if the structures interfere with access to mineable resources or the ability to remove mineral resources.

Archaeology and Historic Architectural Resources. Archaeological and historic architectural sites present within the ROW and historic architectural sites located within 1 mile of the anticipated alignment could be impacted by the proposed Project similar to that described for the West Section. **The draft PA is included as Appendix V of this Final EIS.** (See Archaeology and Historic Architectural Resources discussion in Section S.9.1.)

Natural Environment. Water resources in the East Section include watercourses, waterbodies, wetlands, floodplains, and groundwater resources. The proposed Project's impacts on water resources are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Vegetation in the East Section consists primarily of upland forests and lowland swamps. The proposed Project's impacts on vegetation are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Wildlife in the East Section includes a wide range of resident and migratory wildlife species. The East Section contains natural wildlife habitat as well as managed wildlife habitat, such as WMAs. The proposed Project's impacts on wildlife are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Rare and Unique Natural Resources. Three federally threatened or endangered species are known to be present in the counties where the East Section is located. Three state threatened species have been documented within one mile of some of the proposed routes and variations in the East Section. In addition, six state special concern species have been documented within one-mile of some of the proposed routes and variations in the East Section: three vascular plants, one bird, and two mussels.

Several rare communities have been identified within or adjacent to the variation areas in the East Section, many of them located within state forests. Potential short- and long-term impacts on rare and unique natural resources in the East Section are similar to those described for the West Section. (See Rare and Unique Natural Resources discussion in Section S.9.1.)

Corridor Sharing. In the East Section, the proposed Project would parallel existing 115 kV, 230 kV, and 500 kV transmission lines, roads, field lines, trails, and public land survey sections. By paralleling existing corridors, and thereby reducing the need for new transmission line corridors, potential impacts on human settlements, land-based economies, and the natural environment would be expected to be minimized.

Electric System Reliability. Both of the Applicant's proposed routes and three variations in the East Section include segments that would run parallel and adjacent to, but not within, the ROW of two existing high voltage transmission lines. Impacts associated with construction, operation, maintenance, or emergency repairs of the proposed

Project in the Central Section are similar to those described for the West Section. (See Electric System Reliability discussion in Section S.9.1.)

Costs that Depend on Design and Route. Projected costs for the routes and variations in the East Section are given in Section 5.5.8. These cost estimates are based on an estimated cost per mile for the general structure type planned for each proposed route or variation. Since property acquisition, access costs, or segment-specific design criteria are uncertain, these are not full construction estimates and were developed for comparative purposes only.

S.10 Comparative Environmental Consequences

Data and analyses presented in Chapter 6 are commensurate with the potential significance of the impact and with the level of concern raised during the scoping process a**nd the Draft EIS comment period.** The following resource areas are presented: human settlement (aesthetics and land use compatibility), water resources, vegetation, wildlife, rare and unique resources, archaeology and historic architectural resources, the reliability of the electrical system, and the costs of constructing, operating, and maintaining the facility which are dependent on design and route.

S.10.1 West Section

The West Section contains five variation areas: Border Crossing, Roseau Lake WMA, Cedar Bend WMA, Beltrami North, and Beltrami North Central.

S.10.1.1 West Section: Border Crossing Variation

The Border Crossing Variation Area contains five international border crossings and the transmission lines associated with five route alternatives: Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, Border Crossing Hwy 310 Variation, Border Crossing 500 kV Variation, and Border Crossing 230 kV Variation.

Human Settlement. The Proposed Border Crossing-Blue/Orange Route and Border Crossing Pine Creek Variation would not parallel any existing corridors at the proposed border crossings but due to the **low number of** residences and **lack of** historic architectural sites within the ROW and 1,500 feet, potential impacts would not be expected. The border crossing for the Border Crossing Hwy 310 Variation is located within 1,000 feet of a snowmobile trail and on state forest, but parallels an existing corridor and is not located near residences; therefore impacts to aesthetics are not anticipated.

Based on proximity to residences, state forests, and other sensitive viewing areas, and the contrast, length, and extent of paralleling existing transmission lines and roads, the Border Crossing 230 kV Variation and the Border Crossing 500 kV Variation would likely have fewer aesthetic impacts than the Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, or Border Crossing Hwy 310 Variation.

All transmission line alternatives associated with the Border Crossing Variation Area would cross state forest land (ranging from 96 acres to 394 acres) and snowmobile trails. The transmission line alternatives associated with the Border Crossing 500 kV Variation and Border Crossing 230 kV Variation are likely to produce less contrast because they parallel existing transmission line corridors of similar size and design along their entire lengths. The Border Crossing 500 kV Variation and Border Crossing 230 kV Variation have the least impacts on forests and/or swamps (2,797 and 1,896 acres, respectively, compared to 4,456 to 5,837 acres) and agricultural land (819 and 1,057 acres, respectively compared to 1,901 to 3,609 acres) and the extent of paralleling existing transmission line corridors for more of their length (100 percent for both, compared to 7 to 10 percent) than the Proposed Border Crossing Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation. As a result, the Border Crossing 500 kV Variation and Border Crossing 230 kV Variation would be most compatible with surrounding land uses.

Land-Based Economies. The border crossings for the Proposed Border Crossing-Blue/Orange Route, Border Crossing 500 kV Variation, and Border Crossing Hwy 310 Variation would have the least impact on farmland because there are fewer acres of land designated as prime farmland present (85 acres and 77 acres of land designated as "prime farmland if drained" and "all areas are prime farmland within" the ROW for the Border Crossing 500 kV Variation and Border Crossing Hwy 310 Variation, respectively and 92 acres to 167 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the ROW the other alternatives in this variation area). The Border Crossing 230 kV Variation crosses the least state forest land (96 acres within the ROW for the Border Crossing 230 kV Variation and 120 acres to 394 acres within the ROW if the other alternatives in this variation area); this border crossing would therefore have the least impact on state forests.

Given the extent of paralleling existing transmission lines, the transmission lines associated with the Border Crossing 230 kV Variation would have the least impact on farmland and state forests. No mining resources are located within the Border Crossing Variation Area, so mining resources would not be impacted by the proposed route or variations.

Archaeology and Historic Architectural Resources. No archaeological or historic architectural resources are **known to be** located within the direct APE of the Proposed Border Crossing-Blue/Orange Route, Border Crossing Hwy 310 Variation, and Border Crossing 230 kV Variation, however the Border Crossing Pine Creek Variation and the Border Crossing 500 kV Variation both have one archaeological resource present within the ROW, which could be affected by ground-disturbing activities associated with construction of the proposed Project. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological resources and historic architectural properties. If previously unidentified archaeological resources are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. There are no watercourse crossings at any of the international border crossings. All border crossings are all located within a wetland or a portion of the ROW overlaps with a wetland. The border crossing for the Proposed Border Crossing-Blue/Orange Route is located in forested wetland and would result in conversion of forested wetland to an herbaceous wetland type through removal of woody vegetation in the ROW. The border crossing for the Border Crossing Pine Creek Variation is located within a Federal Emergency Management Agency (FEMA) floodplain. It is expected that the proposed Project would be designed and permitted according to current Federal Flood Risk Management Standards.

The transmission line associated with the Border Crossing 230 kV Variation has the shortest length, fewest **Public Water Inventory** (PWI) (no crossings compared to two or more crossings) and impaired water crossings (no crossings compared to one crossing), and second fewest crossings of non-PWI water resources (nine crossings compared to seven crossings). The transmission lines associated with the Border Crossing 500 kV Variation and Border Crossing 230 kV Variation would not cross floodplains, while the other alternatives would cross 213 acres or more of floodplains. None of the transmission lines associated with the Proposed Border Crossing-Blue/Orange Route or Border Crossing variations would cross waterbodies or PWI waters, but all would cross non-PWI watercourses and ditches. The transmission line associated with the Border Crossing 230 kV Variation contains the least combined forested and shrub wetlands (72 acres compared to 137 or more acres) and would result in the least wetland type conversion. None of the floodplain or wetland crossings would be spannable.

The border crossings for the Proposed Border Crossing-Blue/Orange Route, Border Crossing Hwy 310 Variation, and Border Crossing 230 kV Variation are located primarily in forested land cover types within the Lost River State Forest, while the Border Crossing Pine Creek Variation border crossing is located in herbaceous agricultural vegetation.

The transmission line associated with the Border Crossing 230 kV Variation would have the smallest amount (125 acres compared to 184 acres to 411 acres for the other alternatives) of forested land cover types within the ROW of the proposed routes and variations in the Border Crossing Variation Area. The Border Crossing 500 kV Variation and Border Crossing 230 kV Variation would parallel existing transmission line corridor for their entire length, and would therefore avoid forest fragmentation.

There are no managed wildlife habitats crossed by the border crossings for the Proposed Border Crossing-Blue/Orange Route and all Border Crossing variations. The transmission line associated with the Border Crossing 230 kV Variation has the shortest length and would not pass through any WMAs, Grassland Bird Conservation Areas, or the Gray Owl Management Area; therefore it would likely have the least impact on natural and managed wildlife habitat.

Rare and Unique Natural Resources. There are no documented rare species within one mile of the border crossings for the Border Crossing 230 kV Variation or Border Crossing 500 kV Variation. The border crossing for the Proposed Border Crossing-Blue/Orange Route has the most occurrences of documented rare species within one mile of it (five records compared to one record).

The transmission lines associated with the Proposed Border Crossing-Blue/Orange Route and the Border Crossing Pine Creek Variation have the most documented rare species within one mile of their respective ROWs (eleven and eight records, respectively, compared to five or less records).

Minnesota Biological Survey (MBS) Sites of Biodiversity Significance ranked as outstanding, MBS native plant communities, and MnDNR High

Conservation Value Forest are present within the ROW of the border crossings for the Proposed Border Crossing-Blue/Orange Route and the Border Crossing Hwy 310 Variation. MBS Sites of Biodiversity Significance ranked as moderate are present within the ROW of the border crossings for the Border Crossing 230 kV Variation and the Border Crossing 500 kV Variation, but no MnDNR High Conservation Value Forest or MBS native plant communities are present. There are no rare communities within the ROW of the border crossing for the Border Crossing Pine Creek Variation.

Several rare communities have been identified within the ROW of the transmission lines associated with the proposed route and variations in the Border Crossing Variation Area. The transmission line associated with the Proposed Border Crossing-Blue/Orange Route would likely impact the greatest number of rare communities because there are more MBS Sites of Biodiversity Significance (381 acres compared to 326 acres or less), High conservation Value Forest (82 acres compared to 29 acres or less), and MBS native plant communities (124 acres compared to 69 or less acres). The transmission line associated with the Border Crossing 230 kV Variation has the fewest acres of rare communities in the ROW. The Border Crossing 500 kV Variation and Border Crossing 230 kV Variation would cross native plant communities in areas previously disturbed because they parallel an existing transmission line corridor.

Corridor Sharing. The border crossings and transmission lines associated with the Border Crossing 500 kV Variation and Border Crossing 230 kV Variation parallel existing transmission line corridor for 100 percent of their lengths. The other alternatives parallel existing corridor for less than 50 percent of their lengths; paralleling existing transmission line corridors for less than 10 percent of their lengths.

Costs that Depend on Design and Route. As the longest alternative, the Border Crossing Pine Creek Variation would cost the most to build, while the shortest alternative, the Border Crossing 230 kV Variation, would cost the least to build.

S.10.1.2 West Section: Roseau Lake WMA Variation

The Roseau Lake WMA Variation Area contains three route alternatives: the Proposed Blue/Orange Route, Roseau Lake WMA Variation 1, and Roseau Lake WMA Variation 2.

Human Settlement. Based on proximity to residences (12 residences within 1,500 feet compared to 23 and 50 for Roseau Lake WMA Variation 1 and 2, respectively), historic architectural resources (none within 5,280 feet compared to one and two for Roseau Lake WMA Variation 1 and 2, respectively), state forests (one state forest crossed by each alignment), length (30.7 miles, compared to 44.1 and 37.5 miles for Roseau Lake WMA Variation 1 and 2, respectively), and the extent of paralleling existing transmission lines (33 percent of length compared to 7 and 27 percent for Roseau Lake WMA Variation 1 and 2, respectively), the Proposed Blue/Orange Route would have less aesthetic impact than the other alternatives.

Roseau Lake WMA Variation 1, compared to the Proposed Blue/Orange Route and Roseau Lake WMA Variation 2, would have the least impact on state forest (6 acres, compared to 334 and 52 acres, respectively), state fee lands (6 acres compared to 453 and 145 acres, respectively), and forested and/or swamp lands (2,615 acres compared to 7,350 and 4,269 acres, respectively); although it parallels existing corridors the least amount (7 percent compared to 33 and 27 percent, respectively).

Land-Based Economies. The Proposed Blue/Orange Route, which parallels existing corridors for 60 percent of its length and has the shortest length, would have the least impact on farmland. None of the three alternatives, however, would impact more than 25 acres of farmland of statewide importance.

The Roseau Lake WMA Variation 1, which would parallel existing corridors for 54 percent of its length and pass through fewer acres of State Forest land (6 acres within the ROW of Roseau lake WMA Variation 1, 52 acres within the ROW of Roseau Lake WMA Variation 2, and 334 acres within the ROW of Proposed Blue/Orange Route), would have the least impact on forest lands. No mining resources **are located** within the Roseau Lake WMA Variation Area.

Archaeology and Historic Architectural Resources. No archaeological or historic architectural sites are located within the direct APE for the Proposed Blue/Orange Route or either variation. Both Roseau Lake WMA variations would have historic architectural sites located within the indirect APE (one mile) (one and two sites, respectively). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological resources and historic architectural properties. If previously unidentified archaeological resources are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. Roseau Lake WMA Variation 1 would cross the most PWI and non-PWI watercourses (10 and 38 crossings, respectively), while the Proposed Blue-Orange Route and the Roseau Lake WMA Variation 1 would each cross one non-PWI waterbody. Neither the proposed route nor the variations would cross PWI waterbodies. The Proposed Blue/Orange Route would cross more floodplains (321 acres) than Roseau Lake WMA Variation 1 (202 acres) and more than five times as many wetlands (547 acres compared to 102 acres, respectively). None of these floodplain or wetland crossings would be spannable. The Proposed Blue/Orange Route and both variations would require conversion of forested and shrub wetland areas to herbaceous wetlands since woody vegetation would have to be removed from the ROW. Roseau Lake WMA Variation 1 has fewer acres of forested and shrub wetlands (55 acres compared to 141 acres or more) and would require less wetland type conversion.

The Proposed Blue/Orange Route would pass through the most forested land (515 acres, compared to 275 acres or less), resulting in more impacts on forested vegetation, although that would be mitigated by its sharing the most corridor, which would reduce forest fragmentation. The two variations would pass through more herbaceous agricultural vegetation. While direct, adverse impacts on forested areas would be long term, they would be expected to be minimal because of the small amount of disturbance relative to the large amount of surrounding contiguous forest.

Roseau Lake WMA Variation 1 would have the least impact on natural and managed wildlife habitat because it does not travel through a WMA and **would pass** through the least amount of Grassland Bird Conservation Area (40 acres compared to 131 acres for the Proposed Blue/Orange Route and 220 acres for Roseau Lake WMA Variation 2).

Rare and Unique Natural Resources. The Proposed Blue/Orange Route has the most documented rare species within one mile of the ROW (seven records compared to four records). However, the full extent of potential impacts from the Proposed Blue/Orange Route or either variation cannot be determined without pre-construction field surveys. Coordination with relevant federal, state, and local agencies will continue during development of the Project.

Roseau Lake WMA Variation 1 would have the least impact on rare communities, as the ROW has the fewest acres of MBS Sites of Biodiversity Significance (14 acres compared to 153 acres for Roseau Lake WMA Variation 2 and 404 acres for the Proposed Blue/Orange Route), High Conservation Value Forest (6 acres compared to 22 acres for the Proposed Blue/Orange Route), and MBS native plant communities (5 acres compared to 75 acres for Roseau Lake WMA Variation 2 and 107 acres for the Proposed Blue/Orange Route).

Corridor Sharing. The Proposed Blue/Orange Route would parallel the greatest percentage of existing transmission line corridor (33 percent), while Roseau Lake WMA Variation 1 would parallel the least amount (7 percent).

Costs that Depend on Design and Route. As the longest alternative, Roseau Lake WMA Variation 1 would cost the most to construct, while the shortest alternative, the Proposed Blue/Orange Route, would cost the least to construct.

S.10.1.3 West Section: Cedar Bend WMA Variation Area

The Cedar Bend WMA Variation Area contains two route alternatives: the Proposed Blue/Orange Route and the Cedar Bend WMA Variation.

Human Settlement. Based on proximity to residences (11 residences within 1,500 feet compared to 101 for the Cedar Bend WMA Variation), historic architectural sites (zero sites within 5,280 feet compared to eight sites for the Cedar Bend WMA Variation), and forests (two forests crossed by each alternative), the Proposed Blue/Orange Route would have less aesthetic impact than the Cedar Bend WMA Variation. One scenic byway and two snowmobile trails are within 1,500 feet of the Proposed Blue/Orange Route and the Cedar Bend WMA Variation.

The Proposed Blue/Orange Route and the Cedar Bend WMA Variation would cross state forest (372 acres compared to 78 acres, respectively), state fee lands (441 acres compared to 84 acres, respectively), USFWS Interest Lands (6 acres compared to zero acres, respectively), and forested and/or swamp lands (8,045 acres compared to 4,180 acres, respectively); with the Cedar Bend Variation likely having less impact on these lands. However, Cedar Bend Variation would likely have a greater impact on agricultural land than the Proposed Blue/Orange Route (2,625 acres and 844 acres, respectively).

Land-Based Economies. The Proposed Blue/Orange Route, because it parallels an existing transmission line corridor for its entire length and crosses fewer acres of prime farmland (83 acres of land designated as prime farmland if drained and all areas are prime farmland within the ROW for the Proposed Blue/Orange Route and 186 acres of land designated as

"prime farmland if drained" and "all areas are prime farmland" within the ROW for the Cedar Bend WMA Variation), would have the least impact on farmland. The Cedar Bend WMA Variation, however, would have the least impact on the state forest lands (78 acres of state forest within the ROW of the Cedar Bend WMA Variation and 186 acres of state forest within the ROW of the Proposed Blue/Orange Route). The Proposed Blue/Orange Route would also traverse several acres of mining lands with **expired/ terminated** state mineral leases, with the potential to impact future mining activities in these areas, while the Cedar Bend WMA Variation would not traverse any areas.

Archaeology and Historic Architectural Resources. No archaeologic sites or historic architectural structures are present within the ROW (direct APE) of the Proposed Blue/Orange Route but one archaeological site is located within the ROW of the Cedar Bend WMA Variation. The Cedar Bend WMA Variation also has eight historic architectural sites located within 1 mile of the anticipated alignment compared to zero for the Proposed Blue/Orange Route. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological resources are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Blue/Orange Route and the Cedar Bend WMA Variation would cross approximately the same number of PWI (four and five crossings, respectively), non-PWI (12 and 11 crossings, respectively) and impaired waters (two and three crossings, respectively), all of which would be spannable. The Proposed Blue/Orange Route would not cross any floodplains, while the Cedar Bend WMA Variation would cross floodplains (32 acres). Both would have to cross wetlands too large to span, although the Proposed Blue/Orange Route would have to cross three times the area (466 acres compared to 154 acres for the Cedar Bend WMA Variation).

The Proposed Blue/Orange Route and the Cedar Bend WMA Variation would require conversion of forested and shrub wetland areas to herbaceous wetlands since woody vegetation would have to be removed from the ROW. Cedar Bend WMA Variation has fewer acres of forested and shrub wetlands (109 acres compared to 381 acres for the Proposed Blue/Orange Route) and would require less wetland type conversion.

The Proposed Blue/Orange Route would pass through more forested land (543 acres compared to 266 acres for the Cedar Bend WMA Variation), including state forest (372 acres compared to 78 acres for the Cedar Bend WMA Variation). Both the Proposed Blue/Orange Route and the Cedar Bend WMA Variation, however, would parallel existing transmission line corridors for their entire lengths, which would reduce forest fragmentation. The Cedar Bend WMA Variation would pass through more herbaceous agricultural vegetation. While direct, adverse impacts to forested areas would be long term, they would be expected to be minimal because of the amount of surrounding contiguous forest.

The Cedar Bend WMA Variation has fewer acres of wildlife habitat within the ROW and would likely have the least impact on natural and managed wildlife habitat, as it does not pass through a WMA, **would pass** through less Grassland Bird Conservation Areas (10 acres compared to 50 acres for the Proposed Blue/Orange Route), and does not cross a MnDNR-designated shallow lake.

Rare and Unique Natural Resources. The Proposed Blue/Orange Route may result in more impacts on rare species, as two records of terrestrial species have been documented within one mile of the ROW, while only one record of a rare fish has been documented within one mile of the ROW of the Cedar Bend WMA Variation. All watercourses would likely be spanned so impacts to fish are not anticipated. However, the full extent of potential impacts from the Proposed Blue/Orange Route or the Cedar Bend WMA Variation cannot be determined without pre-construction field surveys.

There are more MBS Sites of Biodiversity Significance present within the ROW of the Proposed Blue/Orange Route (454 acres) than the Cedar Bend WMA Variation (112 acres). In addition, High Conservation Value Forest and MBS native plant communities are present within the ROW of the Proposed Blue/Orange Route, while none are present within the ROW of the Cedar Bend WMA Variation. Because of this, the Proposed Blue/ Orange Route would likely have more impact on rare communities.

Corridor Sharing. The Proposed Blue/Orange Route and Cedar Bend WMA Variation would both parallel existing transmission line corridors for their entire lengths.

Costs that Depend on Design and Route. As the longer alternative, the Proposed Blue/Orange Route would cost more to construct than the Cedar Bend WMA Variation.

S.10.1.4 West Section: Beltrami North Variation Area

The Beltrami North Variation Area contains three route alternatives: the Proposed Blue/Orange Route, Beltrami North Variation 1, and Beltrami North Variation 2.

Human Settlement. Because the Proposed Blue/Orange Route is moderate in length (16.5 miles compared to 15.8 and 19.7 miles for the Beltrami North Variation 1 and 2, respectively), parallels an existing transmission line of similar size and design for its full length (compared to 72 percent and 53 percent for the Beltrami North Variation 1 and 2, respectively), and impacts very few residences (three residences within 1,500 feet compared to six and one residence for the Beltrami North Variation 1 and 2, respectively) and other sensitive visual resources (no historic architectural sites within 5,280 feet compared to zero and two sites for the Beltrami North Variation 1 and 2, respectively),the Proposed Blue/Orange Route would have the least aesthetic impact.

Beltrami North Variation 1 would have the least impact on state forest (291 acres compared to 372 and 462 acres, respectively for the Proposed Blue/Orange Route and the Beltrami North Variation 2) or state fee lands (297 acres compared to 364 and 450 acres, respectively for the Proposed Blue/Orange Route and the Beltrami North Variation 2). The Proposed Blue/Orange Route would cross USFWS Interest Lands (6 acres) whereas Beltrami North Variation 1 and 2 do not cross these lands. Consultation with the USFWS regarding the crossing of these USFWS Interest Lands is on-going.

Land-Based Economies. The Proposed Blue/Orange Route and the two variations pass through similar amounts of farmland (approximately 27 acres of land designated as "prime farmland if drained and "all areas are prime farmland" within the ROW of each alternative). Beltrami North Variation 1 would have the least impact on forest lands (291 acres of state forest within the ROW of Beltrami North Variation 1, 465 acres of state forest within the ROW of Beltrami North Variation 2, and 372 acres of state forest within the ROW of the Proposed Blue/Orange Route).

Beltrami North Variation 2 would likely impact the most acres of **expired/terminated** state mineral lease lands and therefore would be expected to have the greatest potential impact on future mining activity (approximately 150 acres of state mining land within the ROW of Beltrami North Variation 2, and less than 100 acres of state mining land within the ROW of the Proposed Blue/Orange Route and Beltrami North Variation 1).

Archaeology and Historic Architectural Resources. No archaeological or historic architectural sites are located within the direct or indirect APE of the Proposed Blue/Orange Route and Beltrami North Variation 1; however Beltrami North Variation 2 has an archaeological site within the direct APE and two historic architectural sites within the indirect APE. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural sites. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. Beltrami North Variation 2 would cross the fewest PWI waters (three crossings), while Beltrami North Variation 1 would cross the most (nine crossings). Beltrami North Variation 1 would cross the fewest non-PWI waters (four crossings), while Beltrami North Variation 2 would cross the most (12 crossings). The Proposed Blue/Orange Route and Beltrami North Variation 2 would cross the fewest impaired waters (two crossings each), while Beltrami North Variation 1 would cross the most (eight crossings). All of these watercourse crossings would be spannable.

The Proposed Blue/Orange Route and both Beltrami North variations would require conversion of forested and shrub wetland areas to herbaceous wetlands since woody vegetation would have to be removed from the ROW. Beltrami North Variation 1 has the fewest acres of forested and shrub wetlands (285 acres), while Beltrami North Variation 2 would have the most (345 acres) and require the most wetland type conversion. None of these wetland crossings would be spannable.

Beltrami North Variation 2 would pass through the most forested land (473 acres compared to 389 acres or less), including state forest (462 acres compared to 372 acres or less). In addition, Beltrami North Variation 2 parallels the least amount of existing transmission line corridor and crosses more state forest, which would result in more forest fragmentation. While direct, adverse impacts to forested areas would be long-term, they would be expected to be minimal because of the amount of surrounding contiguous forest.

Beltrami North Variation 2 would pass through the Big Bog Important Bird Area and require the creation of a new corridor, which could impact bird habitat. In addition, the Proposed Blue/Orange

Route and Beltrami North Variation 2 would cross an unnamed MnDNR-designated shallow lake, which could impact wildlife that use this lake. However, in this location, the Beltrami North Variation 2 would parallel and existing transmission line corridor.

Rare and Unique Natural Resources. Beltrami North Variation 2 would likely result in more impacts on rare species because more rare species have been documented within a mile of the ROW (seven records) than the Proposed Blue/Orange Route (two records) or Beltrami North Variation 1 (one record). However, the full extent of potential impacts from the Proposed Blue/Orange Route and the variations cannot be determined without pre-construction field surveys.

The Beltrami North Variation 2 **would pass** through more MBS Sites of Biodiversity Significance (460 acres) compared to the Proposed Blue/Orange Route (369 acres) and the Beltrami North Variation 1 (276 acres). In addition, Beltrami North Variation 2 would pass through High Conservation Value Forest and MBS native plant communities, while the Proposed Blue/Orange Route and Beltrami North Variation 1 would not pass through these resources. Because of this, Beltrami North Variation 2 would likely have more impact on rare communities.

Corridor Sharing. The Proposed Blue/Orange Route would parallel existing transmission line corridors for its entire length, Beltrami North Variation 1 would parallel existing transmission line corridor for 72 percent of its length, and Beltrami North Variation 2 would parallel existing corridor for 53 percent of its length.

Costs that Depend on Design and Route. As the longest alternative, Beltrami North Variation 2 would cost the most to construct, while the shortest alternative, Beltrami North Variation 1, would cost the least to construct.

S.10.1.5 West Section: Beltrami North Central Variation Area

The Beltrami North Central Variation Area contains six route alternatives: the Proposed Blue/Orange Route and Beltrami North Central Variations 1 through 5.

Human Settlement. The Beltrami North Central Variation Area alternatives would all be located within 1,500 feet of two state forests and one snowmobile trail. Because the Proposed Blue/Orange Route is the shortest alternative (11.6 miles compared to 12.2 miles to 15.0 miles) and would parallel an existing transmission line of similar size and design for its entire length (compared to 48 to 92 percent), it would have the least aesthetic impact. The aesthetic impact of the Proposed Blue/Orange Route and the Beltrami North Central variations would be expected to be minimal.

The Proposed Blue/Orange Route would parallel an existing corridor for its entire length but would cross the most USFWS Interest Lands (18 acres compared to 0 to 1 acre), while Beltrami North Central Variation 4 avoids the greatest amount of state forest (178 acres compared to 184 acres to 255 acres) and state fee lands (178 acres compared to 184 acres to 246) and does not cross any USFWS Interest Lands.

Land-Based Economies. Beltrami North Central Variation 2 would not impact any prime farmland or farmland of statewide importance, while the Beltrami North Central Variation 4 and Beltrami North Central Variation 5 would impact 20 acres of farmland of statewide importance and 6 acres of prime farmland. Beltrami North Central Variation 4, which parallels an existing 230 kV transmission line corridor for 92 percent of its length and crosses the least state forest land (178 acres of state forest within the ROW of Beltrami North Central Variation 4, 185 acres of state forest within the ROW of Beltrami North Central Variation 5, and more than 225 acres of state forest within the ROW of all other alternatives in this variation area), would have the least impact on state forest lands. There is no mining activity in the Beltrami North Central Variation Area.

Archaeology and Historic Architectural Resources. Beltrami North Central Variation 4 and Beltrami North Central Variation 5 each have one historic architectural site within the indirect APE (one mile). Neither the Proposed Blue/Orange Route nor any of the variations would directly impact any archaeological or historic architectural sites. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological resources are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Blue/Orange Route would cross the least amount of PWI waters (no crossings compared to one or more crossings), floodplains (one acre compared to two acres) and forested/shrub wetlands (249 acres compared to 265 or more acres), and the second least amount of non-PWI waters (five crossings compared to four crossings). Watercourse and floodplain crossings would be spannable, while the Proposed Blue/Orange Route and Beltrami North Central Variations

1 through 5 would cross wetlands too large to span. Since the Proposed Blue/Orange Route crosses the least forested/shrub wetland area, it would require less wetland type conversion.

The Proposed Blue/Orange Route and all of the Beltrami North Central variations would generally pass through similar amounts of forested land and state forest. The Proposed Blue/Orange Route and the Beltrami North Central Variation 4, however, would parallel the most existing transmission line corridor (100 percent and 92 percent, respectively, compared to 48 percent to 70 percent for the other variations) and would therefore fragment the least amount of forest.

The Proposed Blue/Orange Route and all variations would pass through the Big Bog Important Bird Area. All but Beltrami North Central Variation 2, however, would parallel an existing transmission line corridor through this area.

Rare and Unique Natural Resources. No rare species have been documented within one mile of the ROW of Beltrami North Central Variation 4, while between three and four rare species have been documented within the ROW of the Proposed Blue/Orange Route and Beltrami North Central Variations 1, 2, 3, and 5. However, the Proposed Blue/Orange Route would parallel an existing transmission line corridor for its entire length, which would likely minimize impacts. The full extent of potential impacts from the Proposed Blue/Orange Route and the variations cannot be determined without pre-construction field surveys.

MBS Sites of Biodiversity Significance are present in the ROW of the Proposed Blue/Orange Route and all variations. Because the Proposed Blue/Orange Route would parallel an existing transmission line corridor for its entire length and Beltrami North Central Variation 4 for 92 percent of its length, these alternatives would have the least impact on rare communities.

Corridor Sharing. The Proposed Blue/Orange Route would parallel existing transmission line corridor for its entire length, Beltrami North Variation 4 would parallel existing transmission line corridor for 92 percent of its length, Beltrami North Variation 3 and 5 would parallel existing transmission line corridor for 70 percent of their lengths, and Beltrami North Variation 1 and Beltrami North Variation 2 would parallel existing corridor for just less than 50 percent of their lengths.

Costs that Depend on Design and Route. Beltrami North Variation 5 would be the longest alternative, however, Beltrami North Variation 4 would cost the most to construct. The Proposed Blue/Orange Route would be the shortest alternative, however Beltrami North Variation 1 would cost the least to construct.

S.10.1.6 Relative Merits Summary—West Section

Border Crossing Variation Area

Within the Border Crossing Variation Area, the analysis indicates a general trade-off between impacts to elements of the human settlement factors (e.g. the aesthetics element of the human settlement factor and the agriculture element of land-based economies) and impacts to elements of the natural environment factors (e.g. the water resources element of the natural environment factor and the **federally and state-listed species and state** rare communities element of the rare and unique **natural** resources factor). The Border Crossing Pine Creek Variation would pass the most farmland and would therefore have more potential impacts to the agriculture element of land-based economies.

The Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation would have more impacts to all three elements of the natural environment factor and to the state rare communities element of the rare and unique natural resources factor. In particular, the Proposed Border Crossing-Blue/Orange Route **and the Border Crossing Pine Creek Variation are the longest alternatives, and** would have the most potential impacts to forested and shrub wetlands and MBS native plant communities and MBS Sites of Biodiversity Significance. The Border Crossing Pine Creek Variation would avoid some of these impacts to these elements of the natural environment and rare and unique natural resources factors by avoiding the wetlands, state forest land, and MBS Sites of Biodiversity Significance ranked outstanding immediately south of the international border. This variation would also provide more distance between the proposed Project and the Pine Creek Peatland **Scientific and Natural Area (SNA)** than the Proposed Border Crossing-Blue/Orange Route, but by doing so would create more aesthetic and farmland impacts by passing near one more residence than the Proposed Border Crossing-Blue/Orange Route and crossing more agricultural land.

By paralleling existing transmission line corridors, the Border Crossing 230 kV Variation and Border Crossing 500 kV Variation would achieve a balance of sorts in terms of potential impacts to the aesthetic element of human settlement, the

agricultural element of land-based economies, and all three elements of the natural environment. While these two variations would pass near residences and agricultural land, the paralleling of existing transmission lines would likely result in marginal aesthetic impacts to residents in the area and marginal impacts to agricultural land. These variations would intersect less wetland habitat and rare communities and would further minimize potential impacts by paralleling existing infrastructure and thereby minimizing habitat fragmentation.

The Border Crossing 230 kV Variation and Border Crossing 500 kV Variation are also much shorter than the other alternatives in this variation area. **However, the variations would cost less than the Proposed Border Crossing-Blue/Orange Route** in terms of the cost of construction factor.

Impacts to the archaeological and historic resources factor are expected to be slightly greater for the **Border Crossing Hwy 310 Variation**, Border Crossing 500 kV Variation, and Border Crossing Pine Creek Variation as **these** variations would cross sections identified as containing known cultural resources.

Roseau Lake WMA Variation Area

Similar to the Border Crossing Variation Area, the analysis of the Roseau Lake WMA Variation Area indicates a trade-off between impacts to human settlement factors and impacts to natural environment factors. Roseau Lake WMA Variation 1 would have fewer impacts on all three elements of natural environment and on the rare communities element of the rare and unique resource factor than the Roseau Lake WMA **Variation 2** and Proposed Blue/Orange Route as it would avoid crossing the Roseau Lake WMA, MBS Sites of Biodiversity Significance ranked moderate, and extensive wetland areas. However, Roseau Lake WMA Variation 1 would impact the **land use compatibility** element of the human settlement factor and the agricultural element of the land-based economies factor more than the Proposed Blue/Orange Route. Roseau Lake WMA Variation 1 and Roseau Lake WMA Variation 2 would pass through **more** agricultural land and are located near more residences. Roseau Lake WMA Variation 1 would also have more impact on the elements of human settlement and land-based economies because it would parallel a minimal amount of existing corridors and therefore, it would create new aesthetic impacts and a new encumbrance on farmland. Both variations are longer than the Proposed Blue/Orange Route and would result in a greater total area of impact and higher impact in terms of the cost of construction factor.

Impacts to the cultural resources factor are expected to be greater for **Roseau Lake WMA Variation 1** and Roseau Lake WMA Variation 2 than for **the Proposed Blue/Orange Route** in this variation area, as they would pass near or through more sections identified with known cultural resources.

Cedar Bend WMA Variation Area

Both alternatives in the Cedar Bend Variation Area would minimize potential impacts by paralleling existing transmission line corridors for their entire lengths. While paralleling existing corridors would minimize habitat fragmentation (less impacts to the **wildlife** element of the natural environment factor) along the Proposed Blue/Orange Route, and would make the Cedar Bend WMA Variation less conspicuous in terms of potential impacts to the aesthetic element of human settlement, the analysis indicates a trade-off between impacts to human settlement factors and impacts to natural environment factors between the two alternatives in this variation area.

The Cedar Bend WMA Variation was proposed to minimize impacts to the **vegetation and wildlife** elements of the natural environment factor and the rare communities element of the and rare and unique resources by avoiding crossing the Cedar Bend WMA and Beltrami Island State Forest, which is crossed by the Proposed Blue/Orange Route. In avoiding these natural resources, the Cedar Bend WMA Variation would impact the aesthetic element of the human settlement factor by passing near approximately ten times as many residences. The Cedar Bend WMA Variation also **would pass** near more areas where known cultural resources are located, potentially creating more impacts to the archaeological and historic resources factor.

Beltrami North Variation Area

The alternatives in the Beltrami North Variation Area are differentiated primarily in terms of three factors: impacts to the natural environment **including rare and unique natural resources,** cost of construction, and potential cultural resource impacts. The Proposed Blue/Orange Route would minimize impacts to the **wildlife** element of the natural environment factor by paralleling existing corridors and avoiding habitat fragmentation. Beltrami North Variation 1 would parallel less existing corridor than the Proposed Blue/Orange Route, but would minimize impacts to the water resources and **vegetation** elements of the natural environment factor by passing through fewer wetlands and

fewer acres of forest. **In terms of the construction costs factor, both the variations would be more expensive to construct compared to the Proposed Blue/Orange Route.**

Beltrami North Variation 2, on the other hand, is longer than the Proposed Blue/Orange Route and Beltrami North Variation 1 and would likely require many more angle structures, making it more expensive to construct. In addition, the Beltrami North Variation 2 would have relatively more impacts to the water resources and **vegetation** elements of the natural environment factor and the rare communities element of the rare and unique resources factor, passing through more wetland, forest, MBS Sites of Biodiversity Significance, High Conservation Value Forest, MBS native plant communities, and an Important Bird Area. In addition, Beltrami North Variation 2 would have more impacts to the archaeological and historic resources factor as it **would pass** near more sections identified with known archaeological and historic resources.

Beltrami North Central Variation Area

Within the Beltrami North Central Variation Area, the analysis indicates that impacts to the aesthetics element of the human settlement factor and the agriculture element of the land-based economies factor would be minimized by Beltrami North Central Variation 1 and the Proposed Blue/Orange Route, as these alternatives would combine paralleling existing transmission line corridors and passing by relatively fewer residences than any of the other alternatives in this variation area. In contrast, Beltrami North Central Variation 4 and Beltrami North Central Variation 5 would result in more impacts to the aesthetics element of the human settlement factor and the agricultural element of and land-based economies factor, as they would cross slightly more farmland and would be in proximity to more residences. The Proposed Blue/Orange Route and **Beltrami North Central Variation 2 would pass through USFWS Interest Lands and Beltrami North Central Variation 4 and Beltrami North Central Variation 5 would pass through more private land; because of this, these alternatives would have the most** impacts to the land use compatibility element of the human settlement factor.

Of the all the alternatives in this variation area, Beltrami North Central Variation 2 would have more impacts to the **wildlife** element of the natural environment factor and **to the state rare community element of the rare and unique natural resources factor because** it would pass through the Big Bog Important Bird Area and an MBS Site of Biodiversity Significance ranked high, without paralleling any existing infrastructure corridors through these areas. While the Proposed Blue/Orange Route would cross some of these same sensitive areas, paralleling the existing 500 kV transmission line corridor would result in fewer impacts to the **wildlife** element of the natural environment factor associated with habitat fragmentation. Beltrami North Central Variation 4 would have fewer impacts **to the federal and state listed species and** rare communities elements of the rare and unique resources factor than the other alternatives in this variation area, as **there are no MnDNR Natural Heritage Information System (NHIS) records identified within one mile and** it would avoid the sensitive areas crossed by the Beltrami North Central Variation 2 and the Proposed Blue/Orange Route, and would also parallel an existing 230 kV transmission line corridor for its entire length.

The Proposed Blue/Orange Route would cost **the least** to build.

S.10.2 Central Section

The Central Section contains eight variation areas: Pine Island, Beltrami South Central, Beltrami South, North Black River, C2 Segment Option, J2 Segment Option, Northome, and Cutfoot.

S.10.2.1 Central Section: Pine Island Variation Area

The Pine Island Variation Area has two route alternatives: the Proposed Blue Route and the Proposed Orange Route.

Human Settlement. Based on proximity to other sensitive viewing areas like historic architectural sites and state forests (two historic architectural sites within 5,280 feet of the Proposed Blue Route compared to seven historic architectural sites for the Proposed Orange Route, and four state forests for the Proposed Blue Route compared to six state forests for the Proposed Orange Route), and the extent of paralleling existing transmission lines (39 percent for the Proposed Blue Route compared to 23 percent for the Proposed Orange Route), the Proposed Blue Route would result in fewer aesthetic impacts. The ROW for the proposed routes would be within 1,500 feet of one state trail, snowmobile trails (three and four, respectively), and one state water trail. Despite that, both proposed routes are long (109.8 and 105.4 miles, respectively) and only parallel existing transmission lines of similar size and design for a relatively small percentage of their lengths (39 and 23 percent, respectively), therefore, aesthetic

impacts of both proposed routes would potentially be significant.

The Proposed Blue Route would likely impact more acres of state forest (2,291 acres compared to 1,980 acres for the Proposed Orange Route) but would avoid crossing a greater amount of state fee lands (2,095 acres compared to 2,310 acres for the Proposed Orange Route), and USFWS Interest Lands (8 acres compared to 16 acres for the Proposed Orange Route). It would also parallel existing transmission line corridor more (39 percent compared to 23 percent for the Proposed Orange Route).

Land-Based Economies. Both the Proposed Blue Route and the Proposed Orange Route would impact 70 acres of land designated as "all areas are prime farmland". The Proposed Blue Route would have fewer potential impacts to agriculture as it has fewer acres of land designated as "prime farmland if drained" (307 acres in the ROW of the Proposed Blue Route and 503 acres in the ROW of the Proposed Orange Route) and would parallel an existing transmission line for a greater proportion of its length (approximately 40 percent of the Proposed Blue Route compared to 23 percent of the Proposed Orange Route). The Proposed Orange Route would impact fewer acres of state forest lands (2,291 acres of state forest within the ROW of the Proposed Orange Route and 1,980 acres of state forest within the ROW of the Proposed Blue Route). The Proposed Orange Route would also impact fewer acres of **expired/terminated state mineral lease lands (370 acres of expired/terminated state mineral leases in the ROW of the Proposed Orange Route and 1,205 acres** within the ROW of the Proposed Blue Route). In addition, two aggregate resources are present within the ROW of the Proposed Orange Route, while none are present in the ROW of the Proposed Blue Route.

Archaeology and Historic Architectural Resources. Neither route has any archaeological or historic architectural sites within its ROW. The Proposed Orange Route has a higher number of historic architectural sites within 1 mile (seven sites compared to two sites). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route would cross the most PWI waters (25 crossings compared to 18 crossings for the Proposed Blue Route), while the Proposed Blue Route would cross slightly more non-PWI waters (48 crossings compared to 46 crossings for the Proposed Orange Route). Each proposed route would cross one impaired water, and the Proposed Blue Route would cross one MnDNR-designated trout stream. All water course crossings would be spannable. The Proposed Blue Route would also cross the greatest amount of floodplains (20 acres compared to 11 acres for the Proposed Orange Route) and wetlands (2,102 acres compared to 1,875 acres for the Proposed Orange Route). Floodplains would be spannable, while both the Proposed Blue Route and the Proposed Orange Route would cross wetlands too large to span.

Both proposed routes would pass through similar amounts of forested land, including state forest land, but because the Proposed Blue Route parallels existing transmission line corridor for a greater percentage of its length, it would likely have less impact on intact forested areas.

The Proposed Orange Route would pass through more WMA land (274 acres compared to 49 acres for the Proposed Blue Route) and more of the Big Bog Important Bird Area (1,722 acres compared to 1,405 acres for the Proposed Blue Route).

Rare and Unique Natural Resources. The Proposed Orange Route has more documented rare species within one mile of its ROW (14 records compared to 8 records for the Proposed Blue Route) and would likely have a greater impact on rare species. However, the full extent of potential impacts from either the Proposed Blue Route or the Proposed Orange Route cannot be determined without pre-construction field surveys. The Proposed Blue Route would be expected to have less potential impact on critical habitat designated for gray wolf because it would cross less of this resource than the Proposed Orange Route.

Rare communities are present in the ROW of the Proposed Blue Route and Proposed Orange Route. Because the Proposed Blue Route would parallel more existing transmission line corridor (39 percent compared to 23 percent for the Proposed Orange Route), it would likely have less impact on these communities.

Corridor Sharing. The Proposed Blue Route and Proposed Orange Route would parallel existing transmission line corridor for 39 percent and 23 percent of their lengths, respectively. Both proposed routes would parallel existing road/trail, field line, and other corridors for less than 10 percent of their length.

Costs that Depend on Design and Route. As the longer alternative, the Proposed Blue Route would cost more to build than the Proposed Orange Route.

S.10.2.2 Central Section: Beltrami South Central Variation Area

The Beltrami South Central Variation Area contains two route alternatives: the Proposed Orange Route and the Beltrami South Central Variation.

Human Settlement. Because it is slightly shorter (1.2 miles compared to 1.7 miles for the Beltrami South Central Variation), and parallels an existing 500 kV transmission line for its entire length (compared to no paralleling for the Beltrami South Central Variation), and crosses less state forest land (30 acres compared to 43 acres for the Beltrami South Central Variation) the Proposed Orange Route would have the fewest aesthetic impacts and would be expected to be more compatible with existing land uses than the Beltrami South Central Variation, although it crosses more USFWS Interest Lands (16 acres compared to zero acres for the Beltrami South Central Variation).

Land-Based Economies. No prime farmland or mining lands are present in the ROW of either the Proposed Orange Route or the Beltrami South Central. The Proposed Orange Route would have less impact on forest lands with 30 acres of state forest land in its ROW compared to 43 acres in the Beltrami South Central Variation ROW. **No mining resources are located in the Beltrami South Central Variation Area.**

Archaeology and Historic Architectural Resources. No archaeological or historic architectural resources **are known to be located** within the Beltrami South Central Variation Area. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route contains less combined forested and shrub wetlands than the Beltrami South Central Variation (28 acres compared to 39 acres, respectively) and would result in less wetland type conversion. Both the Proposed Orange Route and the Beltrami South Central Variation would cross wetlands too large to span.

The Proposed Orange Route would pass through slightly less forested land (30 acres compared to 43 acres for the Beltrami South Central Variation), including state forest, and would parallel existing transmission line corridor for its entire length, thereby resulting in less forest fragmentation.

Both the Proposed Orange Route and the Beltrami South Central Variation would pass through the Big Bog Important Bird Area. The Proposed Orange Route, however, would traverse a smaller portion (30 acres compared to 43 acres for the Beltrami South Central Variation) and would not require that a new transmission line corridor be created.

Rare and Unique Natural Resources. Four rare species have been documented within one mile of both the Proposed Orange Route and Beltrami South Central Variation; impacts to rare species would likely be similar with either alternative. However, the full extent of potential impacts from either the Proposed Orange Route or the Beltrami South Central Variation cannot be determined without pre-construction field surveys.

The Proposed Orange Route would pass through fewer MBS Sites of Biodiversity Significance (30 acres compared to 43 acres for the Beltrami South Central Variation), and would do so while paralleling an existing transmission line corridor; therefore this alternative would likely have less impacts on this resource.

Corridor Sharing. The Proposed Orange Route parallels existing transmission line corridors for its entire length. The Beltrami South Central Variation does not parallel any existing corridor.

Costs that Depend on Design and Route. As the shorter alternative, the Proposed Orange Route would cost less to construct and less per mile to construct **due to such factors as differences in terrain and projected costs related to acquiring rights of way.**

S.10.2.3 Central Section: Beltrami South Variation Area

The Beltrami South Variation Area contains two route alternatives: the Proposed Orange Route and the Beltrami South Variation.

Human Settlement. State forest lands (one state forest within 1,500 feet of each alternative), but no residences, historic architectural sites, state trails, state parks, national forest, scenic byways, or snowmobile or water trails, would be located within the 200-foot ROWs of the Proposed Orange Route or the Beltrami South Variation. The Proposed Orange Route, however, is shorter (5.6 miles compared to 7.5 miles for the Beltrami South Variation) and parallels transmission line corridor for

its entire length compared to no paralleling for the Beltrami South Variation, so it would likely have the fewest adverse impacts on aesthetics. It also crosses less forested and/or swamp area (2,185 acres compared to 2,887 acres for the Beltrami South Variation), so it would be more compatible with existing land uses.

Land-Based Economies. Neither the Proposed Orange Route nor the Beltrami South Variation crosses prime farmland. The Proposed Orange Route, crosses less state forest and **expired/ terminated state** mineral lease lands (136 acres of state forest and 58 acres of **expired/terminated** state mineral lease lands for the Proposed Orange Route compared to 136 acres of state forest and 58 acres of state mineral lease lands for the Proposed Orange Route), is shorter, and parallels an existing transmission line for its entire length, thereby having the least impact on forest **and expired/terminated state mining lease lands**.

Archaeology and Historic Architectural Resources. No known archaeological or historic architectural resources are present within the Beltrami South Variation Area. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route contains less combined forested and shrub wetlands than the Beltrami South Variation (133 acres compared to 180 acres, respectively) and would result in less wetland type conversion. Both the Proposed Orange Route and the Beltrami South Variation would cross wetlands too large to span.

The Proposed Orange Route would pass through slightly less forested land (135 acres compared to 183 acres for the Beltrami South Variation), including state forest (136 acres compared to 183 acres for the Beltrami South Variation), and because it parallels existing transmission line corridor, it would fragment less forested land.

Both the Proposed Orange Route and the Beltrami South Variation would pass through the Big Bog Important Bird Area. The Proposed Orange Route, however, would traverse a smaller portion (136 acres compared to 183 acres for the Beltrami South Variation) and would not require creation of a new transmission line corridor.

Rare and Unique Natural Resources. Two rare *Botrychium* (moonwort) species have been documented within one mile of the Beltrami South Variation, one of which was also documented within one mile of the Proposed Orange Route. Because species in this genus prefer disturbed, open habitats, impacts would be similar with either alternative. However, the full extent of potential impacts from either the Proposed Orange Route or the Beltrami South Variation cannot be determined without pre-construction field surveys. The Proposed Orange Route would be expected to have less potential impact on critical habitat designated for gray wolf because it would cross less of this resource and would do so in an area where critical habitat designated for gray wolf has already been fragmented.

The Proposed Orange Route would pass through fewer MBS Sites of Biodiversity Significance (120 acres compared to 160 acres for the Beltrami South Variation) and would parallel existing transmission line corridor; it would therefore likely have the fewest adverse impacts on these resources.

Corridor Sharing. The Proposed Orange Route parallels existing transmission line corridor for its entire length. The Beltrami South Variation does not parallel any corridor.

Costs that Depend on Design and Route. As the shorter alternative, the Proposed Orange Route would cost less to construct and less per mile to construct **due to such factors as differences in terrain and projected costs related to acquiring rights of way.**

S.10.2.4 Central Section: North Black River Variation Area

The North Black River Variation Area contains two route alternatives: the Proposed Blue Route and the North Black River Variation.

Human Settlement. Although the North Black River Variation would be slightly longer (9.2 miles compared to 8.4 miles for the Proposed Blue Route) and would impact several more residences than the Proposed Blue Route (five residences within 1,500 feet for the North Black River Variation compared to one residence for the Proposed Blue Route), it would likely have fewer aesthetic impacts because it would parallel an existing transmission line for its entire length compared to the Proposed Blue Route which does not parallel an existing transmission line. Neither alternative would be expected to have aesthetic impacts, as historic architectural sites, state trails, state parks, national forest, scenic byways, or

water trails are not located within the 200-foot ROW of either the Proposed Blue Route or the North Black River Variation. Snowmobile trails are crossed by both alternatives.

The Proposed Blue Route crosses less forested area (3,190 acres compared to 3,296 acres for the North Black River Variation) so it would be more compatible with existing land uses.

Land-Based Economies. The North Black River Variation would pass through more acres of farmland (50 acres of land designated as "prime farmland if drained" and 14 acres of farmland of statewide importance within the North Black River Variation ROW compared to 12 acres of land designated as "prime farmland if drained" and 29 acres of farmland of statewide importance within the Proposed Blue Route ROW). However, because the North Black River Variation would parallel an existing transmission line for its entire length, it would be expected to have fewer impacts on farmland.

The North Black River Variation would pass through less state forest **and expired/terminated state mineral lease lands (156 acres of state forest and 362 acres of expired/terminated** state mineral lease lands for the North Black River Variation ROW compared to 188 acres of state forest and 405 acres of state mineral lease land for the Proposed Blue Route ROW), so it would likely have fewer adverse impacts on these resources.

Archaeology and Historic Architectural Resources. No known archaeological or historic architectural resources are present within the North Black River Variation Area. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. Both the Proposed Blue Route and the North Black River Variation would cross non-PWI waters four times. All these crossings are spannable. Both the Proposed Blue Route and the North Black River Variation would cross wetlands, although the North Black River Variation would cross less combined forested and shrub wetlands than the Proposed Blue Route (156 acres compared to 185 acres, respectively) and would therefore result in less wetland type conversion. Both the Proposed Blue Route and the North Black River Variation would cross wetlands too large to span.

Both the Proposed Blue Route and the North Black River Variation would pass through similar amounts of forested land, including state forest, but because the North Black River Variation parallels existing transmission line corridor, it would cause less fragmentation of intact forest in areas.

Both the Proposed Blue Route and the North Black River Variation would pass through the Big Bog Important Bird Area. The North Black River Variation would cross slightly more of this area (214 acres compared to 191 acres for the Proposed Blue Route), but because it would parallel existing transmission line corridor, it would likely have less impact.

Rare and Unique Natural Resources. No state or federally listed species have been documented within one mile of the Proposed Blue Route or the North Black River Variation. However, the full extent of potential impacts from either the Proposed Blue Route or the North Black River Variation cannot be determined without pre-construction field surveys.

The North Black River Variation would pass through fewer acres of MBS Sites of Biodiversity Significance (109 acres compared to 165 acres for the Proposed Blue Route) and would parallel an existing transmission line corridor; therefore it would fragment less intact forest in areas where forest vegetation is present.

Corridor Sharing. The North Black River Variation would parallel corridor with existing transmission lines for its entire length. The Proposed Blue Route would not parallel any existing corridor.

Costs that Depend on Design and Route. Although the North Black River Variation would be the longer alternative, it would cost the less to build and less per mile **due to such factors as differences in terrain and projected costs related to acquiring rights of way.**

S.10.2.5 Central Section: C2 Segment Option Variation Area

The C2 Segment Option Variation Area contains two route alternatives: the Proposed Blue Route and the C2 Segment Option Variation.

Human Settlement. Although the C2 Segment Option Variation would be longer than the Proposed Blue Route(46.0 miles compared to 32.8 miles, respectively) and would impact substantially more residences (29 residences within 1,500 feet compared to zero residences within 1,500 feet, respectively).The C2 Segment Option Variation also parallels an existing transmission line for a large

portion of the route (81 percent of total length compared to zero percent for the Proposed Blue Route) and therefore is likely to result in somewhat fewer aesthetic impacts than the Proposed Blue Route. Both the Proposed Blue Route and C2 Segment Option Variation would be within 1,500 feet of a state trail, state forest land (two and three forests, respectively), snowmobile trails (two and one, respectively), and a water trail.

The C2 Segment Option Variation crosses more forested and agricultural land (16,121 acres and 167 acres, respectively) than the Proposed Blue Route (11,922 acres and zero acres, respectively), although the Proposed Blue Route would contain more state forest (797 acres compared to 274 acres for the C2 Segment Option Variation) and state fee land (731 acres compared to 640 acres for the C2 Segment Option Variation). Because the C2 Segment Option Variation parallels an existing transmission line corridor for 81 percent of its length compared to zero percent for the Proposed Blue Route, it would be more compatible with surrounding land uses.

Land-Based Economies. The Proposed Blue Route would pass through fewer acres of farmland, including prime farmland (2 acres within the ROW of the Proposed Blue Route and 25 acres within the ROW of the C2 Segment Option Variation), "prime farmland if drained," (92 acres within the ROW of the Proposed Blue Route and 124 acres within the ROW of the C2 Segment Option Variation) and farmland of statewide importance (78 acres within the ROW of the Proposed Blue Route and 177 acres within the ROW of the C2 Segment Option Variation) and may have fewer impacts on agriculture.

The C2 Segment Option Variation would impact fewer acres of state forest land (247 acres within the ROW) compared to the Proposed Blue Route (797 acres within the ROW).

Because the C2 Segment Option Variation would pass through more **expired/terminated state mineral lease lands (67 acres of expired/terminated state mineral lease lands within the C2 Segment Option Variation ROW and 16 acres of expired/terminated** state mineral lease lands within the Proposed Blue Route ROW), it is more likely to potentially interfere with future mining activities in this area.

Archaeology and Historic Architectural Resources. No known archaeological or historic architectural resources are present within the North Black River Variation Area. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The C2 Segment Option Variation would cross fewer PWI and non-PWI waters (eight crossings compared to 17 crossings for the Proposed Blue Route) but more impaired waters (two crossings compared to one crossing for the Proposed Blue Route). All of these watercourses would be spannable. Both the Proposed Blue Route and the C2 Segment Option Variation would cross floodplains and wetlands, and the C2 Segment Option Variation would cross more acres of each (8 acres compared to 28 acres of floodplain for the Proposed Blue Route; 728 acres compared to 829 acres of wetland for the Proposed Blue Route). Both the Proposed Blue Route and the C2 Segment Option Variation would cross wetlands too large to span.

The C2 Segment Option Variation would pass through more forested land (1,080 acres compared to 789 acres for the Proposed Blue Route), but the Proposed Blue Route would pass through more state forest land (797 acres compared to 274 acres for the C2 Segment Option Variation), and even though the C2 Segment Option Variation is longer, it would parallel existing transmission line corridor for much of its length (81 percent), thereby causing less fragmentation of intact forest.

Both the Proposed Blue Route and the C2 Segment Option Variation would also pass through the Big Bog Important Bird Area. The C2 Segment Option Variation would traverse less area (406 acres compared to 469 acres for the Proposed Blue Route) and parallel existing transmission line corridor, therefore it would likely have less impact on this resource.

Rare and Unique Natural Resources. The C2 Segment Option Variation Area contains one state threatened vascular plant within one mile. Habitat for this vascular plant species is likely present within one mile of both the Proposed Blue Route and the C2 Segment Option Variation. Because the Proposed Blue Route would require the creation of new corridor for its entire length, while the C2 Segment Option Variation would parallel an existing transmission line for over 80 percent of its length, the Proposed Blue Route could have more impact on rare species. However, the full extent of potential impacts from either the Proposed Blue Route or C2 Segment Option Variation cannot be determined without pre-construction field surveys.

The C2 Segment Option Variation would be expected to have less potential impact on critical habitat designated for gray wolf because it would cross this resource in an area where critical habitat designated for gray wolf has already been fragmented.

Both the Proposed Blue Route and the C2 Segment Option Variation would pass through MBS Sites of Biodiversity Significance and MnDNR Ecologically Important Lowland Conifers. However, because it would parallel an existing corridor for over 80 percent of its length, the C2 Segment Option would likely have less impact on these resources.

Corridor Sharing. The C2 Segment Option Variation would parallel existing transmission line corridor for 81 percent of its length. The Proposed Blue Route would not parallel any existing corridor.

Costs that Depend on Design and Route. As the shortest alternative, the Proposed Blue Route would cost less to build and less per mile to build **due to such factors as differences in terrain and projected costs related to acquiring rights of way.**

S.10.2.6 Central Section: J2 Segment Option Variation Area

The J2 Segment Option Variation Area contains two route alternatives: the Proposed Orange Route and the J2 Segment Option Variation.

Human Settlement. Given the length (42.2 miles for the Proposed Orange Route compared to 45.2 miles), and proximity to residences (zero and six residences within 1,500 feet for the Proposed Orange Route and J2 Segment Option Variation, respectively), historic architectural resources (two and seven historic architectural sites within 1,500 feet, for the Proposed Orange Route and J2 Segment Option Variation, respectively), state scenic byways (zero compared to two within 1,500 feet for the Proposed Orange Route and J2 Segment Option Variation, respectively), and snowmobile trails (two compared to four within 1,500 feet for the Proposed Orange Route and J2 Segment Option Variation, respectively), the Proposed Orange Route would have less aesthetic impact than the J2 Segment Option Variation. Both alternatives would be located within 1,500 feet of a state trail and state forest (three compared to two for the Proposed Orange Route and J2 Segment Option Variation, respectively), and snowmobile trails.

The Proposed Orange Route would cross more state forest land (851 acres compared to 715 acres for the J2 Segment Option Variation) and state fee land (945 acres compared to 840 acres for the J2 Segment Option Variation) but the J2 Segment Option Variation would cross more USFWS Interest Lands (28 acres compared to zero acres for the Proposed Orange Route). Long-term changes to land use would be expected to be minimal.

Land-Based Economies. The Proposed Orange Route, which is shorter, would have less impact on farmland (434 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the Proposed Orange Route ROW, and 459 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the J2 Segment Option Variation ROW), but because it would contain more state forest lands (851 acres of state forest within the Proposed Orange Route ROW and 715 acres of state forest within the J2 Segment Option Variation ROW), it would be expected to have the greater potential impact on forestry. The Proposed Orange Route also has slightly more **expired/terminated state lease lands in its ROW (82 acres of expired/terminated state mineral lease lands within the Proposed Orange Route ROW versus 73 acres of expired/terminated** state mineral lease lands within the J2 Segment Option Variation ROW).

Archaeology and Historic Architectural Resources. No archaeologic or historic architectural sites are located within the ROW of the Proposed Orange Route or J2 Segment Option Variation but both have historic architectural sites located within one mile (indirect APE) that could potentially be affected (two and seven sites, respectively). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route would cross more PWI waters but fewer non-PWI waters than the J2 Segment Option Variation (six compared to three PWI water crossings, respectively; and 24 compared to 36 non-PWI water crossings, respectively). The Proposed Orange Route would also cross floodplains, while the J2 Segment Option Variation would not cross any. These watercourses and floodplains would all be spannable. The Proposed Orange Route would also cross more forested and shrub wetlands (312 acres compared to 483 acres for the J2 Segment Option Variation), which would result in more wetland type conversion. Both the Proposed Orange Route and the J2 Segment Option Variation would cross wetlands too large to span.

The Proposed Orange Route and the J2 Segment Option Variation would pass through similar amounts of forested land, with the Proposed Orange Route passing through more state forest land (851 acres compared to 715 acres for the J2 Segment Option Variation). Therefore, they would result in similar fragmentation of intact forest, with the Proposed Orange Route fragmenting more state forest land.

The Proposed Orange Route would pass through 262 acres of the Big Bog Important Bird Area, while the J2 Segment Option Variation would pass through 72 acres of the Chippewa Plains Important Bird Area.

Rare and Unique Natural Resources. The Proposed Orange Route has more documented rare species within one mile of its ROW (four records compared to two records for the J2 Segment Option Variation). However, the full extent of potential impacts from either of the Proposed Orange Route or J2 Segment Option Variation cannot be determined without pre-construction field surveys. The J2 Segment Option Variation has two colonial waterbird nesting sites within 1,500 feet of its anticipated alignment, while no colonial waterbird nesting sites have been documented within one mile of the Proposed Orange Route. The J2 Segment Option Variation would be expected to have less potential impact on critical habitat designated for gray wolf because it would cross less of this resource than the Proposed Orange Route.

The Proposed Orange Route would pass through more acres of MBS Sites of Biodiversity Significance (489 acres compared to 185 acres for the J2 Segment Option Variation) and would therefore have a greater adverse impact on these resources.

Corridor Sharing. Neither the Proposed Orange Route nor the J2 Segment Option Variation would parallel existing transmission line corridor.

Costs that Depend on Design and Route. As the shorter alternative, the Proposed Orange Route would cost less to build, but cost about the same per mile to build.

S.10.2.7 Central Section: Northome Variation Area

The Northome Variation Area contains two route alternatives: the J2 Segment Option Variation and the Northome Variation.

Human Settlement. Both the J2 Segment Option Variation and the Northome Variation would be within 1,500 feet of a state forest, and the Northome Variation is also within 1,500 feet of a national forest, although it does not cross the ROW. Because both alternatives are short (3.7 and 4.0 miles, respectively) and impact no residences and few other sensitive visual resources (state and national forests), aesthetic impacts would be expected to be minimal. No historic architectural sites, state trails, state parks, scenic byways, snowmobile or water trails are within the ROW of either alternative.

The Northome Variation ROW contains a greater amount of state fee land (81 acres compared to 39 acres for the J2 Segment Option Variation) while the J2 Segment Option Variation crosses more USFWS Interest Lands (28 acres compared to zero acres for the Northome Variation). Both alternatives contain less than half an acre of state forest land.

Land-Based Economies. The Northome Variation, which is longer, would pass through more farmland, including more prime farmland and "prime farmland if drained" (43 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" for the Northome Variation ROW, and 22 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" for the J2 Segment Option Variation ROW). The Northome Variation would, however, impact less farmland of statewide importance (28 acres of farmland of statewide importance for the Northome Variation ROW, and 39 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" for the J2 Segment Option Variation ROW).

The J2 Segment Option Variation and the Northome Variation would impact minimal amounts of state forest lands. No **state mineral lease** lands would be located within the ROW of either alternative.

Archaeology and Historic Architectural Resources. No archaeological or historic architectural resources are located within the direct and indirect APEs for the J2 Segment Option Variation or the Northome Variation. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The J2 Segment Option Variation would cross more non-PWI waters (six crossings compared to one crossing for the Northome Variation), all of which would be spannable. The J2 Segment Option Variation would also contain more acres of forested and shrub wetlands (eight acres compared to 13 acres for the

Northome Variation), which would result in more wetland type conversion. Both the J2 Segment Option Variation and the Northome Variation would cross wetlands too large to span.

The J2 Segment Option Variation and the Northome Variation would pass through similar amounts of forested land and would therefore fragment similar amounts of intact forest.

The Northome Variation would cross a MnDNR-designated shallow lake along a new transmission line corridor, which could impact the wildlife that uses this lake. Due to its longer length, the Northome Variation could also have a greater overall impact on wildlife.

Rare and Unique Natural Resources. No federally or state-listed species have been documented within one mile of either alternative. However, the full extent of impacts from the Proposed J2 Segment Option Variation and Northome Variation cannot be determined without pre-construction field surveys. One and two colonial waterbird nesting sites has been documented within one mile of the J2 Segment Option Variation and the Northome Variation, respectively.

No documented rare communities appear within the ROW of the J2 Segment Option Variation or the Northome Variation.

Corridor Sharing. Neither the J2 Segment Option Variation nor the Northome Variation parallel any existing corridors.

Costs that Depend on Design and Route. As the shorter alternative, the J2 Segment Option Variation would cost less to build and less per mile to build **due to such factors as differences in terrain and projected costs related to acquiring rights of way.**

S.10.2.8 Central Section: Cutfoot Variation Area

The Cutfoot Variation Area contains two route alternatives: the Proposed Orange Route and the Cutfoot Variation.

Human Settlement. The ROWs of both the Proposed Orange Route and the Cutfoot Variation are within 1,500 feet of three state forests, but neither alternative would be likely to impact other aesthetic resources or residences with high visual sensitivity such as historic architectural resources, state trails, state parks, national forest, scenic byways, snowmobile or water trails as they are not within the ROW or within 1,500 feet of the anticipated alignments. Because the Cutfoot Variation is slightly longer (4.8 miles compared to 4.2 miles for the Proposed Orange Route), it would have a greater impact on aesthetics.

The Proposed Orange Route and the Cutfoot Variation contain roughly the same amount of forest lands (1,652 acres compared to 1,874 acres, respectively), and neither alternative contains any farmland. No long-term changes to land use would be expected to be minimal from either alternative.

Land-Based Economies. The Proposed Orange Route would pass through more acres of farmland, including "prime farmland if drained" (53 acres within the ROW) than the Cutfoot Variation (32 acres within the ROW). Each alternative would impact less than 5 acres of farmland of statewide importance and would not impact prime farmland. The Cutfoot Variation would cross slightly more acres of state forest lands (116 acres within the ROW) than the Proposed Orange Route (103 acres within the ROW), and therefore may have more impact on these lands. The Proposed Orange Route would cross more **expired/terminated state mining lands (29 acres of expired/terminated state mineral lease lands within the ROW of the Proposed Orange route and 4 acres of expired/terminated** state mineral lease lands within the ROW of the Cutfoot variation), and both alternatives would have one aggregate resource within its ROW.

Archaeology and Historic Architectural Resources. Neither the Proposed Orange Route nor the Cutfoot Variation affects any archaeological or historic architectural resource in the direct and indirect APEs. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route would cross two non-PWI waters, while the Cutfoot Variation would not cross any. Both of these non-PWI waterbodies would be spannable. The Cutfoot Variation contains more forested and shrub wetlands and would result in a greater amount of wetland type conversion (52 acres compared to 64 acres for the Proposed Orange Route). Both the Proposed Orange Route and the Cutfoot Variation would cross wetlands too large to span.

Because the Cutfoot Variation is longer, it would pass through more forested land (115 acres compared to 99 acres for the Proposed Orange Route), including more state forest land (116 acres

compared to 103 acres for the Proposed Orange Route), and would result in more fragmentation of intact forest.

Rare and Unique Natural Resources. No state- or federally listed species have been documented within one mile of the Proposed Orange Route or the Cutfoot Variation. However, the full extent of potential impacts from either the Proposed Orange Route or Cutfoot Variation cannot be determined without pre-construction field surveys. The Proposed Orange Route would be expected to have less potential impact on critical habitat designated for gray wolf because it would cross slightly less of this resource than the Cutfoot Variation.

The Cutfoot Variation would pass through more acres of MBS Sites of Biodiversity Significance (60 acres) than the Proposed Orange Route (43 acres) and therefore would likely have more impact on this resource.

Corridor Sharing. Neither the Proposed Orange Route nor the Cutfoot would parallel any existing corridors.

Costs that Depend on Design and Route. The Proposed Orange Route would cost less to build but slightly more per mile to build.

S.10.2.9 Relative Merits Summary—Central Section

Pine Island Variation Area

Within the Pine Island Variation Area, the analysis indicates a trade-off between impacts to human settlement factors and impacts to natural environment factors. Though both **alternatives** would pass through reaches of forest lands and floodplain and forested wetlands too large to span, the Proposed Orange Route would cross **less**, resulting in placement of fewer structures in floodplains and requiring the least wetland type conversion. The Proposed Blue Route would have a greater impact on the watercourse/waterbody crossing indicator of the water resources element as it would cross a trout stream, potentially requiring vegetation along the banks of the stream to be cleared. With respect to the wildlife element of the natural environment factor, t**he Proposed Orange Route would cross more of the WMA and Important Bird Area. The Proposed Orange Route may have more impacts on the federal and state listed species element of the rare and unique natural resources factor because there are more NHIS records present within one mile. In contrast, the Proposed Blue Route may have more impacts to the rare community element of the rare and unique natural resources factor because it crosses more Ecologically Important Lowland Conifer stands.**

The Proposed Blue Route would impact the aesthetics element of the human settlement factor by passing near more residences than the Proposed Orange Route. Although the Proposed Orange Route would pass near the Big Bog Recreation area, a valued resource with respect to both the aesthetics element and the recreation and tourism element of the human settlement factor, the Proposed Orange Route would not be visible from the Big Bog Recreation Area. **The Proposed Blue Route crosses more private land** and both the Proposed Blue Route and the Proposed Orange Route would cross USFWS Interest Lands, affecting the land use compatibility element of the human settlement factor; however, the Proposed Blue Route could avoid USFWS Interest Lands by using the Silver Creek Alignment Modification. The Proposed Blue Route would cross more **expired/terminated state mineral lease lands**, affecting the mining and mineral resources element of the land based economies factor, although the Proposed Orange Route would pass in close proximity to more aggregate resources. The Proposed Blue Route would parallel existing corridors, including transmission line corridors, for a greater length than the Proposed Orange Route. **The Proposed Blue Route would cost less to construct**.

Beltrami South Central Variation Area

The Beltrami South Central Variation would avoid USFWS I**nterest Lands, having less impact on the land use compatibility element of the human settlement factor. However, the Beltrami South Central Variation would have more impacts on the water resources and wildlife elements of the natural environment factor, as it would cross more** forested and shrub wetland, requiring the most wetland type conversion, and Important Bird Area. Furthermore, the Beltrami South Central Variation would not parallel any existing corridors and would be longer than the Proposed Orange Route, requiring more corner structures and costing more to build.

Beltrami South Variation Area

The Beltrami South Variation would avoid USFWS Interest Lands, having less impact on the land use compatibility element of the human settlement factor. However, the Beltrami South Variation would have more impact on the mining and mineral resources element of the land based economies factor because it would cross more expired/terminated state mineral leasing lands. The Beltrami South Variation may also have more

impact on the federal and state listed species element of the rare and unique resources factor because there are more NHIS records documented within one mile of it, including a state-threatened species. Furthermore, the Beltrami South Variation would not parallel any existing corridors and would be longer than the Proposed Orange Route, requiring more corner structures and costing more to build.

North Black River Variation Area

The North Black River Variation would have more impacts to the aesthetics **and land use compatibility elements** of the human settlement factor, as **it would pass close to more residences and crosses more private land** than the Proposed Blue Route, but these impacts are moderated to some extent by paralleling existing roadway and transmission line corridors.

Some impacts associated with the North Black River Variation may be moderated by paralleling existing corridors **for its entire length**; the Proposed Blue Route would not parallel any **existing** corridors. The North Black River Variation is longer and would have a slightly higher construction cost.

C2 Segment Option Variation Area

The C2 Segment Option Variation would have more potential impacts to the aesthetic **and land use compatibility elements of human settlement factor as it would pass near more residences and private land; but these impacts are moderated to some extent by paralleling existing roadway and transmission line corridors for much of its length. The C2 Segment Option Variation could have more impact on the mining and mineral resources element of the land based economies factor, as it would also cross more state expired/terminated mineral lease lands. However, the Proposed Blue Route would have more impact on the forestry element of the land based economies factor, as it would cross almost three times more state forest land and would primarily do so while not paralleling existing corridor.**

The C2 Segment Option Variation **may have more impacts on the rare and unique natural resources factor, as it has a NHIS record for threatened species within one mile, has an SNA within 1,500 feet of the anticipated alignment, and would pass through a SNA Watershed Protection Area (WPA). However, the C2 Segment Option Variation would moderate impacts to some extent by paralleling existing corridors.** Due to its longer length and many angle structures, the C2 Segment Option Variation would cost more to construct than the Proposed Blue Route.

J2 Segment Option Variation Area

The J2 Segment Option Variation would have more impacts on the aesthetics and land use compatibility elements of the human settlement factor, as it would pass by more residences and private land, and would cross USFWS Interest Lands. The J2 Segment Option Variation may also have more impact on the archaeological and historic architectural resources factor, as it would cross several sections with a known archaeological and historic architectural resources. The J2 Segment Option Variation would cost more to construct due to its greater length.

The Proposed Orange Route may have more impact on the mining and mineral resources element of the land based economies factor, as it would cross more state expired/terminated mineral lease lands and aggregate resources. The Proposed Orange Route may also have more impact on the wildlife element of the natural environment factor, as it would cross more than three times as much Important Bird Area. Furthermore, the Proposed Orange Route may have more impact on both the federal and state listed species and rare communities elements of the rare and unique natural resources factor, as it would cross more critical habitat designated for gray wolf, has more NHIS records within one mile, and crosses more MBS Sites of Biodiversity Significance.

Northome Variation Area

The Northome Variation would have a greater impact on the land use compatibility element of the human settlement factor by crossing USFWS Interest Lands. The Northome Variation would also have more impact on the water resources element of the natural environment factor, as it would cross the most forested and shrub wetland, requiring the most wetland type conversion.

The Northome Variation would have more impact on the wildlife element of the natural environment factor, as it would cross a MnDNR-designated shallow lake. The Northome Variation may also have more impacts on the archaeological and historic architectural resources factor, as it would cross a section with known archaeological resource. The Northome Variation is longer and would cost more to construct.

Cutfoot Variation Area

The Cutfoot Variation may have more impact on the land use compatibility element of the human settlement factor, as it would cross more private land. The Cutfoot Variation may also have more impact on the rare community element of the rare and unique natural resources factor because it would cross more MBS Sites of Biodiversity Significance. The Cutfoot Variation would also cost more to construct. The Proposed Orange Route may have more impact on the mining and mineral resources element of the land based economies factor because it would cross more state expired/ terminated mineral lease lands.

S.10.3 East Section

The East Section contains five variation areas: Effie, East Bear Lake, Balsam, Dead Man's Pond, and Blackberry.

S.10.3.1 East Section: Effie Variation Area

The Effie Variation Area contains three route alternatives: the Proposed Blue Route, the Proposed Orange Route, and the Effie Variation.

Human Settlement. Although the Effie Variation is longer compared to the Proposed Blue Route and Proposed Orange Route(49.8 miles compared to 41.1 and 44.6 miles, respectively) and would impact more residences (14 residences within 1,500 feet compared to four and five residences, respectively) and aesthetic resources (three historic architectural sites within 5,280 feet, compared to one and one site, respectively), it parallels two existing transmission lines for 80 percent of its length compared to no paralleling for the Proposed Blue Route and Proposed Orange Route and would therefore likely have the least impact on aesthetic resources. All three route alternatives would have a state trail, two state forests, and snowmobile trails (between four and six) within 1,500 of the anticipated alignment. Historic architectural sites, state parks, national forests, scenic byways, and water trails are not crossed by any of the route alternatives.

Although the Effie Variation ROW would have greater amount of state forest land (1,086 acres compared to 909 and 958 acres, respectively), state fee land (772 acres compared to 645 and 694 acres, respectively), and state conservation land (293 acres compared to 200 and 196 acres, respectively) than the two proposed routes, it parallels existing transmission line corridors for 80 percent of its length (compared to no paralleling for the proposed routes), which would likely make it the most compatible with surrounding land uses.

Land-Based Economies. The Proposed Blue Route, which is the shortest route, would have the least impact on farmland, including farmland of statewide importance (121 acres of farmland of statewide importance within the Proposed Blue Route ROW, 123 acres of farmland of statewide importance within the Proposed Orange Route ROW, and 159 acres of farmland of statewide importance within the Effie Variation ROW), prime farmland (246 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the Proposed Blue Route ROW, 387 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the Proposed Orange Route ROW, and 506 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the Effie Variation ROW). The Proposed Blue Route would also have the least impact on state forest lands (909 acres of state forest within the Proposed Blue Route ROW, 958 acres of acres of state forest within the Proposed Orange Route ROW, and 1,086 acres of acres of state forest within the Effie Variation ROW).

Although the Effie Variation crosses **the most active and expired/terminated state mineral lease lands (647 acres of active and expired/ terminated state mineral lease lands within the Proposed Blue Route ROW, 819 acres of acres of active and expired/terminated state mineral lease lands within the Proposed Orange Route ROW, and 824 acres of active and expired/terminated** state mineral lease lands within the Effie Variation ROW), it does so while paralleling an existing transmission line corridor. All three alternatives would cross a volcanic belt with known metallic mineral occurrences (gold, copper-zinc-lead, iron). No known aggregate resources are located within the Effie Variation Area.

Archaeology and Historic Architectural Resources. The Effie Variation has an archaeological site within the direct APE and more historic architectural sites within the indirect APE relative to either of the proposed routes (three sites compared to one site each for the Proposed Blue Route and Proposed Orange Route). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route and the Effie Variation would cross the most PWI waters (13 crossings each).The Effie Variation would cross the most non-PWI waters (15 crossings compared to 11 crossings or fewer for the other alternatives) and is the only alternative that would cross MnDNR-designated trout streams (six crossings). Only the proposed routes would cross floodplains. All these crossings are spannable. The Proposed Blue Route would cross the most forested and shrub wetlands (418 acres compared to 377 acres or less for the other alternatives), requiring the most wetland type conversion. All of the alternatives would require crossing wetlands too large to span.

Although the Effie Variation would pass through the most forested land (1,164 acres compared to 978 acres to 1,047 acres for the other alternatives), including state forest land (1,086 acres compared to 909 acres to 958 acres for the other alternatives), it would parallel an existing transmission line corridor for the majority of its length and would likely have the least impact on forested lands.

Unlike the Proposed Blue Route and Proposed Orange Route, the Effie Variation would avoid the Chippewa Plains Important Bird Area and would parallel an existing transmission line corridor for the majority of its length, which would result in less fragmentation of forested habitats.

Rare and Unique Natural Resources. The Effie Variation has the fewest rare species within one mile of its ROW (three records compared to five to six records for the proposed routes) and the fewest colonial waterbird nesting sites (two sites compared to three sites for the proposed routes). Because the Effie Variation parallels existing transmission line corridor, it would likely have the fewest impacts on rare species. However, the full extent of potential impacts from the Proposed Blue Route, the Proposed Orange Route, and the Effie Variation cannot be determined without pre-construction field surveys. Although the Effie Variation would cross more critical habitat designated for gray wolf than the proposed routes, it would be expected to have less potential impact on this resource because it would cross in an area where critical habitat designated for gray wolf has already been fragmented.

The Proposed Blue Route, Proposed Orange Route, and the Effie Variation would all pass through MBS Sites of Biodiversity Significance. Because the Effie Variation would parallel an existing transmission line for 80 percent of its length, it is likely to have the least impact on this resource.

Corridor Sharing. The Effie Variation would parallel existing transmission line corridor for 80 percent of its length. The Proposed Blue Route and Proposed Orange Route would not parallel any transmission line corridor.

Electrical System Reliability. The Effie Variation would parallel 500 kV and 230 kV transmission lines for 80 percent of its length. Three high voltage transmission lines in adjacent corridors could decrease the reliability of the proposed Project. When facilities are close together, 1) there is a greater risk that a single event could take out multiple lines, and 2) repairing the lines could be more difficult, which could increase outage times, should an outage occur.

Costs that Depend on Design and Route. As the shortest alternative, the Proposed Blue Route would cost to the least to build, but the Proposed Orange Route would cost the least per mile to build.

S.10.3.2 East Section: East Bear Lake Variation Area

The East Bear Lake Variation Area contains two route alternatives: the Proposed Orange Route and the East Bear Lake Variation.

Human Settlement. The Proposed Orange Route and East Bear Lake Variation would impact similar numbers of aesthetic resources, including a state trail, state forest, and three snowmobile trails within 1,500 feet of the anticipated alignment. No historic architectural sites, state parks, national forests, scenic byways, or water trails are within the ROW of either route alternative. The East Bear Variation, however, although slightly longer (10.5 miles compared to 8.9 miles for the Proposed Orange Route), would parallel two existing transmission lines for 42 percent of its length compared to zero percent for the Proposed Orange Route and would therefore likely have fewer aesthetic impacts.

The East Bear Lake Variation ROW would contain a greater amount of state forest land (256 acres compared to 217 acres for the Proposed Orange Route) and state fee land (256 acres compared to 217 acres for the Proposed Orange Route), but because it would parallel existing transmission line corridor (42 percent of its length compared to zero percent for the Proposed Orange Route), it would be more compatible with current land use.

Land-Based Economies. The East Bear Lake Variation would pass through more acres of farmland, including prime farmland (160 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the East Bear Lake

Variation ROW and 85 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the Proposed Orange Route ROW). However, because the East Bear Lake Variation parallels existing transmission line corridor for just under half of its length, it may have less impact on farmland. The Proposed Orange Route would pass through fewer acres of state forest lands (217 acres of state forest within the Proposed Orange Route ROW and 256 acres of acres of state forest within the East Bear Lake Variation ROW) and would have the least impact on forestry.

The East Bear Lake Variation would pass through **more active and expired/terminated state mineral lease lands (193 acres of active and expired/ terminated state mineral lease lands within the East Bear Lake Variation ROW and 96 acres of acres of active and expired/terminated** state mineral lease lands within the Proposed Orange Route ROW), although both alternatives could potentially interfere with future mining activities in this area.

Archaeology and Historic Architectural Resources. Neither alternative is known to contain any archaeological or historic architectural resources. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route would cross more PWI waters (four crossings compared to two crossings for the East Bear Lake Variation) but fewer non-PWI-waters (no crossings compared to three crossings for the East Bear Lake Variation); all crossings would be spannable. The Proposed Orange Route would cross more forested and shrub wetlands (99 acres compared to 87 acres for the East Bear Lake Variation), requiring the most wetland type conversion. Both the Proposed Orange Route and the East Bear Lake Variation would cross wetlands too large to span.

Although the East Bear Lake Variation would pass through more forested land (251 acres compared to 216 acres for the Proposed Orange Route), including state forest land (256 acres compared to 217 acres for the Proposed Orange Route), and is longer than the Proposed Orange Route, it would parallel existing transmission line corridor and would likely result in fewer impacts on intact forested land and would fragment less forested habitat and thereby displace fewer wildlife species associated with those forest communities.

Rare and Unique Natural Resources. One state-special concern vascular plant species was documented within one mile of both the Proposed Orange Route and East Bear Lake Variation. In addition, two state-special concern mussel species have been documented within one mile of the Proposed Orange Route, one of which was also documented within one mile of the East Bear Lake Variation. Because it is anticipated that all watercourses would be spanned, impacts to these rare mussels are not expected. Because the Proposed Orange Route would require creation of new corridor for its entire length, it would likely result in more impacts on rare species relative to the East Bear Lake Variation; however, the full extent of potential impacts from either the Proposed Orange Route or East Bear Lake Variation cannot be determined without pre-construction field surveys.

Although the East Bear Lake Variation would pass through more MBS Sites of Biodiversity Significance (255 acres compared to 217 acres for the Proposed Orange Route), it would likely have less impact on this resource because it parallels and existing transmission line corridor for over 40 percent of its length.

Corridor Sharing. The East Bear Lake Variation would parallel existing transmission line corridor for 42 percent of its length. The Proposed Orange Route would parallel other existing corridors for 55 percent of its length.

Costs that Depend on Design and Route. As the shorter alternative, the Proposed Orange Route would cost less to build and less per mile to build **due to such factors as differences in terrain and projected costs related to acquiring rights of way.**

S.10.3.3 East Section: Balsam Variation Area

The Balsam Variation Area contains three route alternatives: the Proposed Blue Route, the Proposed Orange Route, and the Balsam Variation.

Human Settlement. Considering the proximity of residences (seven residences for the Proposed Blue Route compared to 21 and 11 for the Proposed Orange Route and Balsam Variation, respectively), and snowmobile trails (two trails for the Proposed Blue Route compared to two and three trails for the Proposed Orange Route and Balsam Variation, respectively)within 1,500 feet of the anticipated alignment and other historic architectural sites within one mile (13 sites for the Proposed Blue Route compared to 24 and 28 sites for the Proposed Orange Route and Balsam Variation, respectively),

the Proposed Blue Route would have the fewest aesthetic impacts compared to the Proposed Orange Route and Balsam Variation. Aesthetic impacts of all three alternatives, however, could potentially be significant.

All three alternatives would cross primarily through forested lands. The Proposed Orange Route avoids the most state fee lands (50 acres) compared to 67 and 107 acres for the Proposed Blue Route and Balsam Variation, respectively, thereby avoiding long-term changes to land use. The Balsam Variation, however, would be **located in** an abandoned transmission line corridor for two-thirds of its length compared to the Proposed Blue Route and Proposed Orange Route following an existing or abandoned transmission line for 15 and 36 percent of their lengths, respectively.

Land-Based Economies. The Balsam Variation, which has the least acres of farmland (203 acres of land designated as "prime farmland if drained", "all areas are prime farmland" and "farmland of statewide importance" within the Balsam Variation ROW, 206 acres of land designated as "prime farmland if drained", "all areas are prime farmland" and "farmland of statewide importance" within the Proposed Blue Route ROW, and 203 acres of land designated as "prime farmland if drained", "all areas are prime farmland" and "farmland of statewide importance" within the Proposed Orange Route ROW) and **would be located in** an abandoned transmission line corridor for approximately two-thirds of its length, would likely have the least impact on farmlands.

The Balsam Variation is the only alternative that would cross **active and expired/terminated state mining lands (89 acres of active and expired/ terminated state mineral lease lands within the ROW), and it could potentially interfere with mining activities in the southern portion of this area**.

Archaeology and Historic Architectural Resources. There are no known archaeological or historic architectural sites located within the ROW of the Proposed Blue Route, Proposed Orange Route, or Balsam Variation but all have many historic architectural sites within one mile of the anticipated alignment (13, 24, and 28 sites, respectively). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Blue Route would cross the most PWI waters (seven crossings compared to five or fewer crossings for the other alternatives), and the Proposed Orange Route would cross the most non-PWI waters (four crossings compared to three or fewer crossings for the other alternatives); all crossings would be spannable. The Proposed Orange Route and the Balsam Variation would both cross floodplains (26 acres and 22 acres, respectively) too large to span, with the Proposed Orange Route crossing the most floodplain. The Balsam Variation would cross the most forested and shrub wetlands (83 acres compared to 59 acres or less for the other alternatives), requiring the most wetland type conversion. The Proposed Blue Route, the Proposed Orange Route, and the Balsam Variation would all require crossing wetlands too large to span.

Although the Balsam Variation would pass through the most forest land (401 acres compared to 299 acres to 318 acres for the Proposed Blue Route and Proposed Orange Route, respectively), it would **be located in** an abandoned transmission line corridor for about two-thirds of its length and would thereby have the least impact on intact forested areas and would likely fragment less forested habitat and thereby displace fewer wildlife species associated with those forest communities. The Balsam Variation, however, would be located within approximately 500 feet of the Chippewa Plains Important Bird Area and could impact more birds and other wildlife associated with that area.

Rare and Unique Natural Resources. The three state special concern species documented within one mile of the three alternatives are aquatic, and because waters would be spanned, impacts would not be expected. However, the full extent of potential impacts from the Proposed Blue Route, the Proposed Orange Route, and the Balsam Variation cannot be determined without pre-construction field surveys.

The Proposed Blue Route, the Proposed Orange Route, and the Balsam Variation would all pass through MBS Sites of Biodiversity Significance, but by **being located in** an abandoned transmission line corridor, the Balsam Variation would have the least impact on this resource.

Corridor Sharing. The Balsam Variation would **be located in** an abandoned transmission line corridor for 66 percent of its length, while the other alternatives would parallel existing corridors for less than half of their lengths.

Electrical System Reliability. The Proposed Blue Route and Proposed Orange Route would parallel two 115 kV transmission lines for approximately 15 percent of their lengths. Three high voltage transmission lines in adjacent corridors could decrease the reliability of the proposed Project. When facilities are close together, 1) there is a greater risk that a single event could take out multiple lines, and 2) repairing the lines could be more difficult, which could increase outage times, should an outage occur.

Costs that Depend on Design and Route. As the shortest alternative, he Proposed Blue Route would cost the least to build, but the Balsam Variation would cost the least per mile to build.

S.10.3.4 East Section: Dead Man's Pond Variation Area

The Dead Man's Pond Variation Area contains two route alternatives: the Proposed Blue Route and the Dead Man's Pond Variation.

Human Settlement. Because the Proposed Blue Route would impact fewer residences within 1,500 feet of the anticipated alignment (two residences compared to four residences for the Dead Man's Pond Variation), and would be slightly shorter (2.2 miles compared to 2.3 miles for the Dead Man's Pond Variation), it would be expected to have fewer impacts on aesthetics. Because both alternatives are relatively short and do not directly cross any sensitive aesthetic resources, aesthetic impacts would be expected to be limited.

The 200-foot ROW of the Proposed Blue Route would contain slightly less state fee land than the Dead Man's Pond Variation (19 acres compared to 37 acres, respectively) and would parallel a road/trail for a portion of its length (17 percent compared to zero percent, respectively). Therefore, the Proposed Blue Route would be slightly more compatible with existing land uses.

Land-Based Economies. The Proposed Blue Route would pass through fewer acres of farmland (20 acres of land designated as "prime farmland if drained" or "all areas are prime farmland" within the Proposed Blue Route ROW and 39 acres of land designated as "prime farmland if drained" or "all areas are prime farmland" within the Dead Man's Pond Variation ROW), including prime farmland, and would therefore likely have less impact on agriculture. No state **mineral lease** lands are located within the ROW of either alternative.

Archaeology and Historic Architectural Resources. Each alternative would have one historic architectural site within one mile of its anticipated alignment. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. There would be no PWI or non-PWI water crossings for either the Proposed Blue Route or the Dead Man's Pond Variation. Both alternatives would cross wetlands. The Proposed Blue Route would have more forested and shrub wetland (14 acres compared to four acres for the Dead Man's Pond Variation) and would require more wetland type conversion. Both the Proposed Blue Route and the Dead Man's Pond Variation would likely cross wetlands too large to span.

The Proposed Blue Route and the Dead Man's Pond Variation would pass through a similar amount of forested land and would therefore fragment similar amounts of intact forest and would likely impact similar amounts of wildlife habitat.

Rare and Unique Natural Resources. No state- or federally listed species have been documented within one mile of the Proposed Blue Route or the Dead Man's Pond Variation. However, the full extent of potential impacts from either the Proposed Blue Route or Dead Man's Pond Variation cannot be determined without pre-construction field surveys.

No rare communities been documented within the ROW of the Proposed Blue Route or the Dead Man's Pond Variation.

Corridor Sharing. The Proposed Blue Route would parallel existing road/trail corridors for 17 percent of its length, while the Dead Man's Pond Variation would not parallel any existing corridors.

Costs that Depend on Design and Route. While both alternatives are similar in length, the Proposed Blue Route would cost less to build and less per mile to build **due to such factors as differences in terrain and projected costs related to acquiring rights of way.**

S.10.3.5 East Section: Blackberry Variation Area

The Blackberry Variation Area contains two route alternatives: the Proposed Blue Route and the Proposed Orange Route.

Human Settlement. Although the Proposed Orange Route impacts more residences within 1,500 feet than the Proposed Blue Route (22 and 11 residences, respectively), it would impact slightly fewer historic

architectural sites within one mile (one and six sites, respectively) and would likely produce less contrast by paralleling an existing large transmission line for a greater percentage of its length (37 percent and 20 percent, respectively). The Proposed Orange Route is therefore likely to result in slightly fewer aesthetic impacts. A snowmobile trail is located within 1,500 feet of both alternatives.

The 200-foot ROW for the Proposed Orange Route would have a slightly greater amount of state fee land than the Proposed Blue Route (54 acres compared to 41 acres, respectively), but because it parallels more existing transmission line corridor, it would be slightly more compatible with surrounding land uses.

Land-Based Economies. The Proposed Blue Route would pass through less farmland, including prime farmland and would likely have less impact on agriculture (71 acres of land designated as "prime farmland if drained" or "all areas are prime farmland" within the Proposed Blue Route ROW and 88 acres of land designated as "prime farmland if drained" or "all areas are prime farmland" within the Proposed Orange Route ROW). Neither alternative would impact more than 15 acres of farmland of statewide importance. The Proposed Orange Route would likely have less impact on **expired/terminated state mineral lease lands (33 acres within the Proposed Orange Route ROW and 37 acres within the Proposed Blue Route ROW).**

Archaeology and Historic Architectural Resources. Neither the Proposed Blue Route nor the Proposed Orange Route would have any archaeological or historic architectural sites within the ROW. The Proposed Orange Route has fewer historic architectural sites within one mile than does the Proposed Blue Route (one compared to six sites, respectively). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route would cross the most PWI waters (three crossings compared to one crossing for the Proposed Blue Route), and both the Proposed Blue Route and the Proposed Orange Route would each cross a Minnesota Pollution Control Agency (MPCA)-listed impaired water once. All of these crossings would be spannable. The Proposed Blue Route would cross more forested and shrub wetlands (51 acres compared to 39 acres for the Proposed Orange Route), requiring more wetland type conversion. Both the Proposed Blue Route and the Proposed Orange Route would likely require crossing wetlands too large to span.

The Proposed Blue Route and the Proposed Orange Route would fragment similar amounts of intact forest and would likely impact similar amounts of wildlife habitat.

Rare and Unique Natural Resources. Two state-threatened vascular plants have been documented within one mile of the Proposed Blue Route and the Proposed Orange Route. In addition, a state-special concern bird has been documented within one mile of the Proposed Orange Route; however, preferred habitat for this species is also likely available within the vicinity of the Proposed Blue Route. Although the Proposed Blue Route is just under a mile shorter in length than the Proposed Orange Route, it would require creation of new corridor for a greater percentage of its length. The full extent of potential impacts on rare species from either the Proposed Blue Route or the Proposed Orange Route cannot be determined without pre-construction field surveys.

The Proposed Orange Route would pass through more MBS Sites of Biodiversity Significance (79 acres compared to 57 acres for the Proposed Blue Route), but it would also parallel an existing transmission line corridor through a portion of these sites, which would minimize impacts to this resource.

Corridor Sharing. The Proposed Orange Route would parallel existing transmission line corridor for 37 percent of its length. The Proposed Blue Route would parallel existing transmission line corridor for 20 percent of its length.

Electrical System Reliability. The Proposed Blue Route would parallel 230 kV and 115 kV transmission lines for approximately 20 percent of its length, and the Proposed Orange Route would parallel two 115 kV transmission lines for approximately 40 percent of its length. Three high voltage transmission lines in adjacent corridors could decrease the reliability of the proposed Project. When facilities are close together, 1) there is a greater risk that a single event could take out multiple lines, and 2) repairing the lines could be more difficult, which could increase outage times, should an outage occur.

Costs that Depend on Design and Route. As the shorter alternative, the Proposed Blue Route would cost less to build and less per mile to build **due to such factors as differences in terrain and projected costs related to acquiring rights of way.**

S.10.3.6 Relative Merits Summary—East Section

Effie Variation Area

The Effie Variation would have the most impacts on the aesthetics element of the human settlement factor because it would pass by the most residences; however, impacts would be moderated to some extent because it would parallel two existing transmission line corridors for most of its length. The Effie Variation may have more impacts on the archaeological and historic architectural resources factor, as it would cross sections identified as containing known archaeological sites and has the most historic architectural sites within one mile. The Effie Variation would have the most impacts on the water resources element of the natural environment factor because it would cross more water courses, including trout streams.

The Proposed Blue Route and the Proposed Orange Route may have more impact on the wildlife element of the natural environment factor because these alternatives would cross an Important Bird Area. These two alternatives may have the most impact on the federal and state listed species element of the rare and unique natural resources factor because they have the most NHIS records within one mile. These two alternatives also parallel minimal existing corridor, while the Effie Variation parallels existing corridor for most of its length. Because of its longer length, the Effie Variation would cost the most to construct.

The Applicant has indicated that paralleling an existing transmission line corridor (with two existing transmission lines) along the Effie Variation could reduce electric system reliability because three high voltage transmission lines would be in parallel corridors, which may increase vulnerability to simultaneous outages and increase safety risks associated with transmission line maintenance and repair.

East Bear Lake Variation Area

Similar to the Effie Variation, the East Bear Lake Variation in the East Bear Variation would parallel an existing transmission line corridor **for just under one-half of its length**, therefore reducing impacts to the elements of the natural environment factor and the rare communities element of the rare and unique resources factor by avoiding habitat fragmentation, and the MBS Sites of Biodiversity Significance in the Bear Wolf Peatland. Because of its slightly longer length and need for angle structures, the East Bear Lake Variation would be more expensive to construct than the Proposed Orange Route.

The Applicant has indicated that paralleling an existing transmission line corridor (with two existing transmission lines) along the East Bear Lake Variation could reduce electric system reliability because three high voltage transmission lines would be in parallel corridors, which may increase vulnerability to simultaneous outages and increase safety risks associated with transmission line maintenance and repair.

Balsam Variation Area

The Proposed Blue Route and Balsam Variation avoid impacts to the **aesthetics element of human settlement factor as they are located further from communities in Balsam and Lawrence townships and pass by fewer residences than the Proposed Orange Route.** The Proposed Orange Route would cost the most to construct.

The Balsam Variation would have more potential impacts to the mining and mineral resources element of the land-based economies factor as it **would cross more active and expired/terminated state mineral lease lands. The Balsam Variation may have more impacts on the archaeological and historic architectural resources factor, as it would cross a section identified as containing known archaeological sites and also has the most historic architectural sites within one mile.**

The Proposed Orange Route and the Balsam Variation may have the most impacts on the water resources element of the natural environment factor, as they would cross the most FEMA-designated floodplains, most of which are too large to span.

The Balsam Variation may result in fewer impacts to the **vegetation and wild life** elements of the natural resource factor as it would be **located in** an abandoned transmission line corridor for much of its length and may result in fewer impacts associated with new habitat fragmentation than the Proposed Blue Route or Proposed Orange Route.

The Applicant has indicated that corridor sharing along the Proposed Blue Route and Proposed Orange Route may reduce electric system reliability because it would place three high voltage transmission lines parallel along the same corridor, which may increase vulnerability to simultaneous outages and increase safety risks associated with transmission line maintenance and repair.

Dead Man's Pond Variation Area

Within the Dead Man's Pond Variation Area, the Dead Man's Pond Variation would create more potential impacts to the aesthetics element of the human settlement factor than the Proposed Blue Route by passing closer to **more residences. The Proposed Blue Route may have more impacts on the water resources element of the natural environment factor, as it would cross wetlands too large to span and would cross more shrub wetlands, resulting in more wetland type conversion.**

The Proposed Blue Route may result in fewer impacts to the **vegetation and wildlife** elements of the natural resource factor as it parallels a corridor for part of its length and may result in fewer impacts associated with new habitat fragmentation than the Dead Man's Pond Variation. Because it would likely require more angle structures, the Dead Man's Pond Variation would also be more expensive to construct.

Table 6-219 provides an overview of this relative merits assessment for the alternatives in the Dead Man's Pond Variation Area. **Appendix X provides the underlying data used in the color graphic determination for each alternative in each variation area. For more comprehensive information on the comparative environmental consequences for each variation area, see the appropriate sections in Chapter 6.**

Blackberry Variation Area

In the Blackberry Variation Area, the Proposed Orange Route would result in more impacts to the aesthetics element of the human settlement factor, as it would pass by more residences. In addition, the Proposed Orange Route is a slightly longer route and would likely require more angle structures than the Proposed Blue Route, so it would cost more to construct.

The Proposed Blue Route may have more impact on archaeological and historic resources, as there are more historic architectural sites located within one mile of the Proposed Blue Route than the Proposed Orange Route.

While both alternatives parallel existing transmission line corridor, the Proposed Orange Route parallels more corridor than the Proposed Blue Route.

The Applicant has indicated that corridor sharing along the Proposed Blue Route and Proposed Orange Route could reduce electric system reliability because three high voltage transmission lines would be in parallel corridors, which may increase vulnerability to simultaneous outages and increase safety risks associated with transmission line maintenance and repair.

S.10.4 Alignment Modifications

Minor adjustments to alternative route segments, or alignment modifications, were proposed during the scoping period. **No alignment modifications were provided during the Draft EIS comment period**. The purpose for each alignment modification is to avoid a specific issue raised by the commenters. In the sections that follow, only the issues that differ between the proposed route and the alignment modification are described.

S.10.4.1 West Section

No alignment modifications were proposed for the West Section.

S.10.4.2 Central Section

Four alignment modifications were proposed for the Central Section: Silver Creek WMA, Airstrip, Mizpah, and Gravel Pit.

Silver Creek WMA Alignment Modification. The Silver Creek WMA Alignment Modification, located in the north-central portion of the Pine Island Variation Area, shifts the centerline approximately 150 feet south onto state forest land and avoids impacts to federal land and the Silver Creek WMA. It does not, however, parallel an existing corridor like the Proposed Blue Route and would result in more fragmentation of intact state forest.

Airstrip Alignment Modification. The Airstrip Alignment Modification, located in the east portion of the C2 Segment Option Variation Area, shifts the centerline approximately 725 feet west to avoid impacts to a private airstrip located east of the existing 230 kV transmission line. This alignment modification would be located approximately 1,000 west of the existing 230 kV transmission line and would provide additional distance for use of the landing strip.

Mizpah Alignment Modification. The Mizpah Alignment Modification, located in the J2 Segment Option Variation Area, would shift the centerline north from a mix of private and state lands onto only state lands. Both the Proposed Orange Route and this alignment modification would require creation of new corridor for their entire length and would fragment intact forest.

Gravel Pit Alignment Modification. The Gravel Pit Alignment Modification, located in the southeast portion of the J2 Variation Area, shifts the centerline approximately 750 feet east to avoid impacts to a private gravel pit and to remove privately-owned land from the ROW. In addition, the Effie dump would be located more than 100 feet west and outside of the ROW.

S.10.4.3 East Section

Five alignment modifications were proposed for the East Section: Bass Lake, Wilson Lake, Grass Lake, Dead Man's Pond, and Trout Lake.

Bass Lake Alignment Modification. The Bass Lake Alignment Modification, located in the central portion of the Effie Variation Area, shifts the centerline approximately 750 feet southwest and away from the Bass Lake Itasca County Park (which includes a campground). This would, however, shift the alignment closer to the Larson Lake State Forest campground and crosses lands designated as Outstanding Rank for the Preliminary MBS Sites of Biodiversity Significance. Land ownership includes slightly more state land and less private corporate land than the Proposed Blue/Orange Route.

Wilson Lake Alignment Modification. The Wilson Lake Alignment Modification, located in the central portion of the Effie Variation Area, shifts the centerline approximately 500 feet east from corporate and state forest lands onto an alignment with a greater percentage of state forest land and crosses lands designated as Moderate Rank for the Preliminary MBS Sites of Biodiversity Significance.

Grass Lake Alignment Modification. The Grass Lake Alignment Modification, located in the northeast portion of the Balsam Variation Area, shifts the centerline approximately 900 feet east to avoid crossing Grass Lake. In addition, this alignment modification also shifts the transmission line away from one residence on the south end of Grass Lake, but shifts the alignment closer to six residences on the west side of Bray Lake.

Dead Man's Pond Alignment Modification. The Dead Man's Pond Alignment Modification, located in the central portion of the Dead Man's Pond Variation Area, shifts the centerline approximately 1,000 feet west and away from one residence located near County State Aid Highway 8, but shifts the alignment closer to two residences located along County State Aid Highway 57. It also crosses Dead Man's Pond, a PWI waterbody, and lands designated as Moderate Rank for the Preliminary MBS Sites of Biodiversity Significance.

Trout Lake Alignment Modification. The Trout Lake Alignment Modification, located in the central portion of the Blackberry Variation Area, shifts the centerline away from two residences located west of the Proposed Blue Route, leaving only one residence located within 1,000 feet to the southeast.

S.10.5 Hops

Five Hops, all located within the West Section, were identified for the proposed Project.

Hop 1. Hop 1, located in the southeastern portion of the Cedar Bend WMA Variation Area and the northwestern corner of the Beltrami North Central Variation Area, is approximately 0.7 miles. It crosses the existing 500 kV transmission line and either shrub or forested wetlands and MBS Sites of Biodiversity Significance ranked as high or moderate significance.

Hop 2. Hop 2, located in the southeastern portion of the Cedar Bend WMA Variation Area and the northwestern corner of the Beltrami North Central Variation Area, is approximately 1 mile. This hop, which parallels an existing 230 kV transmission line for its entire length, crosses Lake of the Woods and Beltrami Island state forests and both shrub or forested wetlands and MBS Sites of Biodiversity Significance ranked as high or moderate significance.

Hop 3. Hop 3, located in the southeastern portion of the Cedar Bend WMA Variation Area and the northwestern corner of the Beltrami North Central Variation Area, is approximately 1.2 miles. It crosses the existing 500 kV transmission line and either shrub or forested wetlands and MBS Sites of Biodiversity Significance ranked as high or moderate significance.

Hop 4. Hop 4, located in the eastern portion of the Beltrami North Variation Area and the northwestern corner of the Beltrami North Central Variation Area, is approximately 1 mile. This hop does not cross any existing transmission lines, but it does cross either shrub or forested wetlands and MBS Sites of Biodiversity Significance ranked as high significance.

Hop 5. Hop 5, located in the southwestern portion of the Beltrami North Central Variation Area, is approximately 3.5 miles. This hop crosses Lake of the Woods and Beltrami Island state forests, the Border Trails snowmobile trail and an unnamed watercourse. It also crosses the existing 500 kV transmission line, emergent, shrub, or forested wetlands and MBS Sites of Biodiversity Significance ranked as high or unknown significance.

S.10.6 Associated Facilities

The associated facilities for the proposed Project include **the proposed 500 kV Series Compensation Station, proposed regeneration stations, and proposed Iron Range 500** kV Substation.

S.10.6.1 West Section

The associated facilities located in the West Section include two regeneration stations and the proposed 500 kV Series Compensation Station.

Proposed Regeneration Stations. The two proposed regeneration stations located along the Proposed Blue/Orange Route within the West Section are both situated in upland areas, one with a residence within 0.6 miles and the other with a residence within 0.13 miles. Land in both cases is privately owned.

Proposed 500 kV Series Compensation Station. The nearest residence to the 60-acre site for the proposed 500 kV series compensation station is located approximately 0.4 miles away. Land ownership includes private land with MnDNR-identified potential mineral resources and scattered emergent wetlands. Based on the United States Geological Survey (USGS) National Landscape Conservation System (NLCS) Gap Analysis Program (GAP) data, the southern half of the site is in the U.S. Department of Agriculture (USDA)-Farm Service Agency Conservation Reserve Program. The compensation station could contrast strongly with its surroundings and could be viewed from residences or other sensitive visual resources.

S.10.6.2 Central Section

The associated facilities located in the Central Section include the four proposed regeneration stations.

Proposed Regeneration Stations. The four regeneration stations consist of fairly small buildings and although they may contrast somewhat with their surroundings, the new transmission line nearby would produce stronger contrast and be more dominant due to its substantially taller height and contrasting form. For these reasons, aesthetic impacts of the regeneration stations would be expected to be minimal.

S.10.6.3 East Section

The associated facilities located in the East Section include the two proposed regeneration stations and the proposed **Iron Range** 500 kV Substation.

Proposed Regeneration Stations. Both regeneration stations would be located in upland areas, one with a residence located 0.4 miles away, and the Big Fork River 0.5 miles away. The other would have a residence 0.2 miles away.

Proposed **Iron Range** 500 kV Substation. The proposed substation would be located approximately 0.25 miles east of the existing Blackberry Substation, with three residences located within a quarter mile. The fenced area of the substation directly impacts 0.3 acres of a shallow marsh/forested wetland complex, but wetlands south of the fenced substation site would not be impacted by the proposed Project. No other natural resources were identified within or near the fenced substation area.

Because the proposed **Iron Range 500 kV** Substation would be visible in the same views from surrounding locations, the addition of the proposed substation adjacent to the existing substation and transmission lines would result in only an incremental increase in contrast for these views, and the aesthetic impacts of the **proposed Iron Range 500** kV Substation would be expected to be minimal.

S.11 Cumulative and Other Impacts

In addition to analyzing the individual impacts of the alternatives, the federal environmental review process requires consideration of the cumulative environmental impacts of multiple actions within an area.

S.11.1 Other Actions Considered for Potential Cumulative Impacts

Past actions are considered part of the existing environment and are not considered here.

Present and Reasonably Foreseeable Future Actions. One power plant and the associated transmission line and natural gas pipeline (Excelsior Energy's Mesaba Project) and one 230 kV transmission line (Minnesota Power's Nashwauk Project) have been issued route permits by the MN PUC but have not yet been constructed. Sections of the approved routes for both of these projects are within the Applicant's proposed routes. In addition, as part of the route permit process for the proposed Enbridge Sandpiper oil pipeline project, the MN PUC has included one route for consideration that would cross alternatives for the proposed Project ROW. The proposed Enbridge Line 3 project, another oil pipeline, would parallel the same route as the proposed Enbridge Sandpiper project, also crossing portions of the proposed Project ROW alternatives.

Iron-ore mining from previously developed stockpiles, basins, underground workings, or open pits ("scram" mining) would be within four to six miles of the proposed routes and variations, and one variation would cross a 115 kV transmission line that serves one of the scram mining facilities.

S.11.2 Cumulative Impacts

The following sections summarize the resources that were analyzed for potential impacts in Chapter 6 of this EIS.

S.11.2.1 Human Settlement

Aesthetics. Though many of the aesthetic impacts of the proposed Project would be short-term during construction, the presence of transmission structures in the landscape and clearing the ROW of trees would result in a long-term change in local aesthetics. In addition, utilities paralleling existing corridors can cumulatively create wide, long areas of visual disturbance.

The reasonably foreseeable future projects mentioned above are all in the Balsam and Blackberry variation areas where there are more population centers, infrastructure, and mining activity. The Sandpiper Pipeline RA-06 route, if selected, and the Enbridge Line 3 project would intersect the Proposed Blue/Orange Route, but would be located underground and would cross the 200-foot ROW for the proposed Project. The potential cumulative aesthetic impacts in this area would be expected to be minimal because they would only involve paralleling transmission lines for approximately nine miles, and this infrastructure would not be incompatible with existing conditions.

Air Quality, Greenhouse Gas Emissions, and Climate Change. Construction activities for the proposed Project and other reasonably foreseeable future projects would generate criteria pollutant emissions, but these would be short-term and localized. The proposed Project would reduce indirect criteria pollutants and GHGs because it would reduce the need for coal-fired generation in Minnesota by replacing it with wind and hydroelectric generation (for detailed information on air quality, see Section 5.2.1.3).If the large electric power generating plant for the Mesaba Energy project were built, it would result in long-term emissions from operations. None of the reasonably foreseeable future projects individually or cumulatively, however, would contribute to air emission impacts because the projects would be in attainment for all NAAQS.

Socioeconomics. If all the reasonably foreseeable future projects mentioned above were constructed at the same time, there would be a cumulative socioeconomic benefit, primarily in the form of short-term construction employment, value-added services, and long-term revenue from taxes. The proposed Project would employ an average of 120 construction workers annually during the five year construction period, and during the pre-construction and construction phases would generate approximately $26.5 million dollars in state and local taxes.

The Mesaba Energy Project, if constructed, would also employ 1,600 during its peak year of construction, plus create another 955 new jobs through increased consumer spending. The Enbridge Sandpiper pipeline project and the Enbridge Line 3 project would also create new employment during construction in the area, and could contribute to a temporary housing shortage in the area all these projects were to be constructed at the same time. Because Grand Rapids is within commuting distance of the construction area of these reasonably foreseeable future projects, any housing shortage would be expected to be minimal.

In addition, the proposed Project would benefit the entire MISO footprint, by reducing wind curtailments and better using both wind and hydro resources, thereby increasing the efficiency of the energy supply system as a whole. MISO estimated that these benefits, over a 20-year period, would total $1.6 billon based on 2012 dollars.

S.11.2.2 Land-Based Economies

Agriculture. The proposed Project and other reasonably foreseeable future projects, could cumulatively increase impacts on agriculture. However, these cumulative impacts to agriculture would only occur in the Balsam and Blackberry variation areas; since farmland is not common in these variation areas, adverse cumulative impacts would be expected to be minimal.

Forestry. The proposed Project and other reasonably foreseeable future projects could collectively result in adverse, localized cumulative impacts to forestry and timber operations. The cumulative impacts of the foreseeable projects would, however, occur in the southern portion of the Balsam Variation Area and the Blackberry Variation Area, where there are fewer areas of state forests and state fee lands. The cumulative impacts to forestry and timber operations from the reasonably foreseeable future projects are therefore expected to be minimal.

Mining and Mineral Resources. The Proposed Blue Route and the transmission line and pipeline routes for the Mesaba Energy project all cross one area of known mineral resources in the north portion of the Blackberry Variation Area. Route RA-06 for the Enbridge Sandpiper pipeline project and the Enbridge Line 3 project also would cross through areas with known mineral resources. If all of these projects were eventually constructed, they might all need to be relocated in the future in order to access that mineral resource area. **The Balsam Variation would also cross known mineral resources leased by the MnDNR and would potentially encumber the lease.**

According to the Applicant, the proposed Project is needed in part to meet increased industrial and mining electricity demand, especially on the Iron Range. The proposed Project would also facilitate recent contracts for firm power sales from Manitoba Hydro to the Wisconsin Public Service Corporation. The potential indirect, cumulative impacts of the proposed Project on mining development and the related environmental impacts are too remote and speculative to evaluate meaningfully.

S.11.2.3 Archaeology and Historic Architectural Resources

Indirect, long-term, adverse visual effects on architectural resources are likely to occur wherever the cumulative projects are visibly prominent and appear inconsistent with other architectural resources. Since this would mainly occur in a developed area, none of the cumulative projects would be expected to be inconsistent with other architectural resources.

As the proposed routes and variations have not been surveyed, cultural resource assessments are required to comply with federal and/or state regulations.

S.11.2.4 Natural Resources

Water Resources. The long-term impacts of removing woody wetland vegetation and maintaining herbaceous wetland vegetation in the ROWs of all cumulative projects would result in adverse impacts to wetland hydrology, vegetation composition, and wetland function. Adverse cumulative wetland impacts would be expected to be minimal given the amount of surrounding forested and shrub wetlands in the region. The Applicant for the proposed Project and other reasonably foreseeable future project proponents would need to mitigate wetland impacts as part of permit negotiations for their individual projects.

Vegetation. Permanently removing trees and shrubs along project ROWs could result in cumulative impacts if these reasonably foreseeable future projects are constructed close to one another and do not minimize impacts through paralleling existing corridors.

Wildlife. Clearing vegetation and trees and disturbing wildlife habitats could physically harm or displace wildlife species. In addition, indirect impacts such as disturbance related to construction noise could occur. For non-listed wildlife species, these impacts would be minimal because these species do not suffer from population level declines, and these impacts would be localized and there would be abundant forested habitat in the vicinity.

S.11.2.5 Rare Species and Communities

Rare Species. The proposed Project, when considered with any other reasonably foreseeable future project that could involve removing trees, could contribute to cumulative impacts on the northern long-eared bat, which relies on forested habitat for roosting. Cumulative impacts could also be detrimental to individual rare vascular plant communities, although some rare vascular plant species colonize disturbed areas and could benefit from new habitat created as a result of ground disturbance from multiple projects. A Biological Assessment is being prepared and consultation with the USFWS is on-going. Avoidance, minimization, and mitigation measures for federally listed species will need to be coordinated with the USFWS in compliance with the ESA.

Rare Communities. Permanently removing trees and shrubs along project ROWs could result in cumulative impacts if reasonably foreseeable future projects are constructed close to one another and do not minimize impacts through paralleling existing corridors.

S.11.3 Adverse Impacts that Cannot Be Avoided

Despite minimization and mitigation efforts, some project impacts cannot be avoided. Unavoidable adverse effects related to the proposed Project construction would last only as long as the construction period and would include: soil compaction, erosion, and vegetation degradation; disturbance to and displacement of some species of wildlife; disturbance to nearby residences; traffic delays in some areas; and minor air quality impacts due to fugitive dust.

Unavoidable adverse effects related to the proposed Project that would last at least as long as the life of the proposed Project would include: the addition of transmission structures and lines to the visual landscape; habitat type changes and fragmentation; adverse impacts to wildlife and wildlife habitat due to project-related changes to wetland type (palustrine forested (PFO) and palustrine shrub (PSS) to palustrine emergent (PEM) and the removal of other vegetation; and direct adverse impacts to wildlife as a result of avian collisions.

S.11.3.1 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitments of resources refer to impacts on or losses of resources that cannot be reversed or recovered, even after an activity has ended. Irreversible commitment applies primarily to nonrenewable resources, such as minerals or cultural resources, and to those resources that are renewable only over long time spans, such as soil productivity. Irretrievable commitment applies to the loss of production, harvest, or natural resources.

S.11.3.2 Rare Species

Activities involving heavy machinery could result in the direct mortality of individual listed species. The loss of an individual of a protected species would be adverse, but is not expected to have irreversible or irretrievable impacts on the species as a whole. A Biological Assessment is being prepared and consultation with the USFWS is on-going. Avoidance, minimization, and mitigation measures for federally listed species will need to be coordinated with the USFWS in compliance with the ESA.

S.11.3.3 Wetland Type Conversion

Removing woody vegetation within forested or shrub wetlands would convert these areas to a different vegetation community and wetland type. This would be considered an irretrievable and irreversible impact because the area would be continuously managed in an emergent, herbaceous state for the life of the project.

S.11.3.4 Other

Materials, energy, landfill space, and human resources irretrievably used to construct the proposed Project are not in such short supply as to be meaningful.

1.0 Introduction and Regulatory Framework

On April 15, 2014, Minnesota Power, a regulated utility division of ALLETE, Inc. (Applicant) applied to the U.S. Department of Energy (DOE) for a Presidential permit to construct, operate, maintain, and connect an approximately 220-mile long, 500-kilovolt (kV) overhead, single-circuit, alternating current (AC) electric transmission system crossing the international border between the Canadian Province of Manitoba and Roseau County, Minnesota. On the same date, the Applicant also applied to the Minnesota Public Utilities Commission (MN PUC) for a Route Permit under the Minnesota Power Plant Siting Act (PPSA). The proposed transmission line would run from the Applicant's proposed international border crossing in Roseau County, Minnesota to the **new Iron Range 500 kV** Substation near Grand Rapids, Minnesota.

On October 29, 2014, the Applicant submitted an amendment to their Presidential permit and Route Permit applications to DOE and the MN PUC, respectively, for the proposed Great Northern Transmission Line (GNTL) Project (proposed Project). The amended Presidential permit application changed the location of the proposed international border crossing under DOE's consideration **approximately 4.3 miles to the east to cross the U.S./Canadian border at latitude 49° 00' 00.00" N and longitude 95° 54' 50.49" W, which is approximately 2.9 miles east of Highway 89 in Roseau County.**[11] The proposed Project, as amended, is described in detail below in Chapter 2.

In addition to the federal Presidential permit and the state Route Permit, the proposed Project will require a variety of state, federal, and local permits. **In May 2015, the MN PUC granted a certificate of need to the Applicant for the proposed Project.** This chapter of the Environmental Impact Statement (EIS) summarizes these permits, the joint federal and state EIS process, and the responsible regulatory agencies

DOE is acting as federal joint lead agency with the Minnesota Department of Commerce-Energy Environmental Review and Analysis (DOC-EERA) acting as state joint lead agency per 40 Code of Federal Regulations (CFR) 1501.5(b). In order to avoid duplication with state environmental review procedures, DOE and Minnesota Department of Commerce—Energy Environmental Review and Analysis (DOC-EERA) have prepared a single EIS to comply with environmental review requirements under National Environmental Policy Act (NEPA) and the Minnesota PPSA.

11 Available at: http://www.greatnortherneis.org/Home/documents.

1.1 Organization of this EIS

This joint federal/state EIS analyzes the environmental impacts of the proposed Project, a range of reasonable action alternatives, and the No Action alternative. The EIS is organized into the following eight chapters, followed by appendices.

Chapter 1 – Regulatory Framework: Describes the regulatory framework associated with the proposed Project, including the purpose and need for agency action, major federal permits (including the U.S. DOE Presidential permit), federal consultation requirements, state permitting requirements (including the MN PUC Route Permit), other state and local permits, and a summary of agencies, tribes, and persons consulted.

Chapter 2 – Proposed Project: Describes the project as proposed by the Applicant including proposed routes, structures, objectives, route selection process, estimated costs, and proposed schedule. Chapter 2 also describes the Applicant's engineering, design, and construction plans, land acquisition processes, and Applicant proposed measures to avoid and minimize environmental impacts.

Chapter 3 – No Action Alternative: Describes the "No Action alternative," in which the DOE would not issue a Presidential permit and the proposed Project would not be built. The analysis of the No Action alternative summarizes the impacts of not constructing the project and provides a baseline for analyzing and comparing potential environmental impacts from DOE's proposed action and alternatives.[12]

Chapter 4 – Route and Alignment Alternatives Proposed during Scoping: Describes the four border crossing alternatives, 22 route variations, and nine alignment modifications that were proposed by agencies and the public during scoping. Chapter 4 also summarizes the process used by DOE in coordination with the DOC-EERA to jointly determine which border crossings and routes to include in the scope of this EIS. Chapter 4 also describes how the selected routes, route variations, and alignments are analyzed by dividing the 220-mile long project area into the three major sections: the West Section, the Central Section, and the East Section.

Chapter 5 – Affected Environment and Potential Impacts: Describes the affected environment for the proposed Project, including descriptions of each resource, the region of influence (ROI)

12 Potential alternative means of meeting the Applicant's objectives, however, are addressed in the separate State of Minnesota's certificate of need process.

of the proposed Project on the resource, and impacts expected from the construction, operation, maintenance, and connection of the proposed Project. Chapter 5 first describes the impacts of the proposed Project that are common to all geographic sections and do not vary by route or route variation. Chapter 5 then describes the resources that do vary by geographic section and for which impacts vary by route and route variation—the impacts and resources are carried forward for detailed analysis and comparison in Chapter 6.

Chapter 6 – Comparative Environmental Consequences: Presents detailed analysis and comparison of the potential human and environmental impacts of the proposed Project and alternative route variations, and describes mitigation measures by geographic section, route, and route variation.

Chapter 7 – Cumulative and Other Impacts: Describes reasonably foreseeable projects in the proposed Project area and assesses impacts of the proposed Project in the context of these reasonably foreseeable projects along with other past and present projects in the same area. Chapter 7 also describes unavoidable, irretrievable, and other impacts as required by federal and state regulations.

Chapter 8 – List of Preparers: Provides a list of the preparers of this EIS.

Chapter 9 – References: Provides references for resources used in development of this EIS.

Chapter 10 – Acronyms and Abbreviations: Lists of the acronyms and abbreviations used in this EIS.

Chapter 11 – Index: Provides an index of terms used in this EIS.

Appendices – Provide information to support the analysis in this EIS:

- **Appendix A** – Tribal Consultations: Provides documentation of and correspondence for the DOE's government-to-government consultation under Section 106 of the National Historic Preservation Act (NHPA) and in accordance with Executive Order 13175.
- **Appendix B** – Route Permit Generic Template and Example: Provides MN PUC's generic Route Permit template and an example of a Route Permit recently issued by the MN PUC, which include a permitted route and anticipated alignment, as well as standard and special conditions specifying construction and operation standards.
- **Appendix C** – Narrative of the Scoping Summary Report: Provides the narrative from the EIS Scoping Summary Report summarizing the joint scoping process and associated public and agency comments provided during the public scoping period for the proposed Project.
- **Appendix D** – DOC-EERA Scoping Decision: Provides the DOC-EERA scoping decision issued for this EIS on January 8, 2015.
- **Appendix E** – Route Analysis Data Tables: Provides detailed data for the right-of-way (ROW), route, and ROI for the proposed routes and variations analyzed in this EIS.
- **Appendix F** – Rare Species Data Tables: Provides detailed Minnesota Department of Natural Resources (MnDNR) Natural Heritage Information System rare species data for the ROW, route, and ROI for the proposed routes and variations analyzed in this EIS.
- **Appendix G** – Rare Communities Data Tables: Provides detailed Minnesota Biological Survey native plant community rare communities data for the ROW, route, and ROI for the proposed routes and variations analyzed in this EIS.
- **Appendix H** – Noise Supplement: Provides terminology and regulations for noise and project-specific noise information.
- **Appendix I** – Applicant's Audible Noise and EMF Calculations: Provides the Applicant's modelling results for audible noise, electric and magnetic field (EMF), and corona effects from the proposed Project.
- **Appendix J** – Property Values Supplement: Provides information and literature regarding the effect of transmission lines on property values.
- **Appendix K** – EMF Supplement: Provides information regarding EMFs.
- **Appendix L** – Stray Voltage Supplement: Provides information regarding stray voltage.
- **Appendix M** – MPCA What's In My Neighborhood Sites: Provides a list of sites in the proposed Project area identified by the Minnesota Pollution Control Agency (MPCA) program – What's In My Neighborhood" – that may have environmental permits or registrations, or are potentially contaminated sites.
- **Appendix N** – Photo Simulations: Provides photo simulations developed for sensitive viewsheds identified in public comments

during the public scoping period for the proposed Project.

- **Appendix O** – Agricultural Impact Mitigation Plan (AIMP) Example: Provides an example of a AIMP prepared for a high-voltage transmission line project.
- **Appendix P** – Cultural Resources **Consultations and Report:** Provides the Phase IA cultural resources survey report for the proposed Project.
- **Appendix Q** – USFWS and DOE Section 7 Consultation: Provides the USFWS letter initiating informal consultation with the DOE under Section 7(a)(2) of the Endangered Species Act (ESA) for the proposed Project.
- **Appendix R** – Biological Assessment: Provides the report which reviews the proposed Project in sufficient detail to determine if the proposed action may affect any federally threatened or endangered species and/or critical habitat.
- **Appendix S** – Detailed Map Books: Provides maps with detailed information for the ROWs and routes for the proposed routes and variations discussed in this EIS.
- **Appendix T** – NEPA Disclosure Statements: Provides signed copies of the NEPA Disclosure Statements.
- **Appendix U – USFWS Recommended Route: Provides the USFWS recommended route.**
- **Appendix V – Draft Programmatic Agreement (PA): Provides the draft Programmatic Agreement as part of the Section 106 Consultation.**
- **Appendix W – Air Emission Technical Memorandum: Provides the air quality analysis for construction emissions requested by the U.S. Environmental Protection Agency (EPA).**
- **Appendix X – Relative Merits Table: Provides the details for the tables at the end of Sections 6.2.6 (West Section), 6.3.6 (Central Section), and 6.4.6 (East Section) of this EIS. These tables provide the information on the 14 factors (identified in Minnesota Rules, part 7850.4100) that the Minnesota Public Utilities Commission must take into account when making a decision on a Route Permit.**
- **Appendix Y – Comment Response Document: Provides the public comments received on the Draft EIS and DOE and DOC-EERA's responses to those comments.**
- **Appendix Z – EIS Distribution List: Provides a list of the 14 local libraries where the EIS is available for public review.**

1.2 Federal Permits, Approvals, and Consultations

1.2.1 United States Department of Energy – Presidential permit

Transmission lines that cross an international border require a Presidential permit from the DOE.[13] DOE's National Electricity Delivery Division, in the Office of Electricity Delivery and Energy Reliability (OE), is responsible for issuing Presidential permits for electric transmission facilities. Before issuing a Presidential permit for the construction, operation, maintenance, or connection of facilities for the transmission of electric energy at the U.S. international border, DOE must determine that such a permit is consistent with the public interest and must obtain favorable recommendations from the Secretary of State and the Secretary of Defense.[14]

1.2.1.1 Factors Considered

In determining consistency with the public interest, DOE considers the potential environmental impacts of the proposed Project under the NEPA, determines the Project's impact on electric reliability (including whether the proposed Project would adversely affect the operation of the U.S. electric power supply system under normal and contingency conditions), and considers any other factors that DOE may find relevant to the public interest. In making its reliability determination, DOE considers the operation of the electrical grid with a specified maximum amount of electric power transmitted over the proposed transmission line. DOE will review the interconnection studies conducted by the Applicant and the Midcontinent Independent System Operator (MISO) to determine whether a reliability finding should be issued for the proposed Project. The regulations implementing DOE's Presidential permit program have been codified at 10 CFR Part 205. DOE's issuance of a Presidential permit indicates that there is no federal objection to the proposed international border crossing and project, but does not mandate that the project be undertaken.

13 Pursuant to Executive Order (EO) 10485 of 1953, as amended by Executive Order 12038, and 10 Code of Federal Regulations (CFR) Section 205.320.

14 Executive Order 10485, Section 1.

Table 1-1 Major Federal Authorizations

Issue	Authorization	Jurisdiction
Construction and water quality	Section 10 Permit	U.S. Army Corps of Engineers (USACE)
	Section 404 Permit	USACE
	Section 402 National Pollutant Discharge Elimination System (NPDES) Permit (assigned to state of Minnesota)	EPA/MPCA
Land use and natural resources	Special Use Permit Right-of-way (ROW) Grant Right-of-way permit to cross USFWS Interest Lands	U.S. Forest Service (USFS); U.S. Bureau of Land Management (BLM) USFWS
	Potential "take" permit under Bald and Golden Eagle Protection Act of 1972 Potential Biological Opinion "incidental take statement" pursuant to ESA if a listed species may be affected	USFWS
Transportation and safety	Permit to Cross Federal Aid Highway	U.S. Federal Highway Administration (FHWA)
	Obstruction Evaluation	Federal Aviation Administration (FAA)

1.2.2 DOE Purpose of and Need for Agency Action

The purpose of and need for DOE action is to decide whether to or not to grant the Applicant a Presidential permit. If granted, the Presidential permit for the U.S. portion of the proposed Project (OE Docket Number PP-398) would authorize the Applicant to construct, operate, maintain, and connect the U.S. portion of the proposed Project that would cross the international border between the U.S. and Canada. **If granted, there would be no expiration date for the Presidential permit.**

DOE does not, however, determine the underlying need for or the route of the proposed transmission line. These two decisions are the responsibility of the MN PUC. Therefore, portions of this EIS pertain solely to the DOE's determination; other portions pertain solely to the MN PUC's determination, while some portions pertain to both the federal and state processes.

1.2.2.1 DOE's Proposed Federal Action

DOE's preferred alternative is to grant a Presidential permit to Minnesota Power's proposed international border crossing at latitude 49° 00' 00.00" N and longitude 95° 54' 50.49" W, roughly 2.9 miles east of Highway 89 in Roseau County, Minnesota.

If the MN PUC issues a permit for a route with a different border crossing than that currently requested by the Applicant, the Applicant could submit an amended Presidential permit application to DOE that is consistent with the MN PUC route permit decision. DOE would then need to decide what, if any, further environmental review would be necessary, and whether to grant a Presidential permit for the proposed Project at the amended border crossing.

1.2.3 Other Federal Approvals

In addition to the Presidential permit, the proposed Project requires other federal permits, approvals, and decisions before construction and operation can begin. These permits and approvals are listed in Table 1-1. The two formal federal consultations required (Section 106 of NEPA and and Endangered Species Act (ESA), Section 7) are summarized in Section 1.2.4.

The Applicant is working with federal agencies to obtain these potentially necessary authorizations and/or to comply with the regulations listed below.

Section 10 of the Rivers and Harbors Act of 1899 Permit – USACE regulates impacts on navigable waters of the U.S. pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. Section 403). USACE classifies the Big Fork River as a navigable water of the U.S. and the Applicant will apply for a Section 10 permit to allow the proposed Project to cross it.

Section 404 of the Clean Water Act Permit – USACE regulates discharges of dredged or fill material into waters of the U.S. under Section 404 of the Clean Water Act (33 U.S.C. Section 1344). The Applicant has held multiple pre-application conferences with the USACE and will apply for a Section 404 permit. The Applicant has also

coordinated prospective wetland compensatory mitigation plans with the USACE.

Section 402 of the Clean Water Act Permit – EPA requires a construction discharge permit; federal authority is assigned to the MPCA. Additional details are provided in Section 1.3.

Special Use Permit, ROW Grant, or Easement – USFWS and USFS require a Special Use Permit or a ROW Permit/Easement if the proposed Project crosses land under their jurisdictions. USFWS and USFS are authorized but not required to issue land use grants for transmission lines per Section 503 of Federal Land Policy and Management Act of 1976 and individual agency regulations. USFWS requires a transmission line ROW permit to cross USFWS Interest Lands. USFWS general authority for granting ROW permits is the National Wildlife Refuge System Administration Act (16 U.S.C. 668dd(d)). Regulations covering the granting of permits for ROW across USFWS Interest Lands (including easements) are promulgated in 50 CFR 29.21 and 29.22. The U.S. Department of Agriculture (USDA) oversees special use permits for the USFS under 36 CFR 214 Subpart B. The Applicant will work with these agencies to obtain the required permit if a crossing is required.

Bald and Golden Eagle Protection Act – USFWS oversees compliance with the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), which prohibits anyone from "taking" (including disturbance) birds, nests, or eggs without a permit from the Secretary of the Interior. The Applicant is working with USFWS to avoid, minimize, and mitigate potential impacts to bald eagles. Golden eagles are non-breeding residents throughout Minnesota, so may occur in the proposed Project area.[15] Currently no take permit exists for the eastern population of golden eagles, so take will need to be completely avoided through applicant proposed mitigation measures.

Permit to Cross Federal Aid Highway – Transmission lines that cross a federal highway require a use and occupancy agreement. (23 CFR Section 645.213). The Applicant is working with the MnDOT, which is responsible for administering the agreements, to obtain the required approvals.

FAA Obstruction Evaluation – FAA requires proponents of projects that may affect navigable airspace to notify the Administrator of the FAA by filing a Notice of Proposed Construction or Alteration (FAA Form 7460-1) per 14 CFR Section 77.9. The FAA conducts aeronautical studies based on information provided by proponents on an FAA Form 7460-1 to protect air safety and the efficient use of the navigable airspace.

15 Available at: http://www.sdakotabirds.com/species/maps/golden_eagle_map.htm

Table 1-2 Federal Consultations

Consultation	Jurisdiction
Section 106 Consultation	DOE in consultation with Minnesota State Historical Society(SHPO) and Tribal Historic Preservation Offices (THPOs)
ESA Section 7 Consultation	USFWS

1.2.4 Federal Consultations

Prior to issuing the Presidential permit, the DOE must also complete formal consultations with state, tribal, or federal agencies, shown in Table 1-2.

1.2.4.1 Section 106 of the National Historic Preservation Act (NHPA)

Section 106 of NHPA (16 U.S.C. 470) requires that federal agencies take into account the potential effects of their proposed actions (undertakings) on historic architectural properties, and to develop measures to avoid, minimize, or mitigate any adverse effects.[16] NHPA also requires federal agencies to consult with Indian Tribes that may be affected by the proposed Project, the SHPO, and other appropriate parties as defined in 36 CFR Section 800.2. DOE and USACE have developed a Memorandum of Understanding that, among other things, designates DOE as the lead agency implementing Section 106 compliance for the proposed Project. DOE requested initiation of Section 106 Consultation under the NHPA for the proposed Project in a November 19, 2014, letter to the Minnesota SHPO. DOE also notified the Advisory Council on Historic Preservation (ACHP) about DOE's intent to develop a Programmatic Agreement (PA) for a phased approach for Section 106 identification and evaluation efforts under 36 CFR Section 800.14, and asked for ACHP's participation as a consulting party. The ACHP accepted this invitation in a March 26, 2015 letter to DOE. **The Draft PA is provided in Appendix V**. DOE invited all potential Section 106 Consulting Parties, including Indian tribes, via email and letter on January 14-15, 2015, to participate in consultation over historic architectural properties and traditional cultural resources that may be affected by the

16 Section 106 of the National Historic Preservation Act (NHPA), 16 United States Code Section 470f, and its implementing regulations, 36 CFR Sections 800.1–800.16

proposed undertaking.[17] Section 106 consultation efforts for the proposed undertaking are on-going **and consultation records are provided in Appendix A and P. It is anticipated that the PA will be signed before the Record of Decision is issued.**

As proposed, the proposed Project would not cross tribal reservation lands; however, each route could have the potential to affect cultural resources of significance to tribes. For example, some tribes and tribal members consider eagle nests sacred sites provided for in the American Indian Religious Freedom Act (42 U.S.C. 1996) (some are frequently referred to as traditional cultural properties (TCPs)), and as potential historic properties of religious and cultural importance under the NHPA. Such sites are not limited to currently-recognized Indian lands, and they occur across the entire aboriginal settlement area. In addition, some tribes may consider all eagles and eagle nests as TCPs or sacred sites, and potential historic properties of religious and cultural significance which must be considered under Section 106 of NHPA.

DOE initiated its government-to-government tribal consultation efforts in a June 27, 2014 letter to potentially affected tribes, and held consultation meetings July 15 and 22, 2014 in the proposed Project area in northern Minnesota. DOE held further tribal consultation meetings on March 24-26, 2015 in Prior Lake, Minnesota in support of its on-going efforts to identify archaeological sites, historic architectural structures, and any other properties or resources of traditional religious and cultural importance to tribes and known to occur in or near the proposed Project area (Appendix A). DOE's government-to-government consultation efforts with potentially affected tribes for the proposed undertaking are on-going.

1.2.4.2 Section 7 of the Endangered Species Act

The USFWS oversees compliance with the ESA (16 U.S.C. Section 1536), which requires that federal agencies "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat of such species." DOE, as the lead federal agency for the proposed Project, prepared a Biological Assessment in accordance with the ESA to analyze potential Project-related impacts on federally-listed threatened and endangered species, candidate species, species proposed for listing, and their designated critical habitats **(Appendix R)**. Formal **consultation under Section 7 of ESA was initiated by DOE's submission of the BA and its determination of findings letter to USFWS and this consultation process is on-going (Appendix R). USFWS will issue a Biological Opinion and Incidental Taking Permit statement, if necessary.**

1.2.4.3 Migratory Bird Treaty Act (MBTA)

The USFWS oversees compliance with the MBTA (16 USC 703-712), which regulates the taking, selling, transporting, and importing of migratory birds, their nests, eggs, parts, or products. Although not formally subject to or part of an agency consultation process, take permits are not available under the MBTA. **The Applicant, therefore, has proposed measures to avoid and minimize impacts on migratory birds. The Applicant must continue to work with USFWS to determine any further appropriate avoidance, minimization, and conservation measures intended to address potential impacts to migratory bird habitat. Any such measures determined through these discussions would be addressed in a DOE Presidential permit, if issued.**

1.3 State Permits and Approvals

1.3.1 Minnesota Public Utilities Commission – Route Permit

The PPSA provides that no person may construct a high-voltage transmission line without a Route Permit from the MN PUC. Under the PPSA[18], a high-voltage transmission line includes a transmission line of 100 kV or more and greater than 1,500 feet in length, with associated facilities.[19] As part of the Route Permit, the MN PUC will also list any conditions it will require for constructing, operating, and maintaining the proposed Project. Details of the state route permit process are provided in Minnesota Rules, chapter 7850, including the major factors that the MN PUC must use to evaluate routes.[20]

The Applicant's Route Permit application and associated filings can be viewed on the state's eDockets website.[21] The MN PUC found the Route Permit application complete on July 2, 2014.

17 In addition to the State Historic Preservation Office (SHPO), Indian tribes, and the Advisory Council on Historic Preservation (ACHP), Section 106 consulting parties may include certain individuals and organizations with a demonstrated interest in the undertaking due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties (36 CFR Section 800.2)

18 Minnesota Statutes, section 216E.03, subdivision 2

19 Minnesota Statutes, section 216E.01; subdivision 4

20 Minnesota Rules, part 7850.4100

21 Minnesota Public Utilities Commission (MN PUC) Docket No. E015/TL-14-21 available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=eDocketsResult&userType=public

1.3.1.1 Factors and Elements Considered

The MN PUC is charged with selecting routes that minimize adverse human and environmental impacts while ensuring continuing electric power system reliability and integrity. Route Permits issued by the MN PUC include a permitted route and anticipated alignment, as well as conditions specifying construction and operation standards. The MN PUC's generic Route Permit template and an example Route Permit previously issued by the MN PUC are included in Appendix B.

Minnesota Statutes, section 216E.03, subdivision 7 identifies considerations that the MN PUC must take into account when designating transmission line routes, including minimizing environmental impacts, and minimizing conflicts with human settlement and other land uses. Minnesota Rules, part 7850.4100 lists 13 factors[22] for the MN PUC to consider when making a decision on a Route Permit:

- Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation and public services;
- Effects on public health and safety;
- Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism and mining;
- Effects on archaeological and historic resources;
- Effects on the natural environment, including effects on air and water quality resources and flora and fauna;
- Effects on rare and unique natural resources;
- Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity;
- Use or paralleling of existing ROW, survey lines, natural divisions lines and agricultural field boundaries;
- Use of existing transportation, pipeline and electrical transmission systems or ROWs;
- Electrical systems reliability;
- Costs of constructing, operating and maintaining the facility which are dependent on design and route;
- Adverse human and natural environmental effects which cannot be avoided; and
- Irreversible and irretrievable commitments of resources.

The analysis in Chapter 5, Chapter 6, and Chapter 7 of this EIS addresses each of these factors by evaluating the potential impacts to individual components or "elements" of each factor. For example, effects on human settlement (the first factor in Minnesota Rules, part 7850.4100) are assessed by evaluating potential impacts to 12 different components or "elements" of human settlement including displacement, noise, property values, air quality, electronic interference, transportation and public services, environmental justice, socioeconomics, aesthetics, land use compatibility, cultural values, and recreation and tourism. Similarly, effects on the natural environment (the fifth factor in Minnesota Rules, part 7850.4100) from the proposed Project are assessed by evaluating potential impacts to three distinct components or "elements" of natural environment including, water resources, vegetation, and wildlife.

For each element, a number of "indicators"—data sources that provide an indication of potential impacts—have been analyzed in Chapter 5 and Chapter 6. For example, proximity to residences is used as one "indicator" of potential aesthetic impacts that residents may experience. Similarly, the evaluation of the water resources element of the natural environment relies on data about the acres of wetland impacted by a proposed route. The acres of wetland impact is used as one "indicator" of potential impacts on water resources.

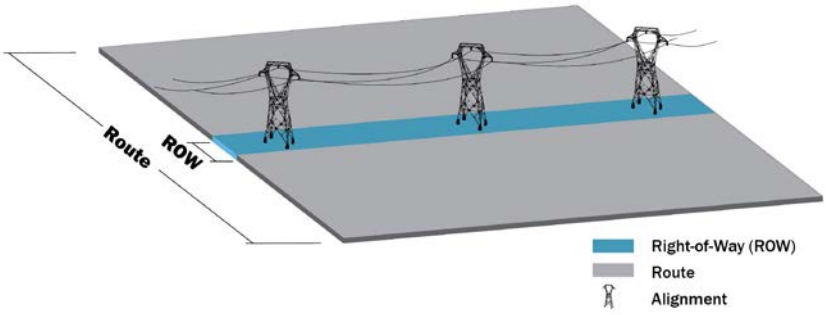
A general analysis of indicators and impacts is provided in Chapter 5 for the elements of each factor, with the exception of "irreversible and irretrievable commitments of resources", which is covered in Chapter 7. Chapter 6 provides a geographically refined analysis of all the elements for which the available indicators suggest variability in impacts between the alternative routes.

1.3.1.2 Minnesota Route Permit Content Requirements

Applications for transmission line route permits are subject to environmental review conducted by DOC-EERA staff (Minnesota Rules, part 7850.2500). Projects proceeding under the full permitting process, such as this one, require the preparation of

22 One additional factor is included in Minnesota Rules, part 7850.4100— "Use of existing large electric power generating plant sites" —however, it is not relevant to the decision on a transmission line route.

Figure 1-1 Typical Route and ROW Schematic



a state EIS. An EIS is a document which describes the potential human and environmental impacts of the project and possible mitigation measures, including route, alignment, and site alternatives. DOC-EERA determines the scope of the EIS. DOC-EERA may include alternatives suggested by the public in the scope of the EIS if such alternatives are otherwise permittable and will assist in the MN PUC's decision on the Route Permit.

1.3.1.3 Minnesota Route Permit Scope of Review

Under Minnesota law, the Route Permit process does not determine whether the proposed Project is needed. That decision is made as part of a separate process: the certificate of need. The certificate of need process is described in Section 1.3.2.

However, under the PPSA, the MN PUC needs to determine whether to issue a Route Permit for the proposed Project and must also review any alternative routes or route segments proposed according to the applicable rules,[23] and then needs to determine the final route. The MN PUC must make specific findings that it has considered locating a route for a new transmission line along an existing high voltage transmission line ROW or parallel to existing highway ROW and, to the extent these are not used for the route, the MN PUC must state the reasons why (Minnesota Statutes, Section 216E.03, subdivision 7). Also, before the MN PUC makes a final decision on a route permit, the MN PUC must determine whether the EIS for the project is adequate (Minnesota Rules, part 7850.2700).

Therefore, the MN PUC is not only determining whether to issue a Route Permit for the proposed Project, but it is also responsible for assessing and selecting the final route. As part of the Route Permit, the MN PUC will also list any conditions it will require for constructing, operating, and maintaining the proposed Project. Therefore, the underlying need for MN PUC action in the Route Permit docket is to decide what route to approve for the proposed Project and under what conditions. **Once the route permit is issued, the permittee needs to start construction and improvement of the proposed Project within four years or the MN PUC will suspend the route permit. If the permittee decides to construct the proposed large electric power generating facility or high voltage transmission line after four years, the permittee must certify to the MN PUC that there have been no significant changes in any material aspects of the conditions or circumstances existing when the permit was issued (Minnesota Rule 7850.4700).**

1.3.1.4 Route Width, Right-of-Way, and Anticipated Alignment

When it issues a Route Permit, the MN PUC approves a route, a route width, and an anticipated alignment within that route (Figure 1-1). As described below, the transmission line must be constructed within the MN PUC's designated route unless subsequent permissions are requested and approved by the MN PUC.

The applicable regulations allow the Applicant to request a route that is wider than the actual ROW needed for the transmission line.

A "**right-of-way**" is defined in the regulations as "the land interest required within a route for the construction, maintenance, and operation of a high voltage transmission line."[24]

A "**route**" is defined as "the location of a high voltage transmission line between two end points. A route may have a variable width of up to 1.25 miles within which a ROW for a high voltage transmission line can be located."[25]

23 Minnesota Rules, part 7850

24 Minnesota Rules, part 7850.1000, subpart 15

25 Minnesota Rules, part 7850.1000, subpart 16

Therefore, the ROW is the area required for the safe construction and operation of the transmission line, where such safety is defined by the National Electricity Safety Code (NESC) and North American Electric Reliability Corporation (NERC) reliability standards (see part 4.8.1 in the MN PUC generic Route Permit template in Appendix B). The ROW must be within the designated route and is the area for which the Applicant obtains rights from landowners to construct and operate the transmission line.

For the proposed Project, as described in Section 2.5.9, the Applicant has requested a 200-foot ROW, with route widths that vary from 650 feet up to 3,000 feet in some limited areas. The larger route width allows applicants to work with landowners to address their concerns and address local engineering issues that may arise after a permit is issued. The MN PUC could also designate a route width narrower than 650 feet if necessary to avoid a site-specific constraint such as a residence or a protected land use or designation. The route width, in combination with the anticipated alignment, is intended to balance flexibility and predictability during final design and construction.

The MN PUC may include conditions in a Route Permit that address the route width, ROW width, or anticipated alignment in a specific area of the project. For example, the Route Permit could require the alignment for a specific portion of the route to be north, rather than south, of a road or requiring that the route width be narrower in a certain area.

Once a Route Permit is issued by the MN PUC, the permittee would conduct detailed survey and engineering work, including, for example, soil borings. Additionally, the permittee would contact landowners to gather information about their property and their concerns and discuss how best the ROW for the project might proceed across the property. Permission to use a ROW for a transmission line across private property is typically obtained by an easement agreement. Permission to cross state property or federal interest lands, however, must be obtained through a permit or license as summarized above in Section 1.2.3.

The MN PUC Route Permits typically include a condition stating that at least 30 days before ROW preparation begins on any segment of a project, the Permittee must provide a plan and profile of the ROW that includes the specifications and drawings for ROW preparation, access roads, construction, structure specifications and locations, cleanup, and restoration for the transmission line. The plan and profile must be approved as a compliance filing before any construction can begin. Any proposed modifications to the permitted anticipated alignment within the designated route would be required to be specifically identified and approved as part of this MN PUC plan and profile approval process.

Minor Alteration

In order to construct any portion of a permitted transmission line outside of the approved route width, the Permittee would need to either reapply for a new Route Permit or request a minor alteration under Minnesota Rules, part 7850.4800.[26] A minor alteration is "a change in a large electric power generating plant or high voltage transmission line that does not result in significant changes in the human or environmental impact of the facility." The application for a minor modification would be provided in writing and would describe the alteration and explain why the alteration is minor.

Under Minnesota Rules, part 7850.4800, subpart 3,[27] the MN PUC must determine whether the requested changes are minor, whether to authorize the alteration, and whether to apply conditions. The MN PUC may also determine that the alteration is not minor and needs to be considered under the full permitting process. The MN PUC uses the routing factors of Minnesota Rules, part 7850.4100 to help make their determination, including the proposed alteration's impacts to natural resources and human settlement.

1.3.2 Minnesota Public Utilities Commission – Certificate of Need

Minnesota Statutes, section 216B.243 dictates that a certificate of need is required for a "large energy facility" as that term is defined in Minnesota Statutes, section 216B.2421. A large energy facility includes "any high-voltage transmission line with a capacity of 200 kilovolts or more and greater than 1,500 feet in length" (Minnesota Statutes, section 216B.2421, subdivision 2 (2)).

The Applicant filed its certificate of need application for the proposed Project with the MN PUC on October 22, 2013. **In reviewing that application, the MN PUC considered whether there is a need for a transmission line and established the size, type, and required end points of the proposed Project**. Following a formal contested case hearing, the Administrative Law Judge (ALJ) issued her report on March 31, 2015, which concluded that the Applicant satisfied the certificate of need requirements and recommended the MN PUC grant a certificate of

26 Available at: https://www.revisor.mn.gov/rules/?id=7850.4800
27 Available at: https://www.revisor.mn.gov/rules/?id=7850.4100

Table 1-3 State and Local Permits

Issue	Minnesota State Reviews/Approvals	
Cultural resources	Cultural and Historic Resources Review and Section 106 Consultation	Minnesota Historical Society, State Historic Preservation Office (SHPO)
Conservation easement	**Easement Renegotiation**	**MnDNR Forestry**
Transportation	Utility Permit	MnDOT
Natural resources	Endangered Species Consultation/Wildlife Take Permits	MnDNR Ecological Services
Construction and water quality	License to Cross Public Lands and Waters	MnDNR Lands and Minerals
	Public Waters Work Permit	MnDNR Waters
	Water Appropriation/Dewatering Permit	MnDNR Waters
	Wetland Conservation Act Permit	Board of Water and Soil Resources (BWSR) and/or Local Government Units
	Section 401 Water Quality Certification	MPCA (delegated federal authority)
	Section 402 National Pollutant Discharge Elimination System Permit	MPCA (delegated federal authority)
Agriculture	Agricultural Impact Mitigation Plan Permit	Minnesota Department of Agriculture (MDA)
	Noxious Weed Management Plan	MDA
	Local Coordination	
Transportation and safety	Road Crossing/Right-of-Way	County, Township, City
	Public Lands	County, Township, City
	Overwidth Load	County, Township, City
	Driveway Access	County, Township, City

need to the Applicant for the construction of the proposed Project and associated facilities. The MN PUC granted the certificate of need on June 30, 2015. **As part of that process, the MN PUC reviewed various non-transmission line alternatives and found that the proposed Project is the Applicant's best option to meet its existing and future energy demand**. The certificate of need application, ALJ recommendations, and MN PUC Order can be viewed on the MN PUC website.[28]

1.3.3 Other State and Local Permits

In addition to the state certificate of need and Route Permit, other state and local permits, approvals, and decisions that may be required for the proposed Project are listed in Table 1-3.

The Applicant is working with state agencies to obtain the potentially necessary approvals and/or to comply with the regulations listed below.

Cultural and Historic Resources Review – Minnesota Statutes designate the director of the Minnesota Historical Society as the SHPO (Minnesota Statutes, section 138.081) and places responsibility for the historic preservation program with the Minnesota Historical Society. As noted in Section 1.2.4.1. DOE is leading coordination with Minnesota SHPO on the proposed Project and Section 106 consultation efforts for the proposed undertaking are on-going.

Conservation Easement – An easement is a legally binding contract between the State of Minnesota and a private land owner that is an encumbrance on the forest land parcel. The purpose of the easement is to prevent fragmentation and provide economic value to the region through the use of forest management to maintain and improve the timber resource for multiple markets and provide wildlife habitat for the public's enjoyment. The private landowner retains ownership and can continue activities such as timber management, recreation, and hunting as long as they do not conflict with the terms of the easement. Each easement is individually negotiated. A high voltage transmission line crossing of a conservation easement requires renegotiating the easement agreement. Renegotiation of conservation

28 MN PUC Docket No. E015/CN-12 1163, "Certificate of Need Application" is available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={65F60020-4419-41F0-AB43-E4D7F22A6E28}&documentTitle=20153-108775-01

easements funded by the Minnesota Outdoor Heritage Fund (Minnesota Statutes 97A.056) also require approval from the Lessard-Sams Outdoor Heritage Council.

Utility Permit – A permit from MnDOT is required under Minnesota Rules, part 8810.3300, for construction, placement, or maintenance of utility lines adjacent or across highway ROWs. The Applicant is working with the MnDOT to obtain the required approvals.

Minnesota's Endangered Species Act Consultation/Wildlife Take Permits – The MnDNR is responsible for overseeing the regulations and permitting for development projects under Minn. Stat. § 84.0895 and associated rules govern the taking (including killing, capturing, collecting, and/or possessing) of state endangered or threatened species in Minnesota. The Applicant is working with the MnDNR to obtain any take permits, as appropriate.

License to Cross Public Lands and Waters – MnDNR Division of Lands and Minerals regulates utility crossings over, under, or across any state land or public water identified in the Public Waters Inventory maps. A license to cross public waters is required under Minnesota Statutes, section 84.415 and Minnesota Rules, chapter 6135. The Applicant is coordinating with MnDNR to determine necessary crossing permits.

Public Waters Work Permit – The MnDNR Public Waters Work Permit Program regulates development activities below the ordinary high water mark of wetlands, streams, and lakes identified in the Public Waters Inventory maps. Under Minnesota Statutes, section 103G.245, Subdivision 1, a Public Waters Work Permit is required for any action taken by the state, political subdivision of the state, or corporation or person that alters or develops any obstruction to public waters or changes the course, current, or cross-section of wetlands, streams, and lakes identified in the Public Waters Inventory maps. The Applicant will apply for this permit as necessary.

Water Appropriation/Dewatering Permit – During construction, temporary impacts may occur if dewatering is necessary to install the transmission structures or if pumping wells are installed to supply water for concrete batch plant operations. If dewatering or pumping is necessary, the Applicant will obtain water appropriations permits from the MnDNR.

Wetland Conservation Act Approval – Minnesota BWSR administers the state Wetland Conservation Act pursuant to Minnesota Rules, chapter 8420. The transmission line portion of the proposed Project would be expected to be exempt under Minnesota Rules, part 8420.0420, subpart 6.[29] The Applicant anticipates that impacts related to the proposed **Iron Range** 500 kV Substation will require an approval. The Applicant will apply for this approval (which is applied for jointly with a Section 404 Clean Water Act Permit from USACE), as necessary.

Section 401 Water Quality Certification – MPCA regulates water quality under Section 401 of the Clean Water Act (33 U.S.C.. Section 1344). The Applicant will apply for this Certification (which is applied for jointly with a Section 404 Clean Water Act Permit from USACE).

Section 402 National Pollutant Discharge Elimination System (NPDES) Permit – MPCA has been delegated federal authority to issue a NPDES permit for stormwater discharges associated with construction activities disturbing an area of one acre or more (Minnesota Rules, part 7090.0030). The permit requires the Applicant to develop and implement a Stormwater Pollution Prevention Plan (SWPPP), which includes best management practices (BMPs) to minimize discharge of pollutants from the site. **If a project disturbs more than 50 acres of land, MPCA staff review of the SWPPP is required.** The Applicant will apply for this permit once the design is complete, prior to initiation of construction.

Agricultural Impact Mitigation Plan – MDA requires an agricultural impact mitigation plan to identify measures that can be taken to avoid, mitigate, repair, and/or provide compensation for impacts caused by the transmission line construction on agricultural lands (Minnesota Statutes, section 216B.243, subdivision 7). The Applicant will develop this plan as necessary.

Noxious Weed Management Plan – MDA has the responsibility for eradication, control, and abatement of nuisance plant species (Minnesota Statutes, section 18G.04). The local County Agricultural Inspector administers the program. The Applicant will develop a vegetation maintenance and management plan for the proposed Project.

Local Coordination – Minnesota has exclusive authority to designate the route for the proposed Project (Minnesota Statues, section 216E.10) which supersedes and preempts all zoning, building,

29 Minnesota Rules, part 8420.0420, subpart 6 Utilities. A. A replacement plan is not required for impacts resulting from: (1) installation, maintenance, repair, or replacement of utility line, including pipelines, if: (a) the impacts have been avoided and minimized to the extent possible; and (b) the proposed project significantly modifies or alters less than one-half acres of wetlands.

or land use rules, regulations, or ordinances promulgated by regional, county, local, and special purpose government.

The Applicant has provided notice to local government units (LGUs) in compliance with Minnesota Statutes, section 216E.03, subdivision 3a and anticipates coordination with LGUs regarding the following issues listed below.

- *Road Crossing/ROW* – Coordination may be required to cross or occupy county, township, and city road ROWs.
- *Public Lands* – Coordination would be required to occupy county, township, and city lands such as forest lands, park lands, watershed districts, and other properties owned by these entities.
- *Overwidth Load* – Coordination may be required to move over-width or heavy loads on county, township, or city roads.
- *Driveway Access* – Coordination may be required to construct access roads or driveways from county, township, or city roads.

1.4 Joint Federal and State EIS Process

1.4.1 Joint Process

Pursuant to the NEPA, when evaluating an application for a Presidential permit, DOE must take into account potential environmental impacts of the proposed facility. DOE determined that an EIS is the appropriate level of environmental review for the proposed Project, and this EIS is prepared in compliance with the Council on Environmental Quality's (CEQ) NEPA implementing regulations at 40 CFR Parts 1500-1508 and DOE's NEPA implementing regulations at 10 CFR Part 1021. Further, in accordance with DOE regulations at 10 CFR Part 1022, *Compliance with Floodplain and Wetland Environmental Review Requirements*, DOE will develop a floodplain and wetland statement of findings for the proposed Project.

In addition, under the PPSA, the MN PUC must also determine the route for the proposed line and any conditions it will require for construction, operation, and maintenance. As part of this MN PUC Route Permit decision-making process, a state EIS must be prepared.[30]

To avoid duplication, DOE and the DOC-EERA are preparing a single EIS to comply with environmental review requirements under NEPA and the PPSA. DOE is acting as federal joint lead agency with DOC-EERA acting as state joint lead agency per 40 CFR 1501.5(b).

DOE and DOC-EERA have implemented a joint planning and scoping process to encourage agency and public involvement in reviewing the proposed Project, and to identify the range of reasonable alternatives. The first phase of the formal agency public outreach process was designed to facilitate public discussion of the scope of appropriate issues to be addressed in the EIS.

DOE and DOC-EERA will continue to jointly implement public involvement and the public comment process on the Draft EIS by holding joint federal and state public hearings and informational meetings on the Draft EIS in various locations in the project area in northern Minnesota.

1.4.2 Issues Outside the Scope of this EIS – Impacts in Canada

A few scoping comments focused on the potential effects of the Project on Canadian resources.

This issue is outside of the scope of this EIS because DOE determined that an analysis of environmental and socioeconomic issues in Canada is not appropriate. While implementation of the proposed Project would require construction of a transmission line and other infrastructure in Canada, NEPA does not require an analysis of environmental impacts that occur within another sovereign nation that result from actions approved by that sovereign nation. For that reason, potential environmental impacts in Canada are not addressed in this EIS.

This approach is consistent with Executive Order 12114, Environmental Effects Abroad of Major Federal Actions (January 4, 1979), which requires federal agencies to prepare an analysis of potentially significant impacts from a federal action in certain defined circumstances and exempts agencies from preparing analyses in others. Section 2-3[b] of the Executive Order does not require federal agencies to evaluate impacts outside the U.S. when the foreign nation is participating with the U.S., or is otherwise involved in the action.

Manitoba Hydro is developing the proposed transmission line on the Canadian side of the border. The Manitoba section of the proposed transmission line requires a Class 3 License under The Environment Act (Manitoba) and Canadian federal authorization through the National Energy Board (NEB). Manitoba Hydro has submitted their environmental review of potential impacts

30 *Minnesota Statutes, section 216E.03, subdivision 5.*

(Canadian EIS) for the portion of the proposed transmission line project in the Province of Manitoba for regulatory approval.

Based on their July 30, 2015 comment letter on the Draft EIS (See Comment document 51 in Appendix Y), Manitoba Hydro can only support the border crossing developed in their planning process and agreed upon with the Applicant. The Proposed Border Crossing-Blue/Orange Route, is located at latitude 49° 00' 00.00" N and longitude 95° 54' 50.49" W. According to Manitoba Hydro, the Proposed Border Crossing was jointly selected because it balances environmental, technical and stakeholder impacts on both sides of the border.

Manitoba Hydro determined that other border crossings are not feasible for reasons stated in its July 30, 2015 comment letter (see Appendix Y). These reasons include, but are not limited to, the fact that other border crossings traversed areas of high biological diversity that were noted by government agencies and environmental non-government organizations. Furthermore, on the Canadian side of the border, the areas immediately to the east of the Proposed Border Crossing are primarily composed of Crown (public) lands, which support traditional Aboriginal use. First Nations therefore noted significant concerns in regards to route alternatives in this area. Also, according to Manitoba Hydro's comment letter, the Border Crossing 500 kV Variation and the Border Crossing 230 kV Variation are outside of the agreed upon crossing areas and thus were not analyzed in their planning process, but those border crossings would pose many of the same challenges as those just to the east of the Proposed Border Crossing.

National Energy Board (NEB) - Federal – This proposed Project is an international transmission line and will require authorization from the NEB. The NEB will include a public comment period. For more information, visit www.hydro.mb.ca/mmtp. In both cases, Manitoba Hydro would provide an EIS to all necessary authorities with the filings for the project approval. See Section 2.2.1 for information about Manitoba Hydro.

Manitoba Conservation and Water Stewardship (MCWS) - Provincial – The Canadian EIS will be submitted to MCWS for review as a Class 3 development under The Environment Act (Manitoba). Following submission to MCWS, a public review period will begin and the EIS will be open for review and comment.

1.4.3 Cooperating Agencies and Coordination

DOE invited other federal agencies to participate in the preparation of this EIS as cooperating agencies to ensure that it satisfies those agencies' environmental requirements and/or to engage their specialized expertise. **These other agencies consist of other federal agencies and federally recognized Indian tribes. The federally recognized Indian tribes are the Red Lake Band of Chippewa Indians, Minnesota, and the Bois Forte Band of the Minnesota Chippewa Tribe, Minnesota. The Red Lake Band of Chippewa Indians, Minnesota accepted DOE's invitation and is a cooperating agency for the preparation of this EIS. The Bois Forte Band (Nett Lake) of the Minnesota Chippewa Tribe, Minnesota declined DOE's invitation to participate as a cooperating agency in the preparation of this EIS, although they were actively consulted under Executive Order 13175 in the preparation of this EIS and are a consulting party in DOE's compliance process for Section 106 of NHPA.**

The federal cooperating agencies are the St. Paul District of the USACE, Region 5 of the EPA, the Twin Cities Ecological Field Office (Region 3) of USFWS, **and the Red Lake Band of Chippewa Indians, Minnesota. These federal agencies and American Indian tribe accepted DOE's invitation and are considered cooperating agencies for the preparation of this EIS.**

The following outlines each agency's requirements **and/or specialized expertise** for this EIS:

USACE. USACE will use this EIS in their decision making for the permits that would be required under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. In accordance with 33 CFR Part 325 Appendix B (8)(c), USACE will coordinate with DOE to ensure this EIS supports USACE's decision-making requirements on the Applicant's Section 10 and Section 404 permit application.

EPA. Under Section 309 of the Clean Air Act, the EPA is required to review and publicly comment on the environmental impacts of major federal actions. EPA also has responsibilities under the Clean Water Act. In addition, the EPA administers various statutes and regulations, including, but not limited to, the Safe Drinking Water Act; the Pollution Prevention Act; the Resource Conservation and Recovery Act; and the Comprehensive Environmental Response, Compensation, and Liability Act.

EPA's involvement as a cooperating agency includes (1) participation in relevant project meetings and calls and (2) review and comment on preliminary documents to the extent that staff resources allow.

USFWS. USFWS's role includes evaluating general environmental impacts on fish and wildlife. They also evaluate potential environmental impacts on federally-listed threatened and endangered species and designated critical habitat, and may issue a Biological Opinion based on a Biological Assessment prepared for the proposed Project, as appropriate. An incidental take statement (along with reasonable and prudent measures) may be issued if appropriate. USFWS also has responsibility for enforcing the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Coordination for any necessary eagle permits will be conducted with USFWS. USFWS will also coordinate any special use permit if ROW access is requested and granted on USFWS interest properties. **The USFWS provided a recommended route that avoids USFWS Interest Lands, as described in their August 10, 2015 comment letter in Appendix U.**

Red Lake Band of Chippewa Indians, Minnesota. The role of the Red Lake Band of Chippewa Indians, Minnesota, as a cooperating agency in the preparation of this EIS is to provide specialized expertise in the identification of resources of concern to the tribe and the evaluation of general environmental impacts on resources of concern to the tribe. The tribe's involvement as a cooperating agency includes: (1) participation in relevant project meetings and calls, (2) identification of resources of concern to the tribe that may be potentially impacted, including, but not necessarily limited to, natural resources (such as water resources), biological resources (such as wildlife, including game species, fish, and plants), cultural resources (such as archaeological sites, properties of traditional religious and cultural importance, and traditional cultural properties), and socioeconomic resources (such as environmental justice or game species such as walleye), and (3) review and comment on preliminary documents. Separately, the tribe will exercise its independent review and comment responsibilities as a consulting party to DOE's compliance process for Section 106 of the NHPA.

1.4.4 Public Involvement

On June 20, 2014, MN PUC issued a Notice of Public Information and EIS Scoping Meeting. The notice described the proposed Project and provided an overview of the MN PUC process and opportunities for public comment. The notification lists for the notice included individuals on the MN PUC's general service list and MN PUC's project contact list for the proposed Project (Minnesota Rules, part 7850.2100, subpart 1). Per Minnesota Rule 78520.2300 Subpart 2, notice of the public meeting was provided by the Applicant on MN PUC's behalf via advertisements in 11 local and regional newspapers along the proposed Project routes. Issuance of the notice commenced the state public scoping period that ended on August 15, 2014. The Applicant also provided the notice to its landowner list of potentially affected landowners.

On June 27, 2014, DOE published its Notice of Intent (NOI) to Prepare an EIS and to Conduct Public Scoping Meetings; Notice of Floodplains and Wetlands Involvement for the Great Northern Transmission Line (79 Federal Register (FR) 36493). The NOI explained that DOE would be assessing potential environmental impacts and issues associated with the proposed Project and the no-action alternative. The NOI was sent to interested parties including federal, state, and local officials; agency representatives; stakeholder organizations; local libraries, newspapers, and radio and TV stations; and private individuals in the vicinity of the proposed transmission line. Issuance of the NOI commenced a 45-day federal (NEPA) public scoping period that ended on August 11, 2014, however, DOE continued to accept scoping comments through August 15, 2014, in order to align the federal and state scoping period.

During the public scoping period, DOE and DOC-EERA conducted eight joint scoping meetings. A summary of the joint scoping process and associated public and agency comments are in the EIS Scoping Summary Report, the body of which is provided in Appendix C.[31] In short, five border crossing alternatives were suggested by the public and agencies for detailed study in the EIS during the public scoping period. Four of these border crossing alternatives were determined by DOE as potentially reasonable alternatives and are included in the scope of the EIS.

In addition, the MN PUC requested the DOC-EERA to conduct a minimum of two citizen Workgroup meetings and consult directly with LUGs within the project area. The purpose of the Workgroup

31 The full text of the Scoping Summary Report is available at: http://www.greatnortherneis.org (http://www.greatnortherneis.org/Files/Scoping%20Summary%20Report%20NOV2014%20v2.pdf) and on e-Dockets (eDockets Numbers: 201411-104621-01 to 10, 104622-01 to 09, 104623-01 to 10, 104624-01 to 08, 104625-01 to 07, and 104626-01 to 03) at: http://mn.gov/commerce/energyfacilities/Docket.html?Id=33847#edocketFiles

is primarily to provide an additional opportunity for local government representatives to discuss their concerns, develop potential alternative route segments, review potential zoning conflicts, and ensure local input necessary for informed decision-making. The DOC-EERA held two four-hour Workgroup meetings in Grand Rapids, Minnesota, on September 30 and October 29, 2014. In addition to the two meetings, Workgroup members were provided a scoping questionnaire designed to assist Workgroup members in identifying ordinances, land use planning, or zoning issues.

The major issues identified during public scoping focused on ways to minimize unavoidable conflicts with forested areas and the associated natural resources, avoiding potential conflicts with airports or seaplane-landing areas on nearby lakes, or proposed alternatives to reduce or eliminate visual, health, or other impacts on quality of life or use of a specific property.

Based on the scoping comments received, the DOC-EERA issued the scoping decision for this EIS on January 9, 2015 (Appendix D). The scoping decision identifies matters to be addressed in this EIS, including resources potentially impacted by the project and alternative route segments and alignment modifications – beyond those proposed routes and associated facilities proposed by the Applicant.

1.4.4.1 Draft EIS Comment Period

Federal NEPA implementing regulations require a minimum 45-day public comment period following publication of the Notice of Availability (NOA) by EPA in the FR. CEQ and DOE NEPA implementing regulations also require DOE to hold at least one public hearing on the Draft EIS in order to obtain comments from the public (40 CFR 1506.6(c) and 10 CFR 1021.313(b)). State regulations also require mailed notices and publication of the notice of Draft EIS availability and the opportunity for the public to comment in the Environmental Quarterly Bulletin (EQB) Monitor.

Publication of the joint EIS also requires DOC-EERA to hold an informational meeting to obtain comments on the Draft EIS (Minnesota Rules, part 7850.2500, subpart 8). The federal public hearings and state informational meeting on the Draft EIS **were** held jointly. State regulations require the public comment period be held open for at least ten days following the close of these joint public hearing/information meetings. The dates and times of these public comment meetings **were made** available on the agency project websites.[32]

Comments on the Draft EIS were accepted during the 45-day period following publication of the EPA's NOA in the Federal Register on June 26, 2015 (80 FR 36795) and ending August 10, 2015. The DOC-EERA also issued its Notice of Availability of Draft EIS, State Public Information Meetings and Federal Public Hearings on June 19, 2015. In preparing this Final EIS, DOE and DOC-EERA solicited comments during the scoping period (June 27, 2014, through August 11, 2014) and public comment period on the Draft EIS (June 26, 2015 through August 10, 2015). Late comments on the Draft EIS that were received or postmarked after the scoping comment period and the Draft EIS comment period were also considered in preparation of this Final EIS.

During the 45-day public comment period, DOE and DOC-EERA held nine federal public hearings/state information meetings on the Draft EIS in the following locations: Red Lake, Minnesota, on July 14, 2015; Roseau and Baudette, Minnesota, on July 15, 2015; Littlefork and International Falls, Minnesota, on July 16, 2015; Kelliher and Bigfork, Minnesota, on July 21, 2015; and two meetings in Grand Rapids, Minnesota on July 22, 2015.

DOE and DOC–EERA responded to written and verbal comments from 208 letters and comments provided orally in public hearings/information meetings on the Draft EIS. This included five comments from federal government officials or agencies, seven from federally recognized tribes, 12 from state government officials or agencies, 21 from local government officials, agencies, or planning boards, 12 from commercial companies, one from a non-governmental organization, four from the Applicant, one from a Manitoba Justice, and 145 from private citizens. The comments letters and more detailed responses are included in Appendix Y. The major issues identified during the Draft EIS comment period, including late comments, include:

***Regulatory Process/Public Involvement*—Several comments noted that landowners did not receive appropriate public notice, that the meetings were not publicized property, or that there was not enough opportunity to provide meaningful input into the route selection process.**

32 Available at: http://energy.gov/oe/downloads/application-presidential-permit-oe-docket-no-pp-398-minnesota-power-great-northern and http://mn.gov/commerce/energyfacilities/Docket.html?Id=33847

DOE/DOC response: Notification of the proposed Project was provided in a manner consistent with DOE and MN PUC requirements and outlined in Section 1.4.4 of the EIS. Additionally, as described in Section 2.3.1, the Applicant hosted numerous public involvement meetings throughout the route selection process to provide Project information and solicit feedback from the public.

Purpose and Need—Several comments questioned the need for the proposed Project from an electrical reliability standpoint and said that the document did not adequately address the need for the Project.

DOE/DOC-EERA response: The purpose and need for DOE's action and decision is described in Section 1.2.2, and the MN PUC certificate of need process is discussed in Section 1.3.2 of the EIS. The MN PUC determined that there is a need for the proposed Project by the Applicant in eDocket #12-1163 (certificate of need).

Project Description/Project Design—Several comments questioned various aspects of the project description and project components including the proposed compensation station, substation, access roads, capacity of the line, and other design criteria.

DOE/DOC-EERA response: As discussed in Section 2.9.7 of the EIS, once a route is selected the Applicant will identify the locations for all permanent and temporary access roads, laydown areas, stringing areas, fly-in sites, and structure locations. They will work with the federal and state agencies to develop survey plans, conduct fieldwork, and determine the wetland and other resource impacts for the project. This information will be needed in order to complete the federal and state permitting processes. Until a route is selected, the exact locations of these project components cannot be known

Alternatives—Several comments suggested that alternative routes or other system and non-transmission alternatives should be evaluated in the Final EIS.

DOE/DOC-EERA response: DOE and DOC-EERA determined that the Draft EIS covered a range of reasonable alternatives and none of the route alternatives presented warranted expanding that range. Non-transmission alternatives were considered but eliminated from detailed analysis because they are outside the scope of the purpose of and need for DOE's federal action, which is to decide whether to issue a Presidential permit. Non-transmission alternatives that are out of scope for this EIS were handled under the state's certificate of need process.

No Action Alternative—Other comments challenged the adequacy of the No Action Alternative analysis and suggested it was slanted in the applicant's favor.

DOE response: The No Action Alternative is discussed in full in Chapter 3 of the EIS. DOE's Federal Action is to decide whether to grant the Applicant a Presidential permit for the international border crossing that is a part of the proposed Project. The no action alternative is to not issue the requested Presidential permit.

Human Settlement—Several comments expressed concern for displacement and impacts to private farmland and homes near proposed routes and variations. Several comments expressed a preference for the proposed Project to utilize public lands instead of private property. Other comments expressed concerns about the proximity of community spaces, such as fire departments, churches, and parks, to proposed routes and variations.

DOE/DOC-EERA response: As discussed in Section 1.3.1.4 of the EIS, once a route is selected and a permit is issued, the Applicant would contact landowners to gather information about their property and their concerns and discuss how the ROW would best proceed across the property.

Noise and Vibration—Several comments expressed concern regarding audible noise from operation of the proposed Project, including noise from corona discharges. Another comment requested that the predicted noise levels for the compensation station be provided in the EIS along with a discussion of infrasound and explanation of whether additional modeling is necessary. One comment provided additional noise modeling for operation of the proposed Project.

DOE/DOC-EERA response: Noise is discussed in Section 5.2.1.2 of the EIS, which provides an analysis of audible noise from operation of the proposed Project, particularly in rainy conditions, when corona noise would be at its highest. This analysis of operational noise also provides estimates for the proposed substation, compensation station, and associated sources (transformers, reactors, and capacitor banks). No additional noise modeling was preformed because it was not deemed necessary to adequately characterize impacts.

Air quality/GHG—A comment requested that the EIS include an estimate of total emissions from construction, operation, maintenance, and emergency repair of the proposed Project and that the Applicant pursue more opportunities to use clean diesel equipment and other emission reduction strategies. A comment also requested quantification of the greenhouse gas emission reductions as result of operation of the proposed Project and subsequent reduction of fossil fuels.

DOE/DOC-EERA response: Employment of additional emission reduction strategies during construction of the proposed Project will be dependent on the Applicant to implement as the proposed Project is not expected to result in long-term adverse criteria pollutant or climate change and GHG emissions which would allow for regulatory agency enforcement of emission reduction strategies. Additional emissions estimates are provided in Section 5.2.1.3.

Socioeconomics—Several comments expressed concern about the proposed Project's potential negative impacts on property values and requested more information. Two comments expressed concern about the validity of the property value impact analysis in the EIS.

DOE/DOC-EERA response: A discussion about the potential effects of transmission lines on property values is included in the EIS in Section 5.2.1.4. This includes a summary of the potential range of property value effects attributed to transmission lines. Further, Appendix J, Property Values Supplement provides a summary of the literature regarding the relationship between transmission lines and property values used to develop the property values analysis in Section 5.2.1.4.

Recreation and Tourism—Several comments expressed concern that the proposed Project would negatively impact recreation and tourism activities such as hunting. One comment expressed concerns that if the Cedar Bend WMA Variation is selected, a recreational business could be affected.

DOE/DOC-EERA response. Discussion of impacts on Recreation and Tourism resulting from the proposed Project is in Section 5.2.1.9. The EIS discussion for Recreation and Tourism is limited to activities on public lands. Impacts to landowners as a result of the proposed Project are discussed relative to Displacement in Section 5.2.1.1 and Land Use Compatibility in Section 5.3.1.2.

Public Health and Safety—Several comments expressed concern regarding the impacts of induced voltage on workers and recreational hunting. One comment expressed concern that the effects of induced voltage were incorrectly reflected in the EIS. Other comments expressed concern for high voltage transmission lines and the unknown potential effects on humans. A comment also expressed concern regarding the potential effect of the proposed Project on implantable medical devices. One comment expressed concern if the proposed Project is in proximity to gravel pits, that corona discharges could result in the Henshaw effect, affecting human health. Several comments expressed concern for health impacts due to EMF. One comment provided updated magnetic field calculations for the proposed Project.

DOE/DOC-EERA response: Section 5.2.2.4 in the EIS discusses induced voltage. Section 5.2.1.2 of the EIS presents the estimated audible noise levels from the proposed 500 kV transmission lines under rainy conditions (worst case scenario for noise generated from corona effect). Section 5.2.2.8 of the EIS discusses public safety hazards associated with the proposed Project including electrical shocks.

Aesthetics—One comment requested viewshed maps be prepared and viewshed analyses be conducted for Bass Lake Park, Larson Lake Campground, Wolf Lake-Wasson Lake Bog, and established campgrounds and trails in these areas. A few comments expressed concern for the adequacy of using the 1,500-foot distance for the buffer as the ROI to assess aesthetic impacts. One comment requested analyses of visual impacts at each proposed crossing of a scenic byway, identification of any specific mitigation to reduce visual impacts, and investigation of any scenic easements in the vicinity of scenic byways.

DOE/ DOC-EERA response: Chapters 5 and 6 in the EIS provide analyses sufficient to characterize aesthetic impacts from the proposed Project to sensitive receptors, which are fully enumerated and accounted for in the analysis. Photo simulations for key observation points are provided in Appendix N and provide sufficient simulations to adequately characterize aesthetic impacts from the proposed Project.

Land Use and Ownership—Comments expressed general concerns about the amount of private land impacted by the proposed Project routes and variations and the evaluation of those impacts. Other comments expressed concern about potential impacts on existing uses and potential future uses of private land. Several comments

expressed preference for avoiding conservation lands and USFWS Interest Lands. One comment requested that all impacts to USFWS Interest Lands be avoided or minimized by selecting a route that does not impact USFWS Interest Lands, using other areas within the ROW to avoid USFWS Interest Lands, and alternative routes be investigated to avoid impacts to USFWS Interest Lands, and after a thorough evaluation, if USFWS Interest Lands are impacted, unavoidable impacts to USFWS Interest Lands may require mitigation.

DOE/DOC-EERA response: As discussed in Section 1.3.1.4 of the EIS, once a route is selected and a permit is issued, the Applicant would contact landowners to gather information about their property and their concerns and discuss how the ROW would best proceed across the property. The Applicant will work with USFWS to determine if permits can be obtained to cross USFWS interest lands. The need for these permits will be determined once the final route is selected by the MN PUC.

Land Use—Agricultural resources and airstrips. Several comments expressed concern regarding potential impacts to agricultural land and farming operations including those outside the ROW. One comment requested that an Agricultural Impact Mitigation Plan (AIMP) be included as part of the EIS. Several comments expressed concern for potential proposed Project impacts to aerial spraying operations. Other comments expressed concern that transmission lines in close proximity to airstrips and public airports could pose potential hazards to take-offs and landings.

DOE/DOC-EERA response: Impacts to agricultural land use are addressed in Sections 5.3.2.1, 6.2.2.2, and 7.3.3.1. Impacts to airports and airstrips are discussed in Section 5.2.1.6 and alternatives are not expected to impact either public airports or private airstrips.

Cultural resources—Comments requested that cultural resources investigations are conducted for all disturbance areas for the proposed Project and that cultural resources and historic properties are evaluated with respect to effects from the proposed project. Comments requested that DOE consider the perspectives of federally recognized Indian tribes and include traditional cultural properties (TCPs) when conducting cultural resources investigations and involve federally recognized Indian tribes in the identification and evaluation efforts of TCPs, as well as consult with federally recognized Indian tribes to ensure that visual impacts on visually sensitive lands owned by the tribes are mitigated adequately or measures are taken to reduce those visual impacts.

DOE/DOC-EERA response: DOE has conducted government-to-government consultation with federally recognized Indian tribes pursuant to Section 106 of the NHPA of 1966, as amended. The discussion of DOE's tribal consultation is presented in Section 5.3.3.1 Archaeology and Historic Architectural Resources of the EIS. Further documentation of ongoing consultation with the federally recognized Indian tribes is provided in Appendix A of the EIS.

Wetlands and Water Quality—Several comments requested that the proposed Project avoid, minimize, and mitigate wetland impacts. A few comments expressed concern that the proposed Project could impact water resources.

DOE/DOC-EERA response: Specific wetland impacts will be quantified upon selection of a project alignment and project design. A mitigation plan for unavoidable wetland impacts is not available at this time. Once DOE and MN PUC issue permits for the Project, a wetland mitigation plan will be developed by the Applicant in coordination with USACE, BWSR, and appropriate local units of government as part of the environmental permitting process.

Biological Resources—Several comments requested that the proposed Project avoid and minimize impacts to a number of biological resources including vegetation, wildlife, rare species, and rare communities. Several comments expressed concern that the proposed Project could increase the spread of noxious weeds and invasive species. Several comments expressed concern that the proposed Project may impact migratory birds and/or that the Applicant should develop an Avian Protection Plan. Several comments expressed concern and requested that the selected alternatives avoid adverse and unnecessary impacts to wildlife habitats and rare communities.

DOE/DOC-EERA response: As discussed in Section 2.11.1 of the EIS, the Applicant would incorporate industry best practices to minimize impacts to migratory birds, which are consistent with the Avian Powerline Interaction Committee (APLIC's) 2012 guidelines. In addition, the MN PUC route permit could require that the Applicant develop and implement an Avian Protection Plan. The Applicant would coordinate with the MnDNR and other appropriate agencies in the development of an Avian Protection Plan. Impacts to vegetation are discussed in Chapters 5 and 6 of the EIS. Chapter

6 of the EIS identifies that the MN PUC Route Permit could also require the development of a Vegetation Management Plan as a permit condition, which could include plant surveys along the permitted ROW, incorporate vegetation clearing, and management of invasive species. The MN PUC typically requires the Applicant to prepare a vegetation management plan in coordination with the MnDNR as a condition of the Route Permit.

All comments, including late comments, were considered during the preparation of this Final EIS. Appendix Y in Volume II of this EIS contains the comments received on the Draft EIS and DOE's and DOC-EERA's responses to these comments. This Final EIS contains revisions and new information based in part on comments received on the Draft EIS.

DOE will announce its decision on its Proposed Action in a Record of Decision (ROD) in the Federal Register no sooner than 30 days after EPA publishes the NOA of the Final EIS, and not before the MN PUC's Route Permit decision. MN PUC's decision on a final route determination is expected in the first quarter of 2016.

The Minnesota Office of Administrative Hearings (OAH) conducted Public Hearings on the Applicant's route permit application. These hearings were held on August 5, 2015 in Roseau, Minnesota; on August 6, 2015 in Baudette, Minnesota and Littlfork, Minnesota; on August 12, 2015 in Kelliher and Bigfork, Minnesota; and on August 13, 2015 in Grand Rapids, Minnesota. The hearings were presided over by Administrative Law Judge Ann C. O'Reilly from the OAH. Notice of the hearings were published in local newspapers and mailed to persons on the project mailing list.

Judge O'Reilly will submit a report to the MN PUC following publication of the Final EIS, which will include findings of fact, conclusions of law, and recommendations on the Applicant's Route Permit application (Minnesota Statutes, section 2l6E.03, subdivisions 6 and 9 and Minnesota Rules, part 7850.2600). MN PUC will consider the ALJ's report and recommendation and determine which route alternative to permit and what conditions to include in the permit.

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2.1 Summary of Proposed Project

On April 15, 2014, the Applicant applied to the U.S, Department of Energy (DOE) for a Presidential permit to cross the U.S. / Canadian border in Roseau County, Minnesota.[33] The Applicant also applied to the MN PUC for a Route Permit to construct an approximately 220-mile, 500 kV alternating current (AC) high-voltage transmission line.[34]

On October 29, 2014, the Applicant submitted an amendment to their Presidential permit and Route Permit applications to DOE and the Minnesota Public Utilities Commission (MN PUC), respectively. The amended Presidential permit application changed the location of the proposed international border crossing under DOE's consideration to cross the U.S. / Canadian border at latitude 49 00 00.00 N and longitude 95 54 50.49 W, approximately 2.9 miles east of Highway 89 in Roseau County.

The transmission line would cross the border between the U.S. and Canada in Roseau County, Minnesota as identified above, and connect into the proposed **Iron Range** 500 kilovolt (kV) Substation adjacent to the existing Blackberry Substation near Grand Rapids, Minnesota (Map 2-1).

The proposed Project would be located on all new 200-foot-wide right-of-way (ROW) with a wider ROW required for certain spans at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. The ROW will be cleared of all vegetation and maintained in herbaceous or low shrub cover for the duration of the proposed Project.

The Applicant continues to evaluate several structure types and configurations that would be used for the Project, including: a self-supporting lattice structure, a lattice guyed-V structure, and a lattice guyed delta structure. The transmission towers would be steel lattice structures for the majority of the route, with the exact type of structure in any given location dependent on land type, land use, and potential effect on the surrounding landscape. The Applicant has requested 650 to 3,000 foot-wide route width for the Route Permit, depending on location, in order to provide flexibility during detailed design.

The transmission tower heights would range from approximately 100 feet to about 170 feet. In some **locations**, such as where the proposed Project crosses an existing transmission line, taller structures would be required. None of the structures are anticipated to be taller than 200 feet so they would not be required to meet Federal Aviation Administration (FAA) lighting standards. The Applicant currently estimates approximately 4 to 5 structures per mile of transmission line and the structures would be placed approximately 1,000 to 1,700 feet apart, with a maximum span of 1,700 feet. Where the transmission line crosses farmland, the Applicant would use self-supporting lattice structures to minimize interference with farm operations. The area of permanent impact for the guyed structures is anticipated to be **1,936** square feet per structure, with a temporary construction disturbance footprint of approximately 0.92 acres per structure.

As part of the proposed Project, the Applicant is also proposing to construct associated facilities including **the proposed Iron Range** 500 kV Substation, a new 500 kV Series Compensation Station, and three regeneration stations with permanent and temporary access roads. Additionally, construction of the proposed Project would require temporary and permanent access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

The Applicant proposes to expand the site of its existing 8.8 acre Blackberry 230/115 kV Substation near Grand Rapids, Minnesota to incorporate the **proposed Iron Range 500 kV Substation. It would be constructed adjacent to and east of the existing Blackberry Substation and would be expected to permanently impact approximately 23 acres**. The Applicant has entered a purchase option agreement with the owner of the property adjacent to and east of the existing Blackberry 230/115 kV Substation. The **proposed Iron Range** 500 kV Substation would accommodate the new 500 kV transmission line, existing 230 kV transmission lines, and all associated 500 kV and 230 kV equipment.

The Applicant proposes to locate a new 500 kV Series Compensation Station within or adjacent to the final route approved by the MN PUC. The final location for the 500 kV Series Compensation Station would be determined by electric design optimization studies and final route selection, but would likely be located at the approximate midpoint **between the existing Dorsey Substation in Canada and the proposed Iron Range 500 kV Substation that would be located just east of the existing Blackberry Substation.** The Series Compensation Station will permanently impact approximately **6 acres**.

The Applicant proposes to locate three regeneration stations within or adjacent to the final route

33 The Presidential permit application and application amendment are available at: http://www.greatnortherneis.org/Home/documents.

34 Available at: http://mn.gov/commerce/energyfacilities//resource.html?Id=33849 (The Route Permit application is nearly identical to the Presidential permit application).

approved by the MN PUC. The sites would be 75 feet by 75 feet and located on upland areas.

The Applicant has indicated that it will be necessary to construct temporary access roads within the ROW for construction. They will work with local property owners to identify suitable access locations during final design. The typical width of the temporary access road would be 16 feet.

The Applicant proposes to establish a permanent "2-track" trail on uplands within the permanent right-of-way as a result of construction traffic. This "2-track" trail would be unimproved and it is assumed that there will be no grading or filling for this permanent access.

The Applicant proposes to establish a main staging area for temporary storage of materials and equipment. There would be other temporary staging areas located along the ROW for laydown and framing prior to structure installation. The laydown areas would be approximately 20 to 40 acres, and would be located along suitable roadways approximately 40 to 50 miles apart, and would be within 5 miles from the final route approved by the MN PUC. Upland areas with prior disturbance will be preferred; however, there may be some areas where this is not feasible, so other areas may need to be used. These yards would be in place for at least one year and used to store equipment and materials and include the construction offices. The Applicant will identify specific staging areas during final design.

The Applicant proposes to establish temporary stringing sites within or adjacent to the final route approved by the MN PUC. The sites would be approximately 2.8 acres in size and spaced 2 miles apart.

The Applicant proposes to establish fly-in sites that would be approximately 10 acres in size, located as near to the ROW as possible, and approximately 5 to 7 miles apart. These sites would be in place for less than 1 year (likely 6 months) and are used to assemble structures for helicopter (sky crane) construction. Upland areas with prior disturbance will be preferred; however, there may be some areas where this is not feasible and other areas would be used. The Applicant will identify fly-in sites during final design.

Additional details of the proposed Project and construction methods are provided in Section 2.7 through Section 2.11. **According to the Applicant, details of the construction methods are subject to change based on field surveys.**

2.2 Applicant's Objectives

The Applicant's federal and state permit applications state that the purpose of the proposed Project is to efficiently provide the Applicant's customers and the region with energy that will: (a) help meet the region's growing energy demands; (b) advance Minnesota Power's Energy Forward strategy of increasing its generation diversity and renewable portfolio; (c) strengthen electric system reliability; and (d) fulfill the Applicant's obligations under its power purchase agreements with Manitoba Hydro, all in a manner that is consistent with the Applicant's commitment to making a positive impact on communities.

As described in their certificate of need application, the Applicant evaluated a wide range of alternative methods to meet their long-term goals, and determined that the proposed Project best meets their objectives and provides other benefits to their region and customers.[35] The complex relationship between the three factors listed above and the need for this transmission line is the central issue of the MN PUC's ongoing certificate of need proceeding for this proposed Project.[36] The purpose of this Environmental Impact Statement (EIS), on the other hand, is to provide the information needed by federal and state regulators to make informed decisions on whether to issue permits for the proposed Project and what permit conditions would be in the public interest.

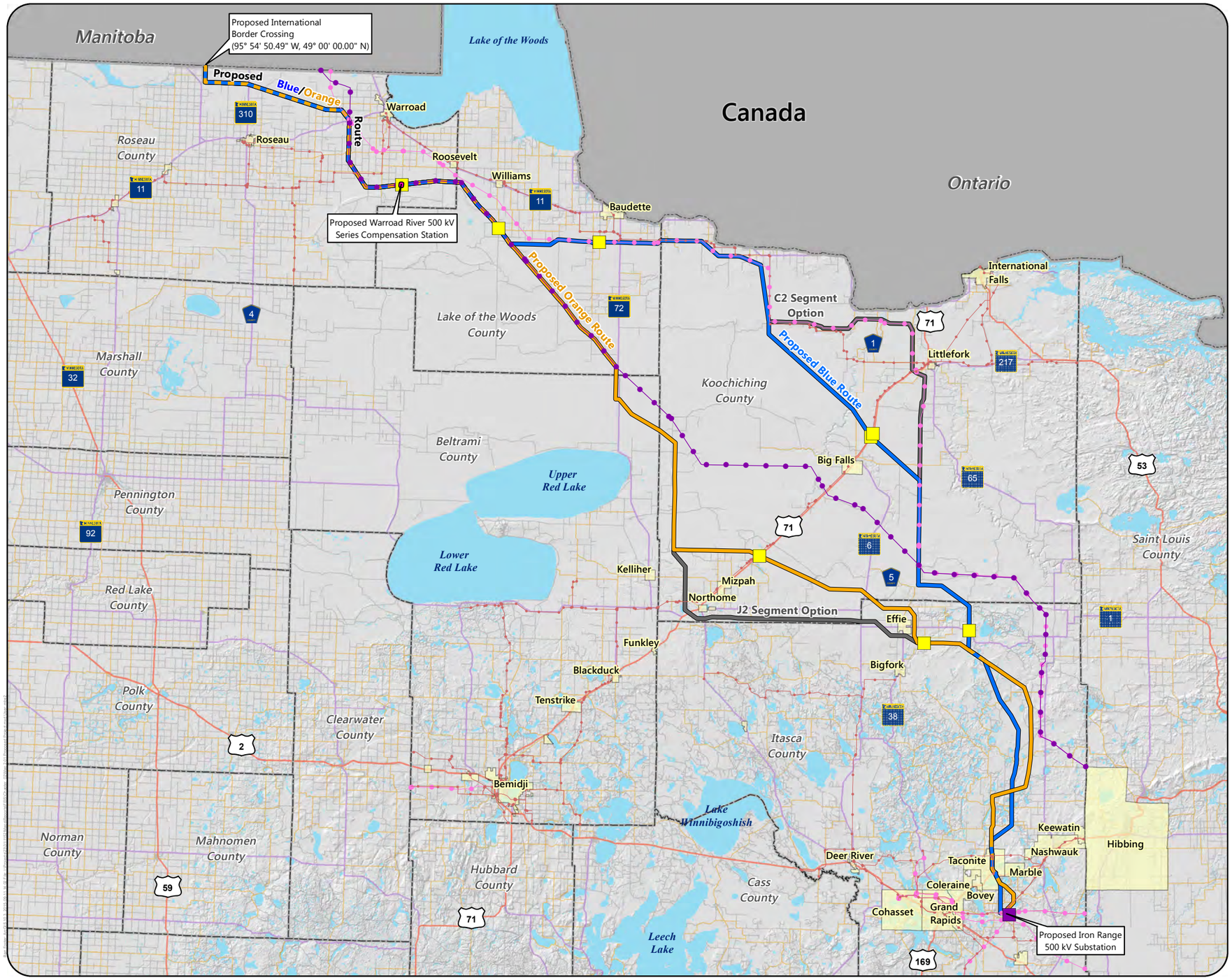
2.2.1 Manitoba Hydroelectric Capacity

Manitoba Hydro is a Canadian Crown Corporation and the province's major energy utility. It currently operates 14 hydroelectric generating stations on the Winnipeg, Saskatchewan, and Nelson rivers in Manitoba with a total generating capacity of more than 5,000 megawatts (MW), and has supplied power to Minnesota since 1970. The existing Manitoba hydroelectric facilities already supply approximately 10 percent of Minnesota's electrical needs. Manitoba Hydro estimates that up to 5,000 MW of additional hydroelectric capacity could be developed in the province if there were sufficient demand for the power and more transmission capacity.[37] According to Midcontinent Independent System Operator's (MISO)

35 *In the Matter of the Request by Minnesota Power for a Certificate of Need for the Great Northern Transmission Line,* MN PUC Docket No. E015/CN-12-1163.

36 *In the Matter of the Request by Minnesota Power for a Certificate of Need for the Great Northern Transmission Line,* MN PUC Docket No. E015/CN-12-1163.

37 Manitoba Hydro's System Development Plans, http://www.cce.umn.edu/documents/cpe-conferences/mipsycon-papers/2012/manitobahydrossystemdevelopmentplan.pdf, accessed December 15, 2014.



- Proposed Regeneration Site
- Proposed Series Compensation Station
- Proposed Blackberry 500 kV Substation

Proposed Routes

- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Existing Transmission Lines

- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways

- US Highway
- State Trunk Highway
- County State Aid Highway
- Local Road
- Municipal Boundary
- County Boundary
- International Boundary

Miles
14 7 0 14

Map 2-01

PROPOSED PROJECT
Great Northern Transmission Line
Final Environmental Impact Statement

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Manitoba Hydro Wind Synergy Study, Manitoba Hydro is looking to expand its hydro system by 2,230MW over the next 15 years.[38]

Manitoba-based hydropower is currently exported to the U.S. on four high-voltage transmission lines: one 500 kV transmission line and three 230 kV transmission lines. However, only two of these transmission lines directly connect into Minnesota. One is a 230 kV transmission line that is jointly owned by Minnkota Power Cooperative and the Applicant, and the other is the 500 kV Forbes-Riel transmission line owned by Xcel Energy.

Both of these transmission lines cross the Manitoba-Minnesota border near Roseau, Minnesota, and connect into substations on Minnesota's Iron Range. The 230 kV transmission line crosses the Manitoba-Minnesota border approximately four miles north-northwest of County Road 137 and 540th Avenue and connects into the Shannon Substation near Hibbing, Minnesota. Xcel Energy's 500 kV transmission line crosses the international border about 1.5 miles west of the 230 kV transmission line and connects to the Forbes Substation. From there, a separate 500 kV transmission line continues from Forbes to the Chisago Substation near Minneapolis-St. Paul.

The proposed Project would add a new high-capacity grid connection between Manitoba's hydroelectric generation facilities and the U.S. The proposed Project is part of the Applicant's long-term plan, called EnergyForward, to shift from primarily coal-fired generation to an approximately equal mix of coal, natural gas, and renewables. Recent regional transmission studies have shown that these existing transmission tie lines from Manitoba cannot accommodate significant additional energy transfers into the U.S.[39]

On July 2, 2014, Manitoba Hydro was granted approval to build a new hydroelectric station on the Nelson River: the 695 MW Keeyask Generating Station. This approval was based in part on the recent power agreements between Manitoba Hydro and the Applicant (described below), as well as an agreement with another U.S. electric utility. Manitoba Hydro started building the Keeyask Generating Station on July 16, 2014.

38 https://www.google.com/search?sourceid=navclient&aq=&oq=Miso+Manitoba+Hydro+wind+energy+study&ie=UTF-8&rlz=1T4NDKB_enUS570US570&q=Miso+Manitoba+Hydro+wind+energy+study&gs_l=hp....0.0.0.13675.....0.oBT5HzE-xNA.

39 See, e.g., https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={B4350025-B874-47BE-AC84-365B2239B082} at 19.

The major remaining barrier to increasing Manitoba hydroelectric power delivery to the U.S. is the lack of transmission capacity. Therefore, the Applicant's primary objective is to add at least 383 MW of new reliable transmission capacity between their system and Manitoba Hydro's system in order to meet their long-term resource-mix and wind-energy storage goals.

2.2.2 Northeast Minnesota and Regional Energy Demand

The proposed Project is designed to be able to transmit enough capacity to meet the Applicant's 383 MW requirements as well as an additional 500 MW—up to a total of 883 MW— in order to accommodate the Applicant's agreements with Manitoba Hydro and other projected requirements in the MISO region.[40] Both MISO and the Applicant believe that a new 500 kV transmission line—which can **facilitate** up to 883 MW of electric power **transfers between Manitoba and the U.S.**—is needed to meet long-term regional needs, especially as industrial load in Minnesota's Iron Range continues to increase. As described in more detail below, the MN PUC is reviewing the Applicant's analysis of these issues in its ongoing certificate of need proceeding.[41]

Not only would the new transmission line help meet long-term regional needs, but it would enhance system reliability. An unplanned outage of the existing 500 kV transmission Riel-Forbes tie line is the second largest contingency in the MISO footprint.[42] Developing a second 500 kV transmission tie line from Manitoba to the Iron Range would reduce loading on the existing Riel-Forbes 500 kV transmission line and improve the performance of the transmission system during such a contingency.[43]

40 Midcontinent Independent System Operator (MISO) is an independent, not-for-profit regional transmission organization responsible for maintaining reliable transmission of power in 15 U.S. states and the Canadian province of Manitoba. MISO also provides independent, equal, and non-discriminatory access to the electric transmission system. MISO's efficient market operations ensure and support increased grid reliability.

41 *In the Matter of the Request by Minnesota Power for a Certificate of Need for the Great Northern Transmission Line*, MN PUC Docket No. E015/CN-12-1163.

42 A contingency is the loss or failure of a part of the power system (e.g. a transmission line). Current electric utility operating policies require that each utility's power system must be able to withstand and recover from any "first contingency" or any single failure such as the loss of a major component like the Riel-Forbes 500 kV transmission line.

43 See, e.g., https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={B4350025-B874-47BE-AC84-365B2239B082} at 19.

The Applicant supplies retail electric service to 144,000 customers, and wholesale electric service to 16 municipalities, within a 26,000 square-mile area in northeastern Minnesota. It operates transmission and distribution systems, including 8,866 miles of transmission lines **and distribution lines** and 169 power substations, including the existing Blackberry Substation, where the proposed Project would interconnect.

The Applicant has historically generated the majority of its electricity from coal-fired units located in northern Minnesota and west-central North Dakota. However, as part of their two most recent integrated resource plans submitted to the MN PUC, the Applicant included a portfolio of North Dakota wind resources and a 250 MW power purchase agreement (PPA) with Manitoba Hydro.

Subsequently, in the docket that approved a 250 MW PPA with Manitoba Hydro, the MN PUC affirmed that the Applicant had significant projected deficits in capacity and output over the period 2020-2035, and therefore, the company "would need a significant additional amount of peaking capacity and energy to meet its future capacity and energy needs."[44] The details regarding the relationship between the Manitoba Hydro 250 MW agreements, the Applicant's demand forecast, and this proposed transmission line is part of the MN PUC's ongoing certificate of need proceeding.[45]

2.2.3 North Dakota Wind Energy Renewable Optimization Opportunity

Since 2012, the Applicant has constructed nearly 500 MW of wind capacity at its Bison Wind Energy Center in south-central North Dakota near the town of New Salem. Once the 200 MW Bison 4 project is operating, the total wind energy produced by the four Bison wind projects will already bring the company to the verge of meeting Minnesota's energy standard of 25 percent renewable energy by in 2015, nearly ten years before the statute's 2025 deadline.

The Applicant's North Dakota wind facilities at times produce more energy than they need or can sell to other utilities. Therefore, any cost-effective method to store and dispatch wind energy would add value to their wind energy investment. The Applicant has determined that a new 500 kV transmission tie line with the Manitoba hydroelectric system would not only provide them with additional hydroelectric capacity, but it would also provide an opportunity to optimize and use what would otherwise be excess wind energy on Manitoba Hydro's system such that it can be dispatched when it is needed.

Therefore, in addition to the 250 MW PPA, the Applicant negotiated an Energy Exchange Agreement that allows the Applicant to sell excess wind energy to Manitoba Hydro when their North Dakota wind production is high and not needed for customer load. This in turn would allow Manitoba Hydro to reduce the flow of water through their hydropower plants during high wind periods, storing hydro energy by increasing the water stored behind those generating stations. The water stored during this process could be used later to generate electricity to be scheduled to Minnesota when wind energy production is low.

The Applicant and Manitoba Hydro also recently finalized the critical commercial terms for an additional 133 MW "Renewable Optimization Agreement" that **was approved by the MN PUC on January 30, 2015 (MN PUC Docket No. E015/M-14-960)**. As summarized above, the Energy Exchange Agreement (which is part of the PPA) and the Renewable Optimization Agreement allow the Applicant and Manitoba Hydro to optimize the use of both wind-generated energy and hydropower. The PPA and the Energy Exchange Agreement were approved by the MN PUC on February 1, 2012.[46] If the MN PUC approves the additional 133 MW renewable optimization agreement, the total capacity of the recent Manitoba Hydro agreements would be 383 MW.

2.3 Applicant's Route Selection Process

2.3.1 Summary of Process

The Applicant began their route selection process with a 20,000 square mile study area and undertook an iterative process that used several routing factors and rounds of public involvement meetings to narrow the initial study area, first into study corridors, then into preliminary route alternatives, and finally into refined route alternatives. From August 2012 to November 2013, the Applicant organized more than 75 agency and public meetings and, as noted in Section 1.4.3, prior to DOE and Minnesota Department of Commerce – Energy Environmental Review and Analysis (DOC-EERA) joint scoping meetings, the Applicant placed advertisements in 11 local and regional newspapers

44 MN PUC Order approving the Minnesota Power – Manitoba Hydro Purchased Power Agreement and Energy Exchange Agreement, MN PUC Docket No. E-015/M-11-983, February 1, 2012

45 In the Matter of the Request by Minnesota Power for a Certificate of Need for the Great Northern Transmission Line, MN PUC Docket No. E015/CN-12-1163

46 MN PUC Docket No. E-015/M-11- 938 ("938 Docket")

along the proposed Project corridor to invite the public to local agency and public meetings and to announce meeting times and locations. Copies of newspaper tear sheets and affidavits are available at the DOC-EERA e-dockets website.[47]

2.3.2 Study Area

The boundary of the Applicant's 20,000 square mile study area was generally developed to include the proposed Project endpoints, extending from the Minnesota-Manitoba border to the delivery location at the proposed **Iron Range** 500 kV Substation. The boundaries of the Applicant's study area are described in further in their Presidential permit and Route Permit applications (Minnesota Power 2014, reference (1)).

The counties in the western one-third of the Applicant's study area are primarily agricultural, characterized by a relatively dispersed population with several small, distributed population centers. The communities in these more agricultural areas to the west value the economic activities of agriculture, tourism, and manufacturing.

The counties in the eastern two-thirds of the Applicant's study area are mostly wetlands, peatlands, and forested areas with lower population density areas and large tracts of federal, state, and county owned lands located throughout the middle of the study area including southern Lake of the Woods County, northern Beltrami County, and Koochiching County. Population density increases moving south and east, with Itasca and Beltrami counties having the highest population in the study area, concentrated in large population centers such as Grand Rapids and Iron Range cities. The economies of the communities in this region are centered on mining, tourism, and manufacturing with relatively little agriculture.

2.3.2.1 Study Corridors

The Applicant developed several study corridors within the study area by reviewing information on environmental and human settlement, meeting with stakeholders, and performing broad environmental and engineering analyses. The Applicant's study corridors were generally 5 to 20 miles wide and met the Applicant's objective of avoiding constraints such as densely populated areas, U.S. Fish and Wildlife Service (USFWS) National Wildlife Refuges, American Indian Lands and Reservations, Minnesota Scientific and Natural Areas (SNAs), large lakes and areas with a high-density of lakes and large wetland complexes, and contiguous areas of relatively undisturbed natural resources. The Applicant then evaluated the study corridors based on the following factors:

Constraints: Routing constraints as defined as resources or conditions that could limit or prevent transmission line development. Avoiding those resources was a goal, but not necessarily a requirement, of the Applicant's route development process. Constraints identified by the Applicant included areas restricted by regulations, or areas where impacts on resources will be difficult to mitigate.

Opportunities: Opportunities are defined as resources or conditions that will facilitate the proposed Project development, for example pre-existing linear infrastructure or other features (for example, roads, transmission lines, and public land survey divisions of land) along which the proposed Project development will be particularly compatible. These opportunities are viewed by the Applicant as avenues to facilitate the proposed Project development by reducing impacts from constraints.

Technical Guidelines: Technical guidelines are defined as the specific engineering requirements and objectives associated with the construction of the proposed Project. These technical guidelines are specific to the proposed Project and provide the technical limitations related to the design, ROW requirements, and reliability concerns.

2.3.2.2 Preliminary Route Alternatives

The Applicant developed a network of potential route segments to compare and evaluate potential route alternatives. The network included opportunities for corridor sharing while avoiding areas with a high concentration of constraints, such as municipalities, and minimizing proximity to residences.

Once the network was developed, the Applicant analyzed the potential impacts associated with the route segments. The first step was to compare groups of smaller routes (contiguous route segments typically 3 to 10 miles long) that had common start and end points and were based on the Applicant's opportunities, constraints, and technical considerations identified in Section 2.3.2.1. When all other factors were relatively equal, the Applicant generally gave preference to the route that had fewer residences in its proximity, less impact on wetlands, and was the shortest length.

Preliminary route alternatives were presented to the public at a second round of open house meetings and to individual agencies during spring 2013. These

47 E-dockets number 14-21, document ID 20149-103236-01 is available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showeDocketsSearch&showEdocket=true.

meetings provided the public and agencies with updated information and facilitated the collection of comments for use in the next step of the route development process.

2.3.2.3 Refined Route Alternatives

The Applicant screened the preliminary route alternatives and defined the refined route alternatives based on feedback from stakeholders and the public and further analysis of the routing factors. Each route alternative was 1,000 to 3,000 feet wide.

The Applicant presented the refined route alternatives to the public at a third round of open house meetings and to individual agencies in the fall 2013. Again, the Applicant used these meetings as an opportunity to both inform stakeholders about the proposed Project and to gather additional information from the public and agencies for use in the route development process.

At the beginning of project planning, the Applicant anticipated development of two transmission lines and associated facilities—the proposed Project and a separate 345 kV transmission line between the proposed **Iron Range** 500 kV Substation and the Arrowhead Substation near Hermantown, Minnesota. Subsequently, the Applicant determined that there were not sufficient transmission service requests to support this 345 kV transmission line. Therefore, the Applicant is not pursuing the 345 kV transmission line at this time.

2.3.3 Border Crossing — Applicant Considerations and Preference

The proposed border crossing location is identified by the Applicant in its October 2014, amended Presidential permit application to DOE. While multiple alternate border crossings were considered during the development of proposed Project, the Applicant and Manitoba Hydro identified the proposed border crossing location as their preferred crossing due to concerns related to First Nations in Canada and environmental impacts affecting the viability of alternate border crossings. Details regarding the Applicant's border crossing selection process, including the factors and alternate border crossings they considered, are described in Section 4.11 of the April 2014 Presidential permit and Route Permit applications.[48]

2.3.3.1 Border Crossing — Manitoba Hydro Considerations and Preference

Key border crossing considerations for Manitoba Hydro included determining route options that balance natural and engineering considerations while taking into consideration feedback from the public, stakeholders, and aboriginal communities. Manitoba Hydro identified Option A7 as the best option based on all considered factors. Option A1 and Option A2 were not feasible as they traverse areas of high biological diversity in Manitoba that have been noted by agencies and environmental non-governmental organizations and primarily traverse Crown lands, which have been criticized as a routing approach by the Clean Environment Commission. Additionally, Option A1 and Option A2 could raise significant concerns from First Nation communities in terms of traditional uses of the area. Manitoba Hydro maintains a website for the Manitoba-Minnesota Transmission project that details the Environmental Assessment and route selection process.[49]

2.3.3.2 Border Crossing — Decision Process

Option A6 and Option A7 were infeasible from the Applicant's perspective because the associated route on the U.S side of the border would affect too many homes, farmland, and a state designated area of outstanding biological diversity. Options A1 and A2, however, were infeasible from Manitoba Hydro's perspective, so these crossings were removed from further consideration. Additionally, Manitoba Hydro preferred the most western crossing (Option A5) over the east crossing (Option A3/A4), since access to the east crossing (Option A3/A4) would also require the selection of a route with more potential environmental impacts.[50]

Therefore, Manitoba Hydro and the Applicant agreed that Option A5 was the best and only feasible Border Crossing Option, taking into account its acceptability to parties, environmental impacts, community impacts, and overall proposed Project schedule (Minnesota Statutes, section 216E.02, subdivision 3). Section 4.11 of the April 2014 Presidential permit and Route Permit applications (reference (1) describes DOE's consideration of border crossing alternatives during the scoping process.

48 Available at: http://www.greatnortherneis.org/Home/documents or http://mn.gov/commerce/energyfacilities//resource.html?Id=33849.

49 Available at: https://www.hydro.mb.ca/projects/mb_mn_transmission/index.shtml.

50 Available at: http://www.greatnortherneis.org/Home/documents or http://mn.gov/commerce/energyfacilities//resource.html?Id=33849.

2.4 Applicant's Proposed Routes

The following provides a detailed description of the locations for the Applicant's proposed route alternatives and segment options (Map 2-1).

2.4.1 Blue Route

The Blue Route is the Applicant's Preferred Route. The Blue Route would originate at the Minnesota-Manitoba border roughly 2.9 miles east of Highway 89 in Roseau County, Minnesota. It would proceed southeast 0.5 miles to 410th Street, approximately 0.16 of a mile from the intersection of 410th Street and County Road 3. The Blue Route would travel south 2 miles to 390th Street and turn east following 390th Street for 10.5 miles (where 390th street then turns into County Road 118). At 0.25 miles from Highway 310 the proposed line would turn southeast and continue for another 12 miles. At 0.5 miles from 510th Avenue, the proposed line would again turn and travel 2.3 miles east to join the existing Minnkota Power 230 kV line. The Blue Route would parallel the existing Minnkota Power 230 kV line southeast for 1.8 miles and then turn south where it would meet the existing Xcel 500 kV line. Beginning at a tenth of mile north of US Highway 11, the proposed transmission line would parallel the existing Xcel 500 kV line route for 36 miles after which it would turn east, leaving the Xcel 500 kV line 2 miles southeast of the intersection of Faunce Forest Road and 19th Street Southwest in Lake of the Woods County.

The Blue Route would proceed east for 5.8 miles and then turn northeast to rejoin the existing Minnkota Power 230 kV line at its intersection with Pitt Grade Trail. The proposed line would then parallel this existing 230 kV line in an easterly direction for 31 miles to a point 1.5 miles west of the County Road 86 in Koochiching County where it would then proceed southeast for 8.3 miles and then south for 1.8 miles. At this point, the Blue Route would be roughly 1.5 mile south from the intersection of County Road 32 and County Road 36 in Koochiching County. The line would then continue southeast for 21.3 miles and intersect Highway 71 roughly 4.5 miles northeast of Big Falls, where it would continue an additional 9.6 miles to the southeast where it would rejoin the existing Minnkota Power 230 kV line, following the existing line in a southerly direction for 12.3 miles.

The Blue Route would continue south for 3 miles following Deer River Line Road (also called County Road 62). The transmission line would turn east for 3.5 miles and then turn southeast again and travel 5 miles to Itasca County near the intersection of County Road 523 and South Lofgrin Forest Road. The proposed line would extend south for 6.4 miles, turning slightly southeast for another 2.8 miles, and then head south for 11.5 miles. At 2.8 miles north of Scooty Lake, the Blue Route would continue to travel 7.5 miles south to County Road 530, where it would cross the West Fork Prairie River. At County Road 530, the proposed line would again turn south and continue 6.5 miles to County Road 57. The line would turn southwest for 3.7 miles, and then head south for 3.8 miles to Diamond Lake Road. The route then heads south, southeast for 2.7 miles. At the Swan River, Blue Route heads south for 4.4 miles where it would meet the existing Minnesota Power 230 kV line, paralleling it for 1 mile to the **proposed Iron Range** 500 kV Substation near Grand Rapids, Minnesota. The Blue Route is 220 miles in length.

2.4.2 Orange Route

The Orange Route originates at the Minnesota-Manitoba border roughly 2.9 miles east of Highway 89 in Roseau County and continues south for approximately 2.5 miles. The Orange Route then heads east for 11 miles to Minnesota TH 310. From Section 2, Township 163N, Range 40W, the Orange Route proceeds southeast for 12 miles to Section 26, Township 163N, Range 38W.

From there, the Orange Route continues east for 2.5 miles to the existing Minnkota Power 230 kV transmission line. The Orange Route follows the 230 kV transmission line southeast for 1.75 miles to the existing Xcel Energy 500 kV transmission line. From this point, the Orange Route follows the existing Xcel Energy 500 kV transmission line to Section 25, Township 157N, Range 31W.

The Orange Route then heads south for 4.75 miles to Section 24, Township 156N, Range 31W. The Orange Route then heads east for 0.5 mile, crossing TH 72, then southeast for 10.5 miles to Section 21, Township 155N, Range 29W. The Orange Route continues south for 16.0 miles to Section 9, Township 152N, Range 29W.

From there, the Orange Route continues east for 12.0 miles to Section 8, Township 152N, Range 27W. The Orange Route then heads southeast for 13.0 miles to Section 5, Township 151N, Range 25W. The Orange Route then continues east for 5.0 miles, southeast for 4.25 miles, and then east for 4.0 miles to Section 11, Township 162N, Range 62W.

The Orange Route then heads southeast for 5.5 miles, crossing TH 1, to Section 1, Township 161N, Range 26W. The Orange Route then heads east

for 6.0 miles to Section 6, Township 161N, Range 24W. The Orange Route then proceeds southeast for 11.5 miles to Section 3, Township 60N, Range 23W. The Orange Route then heads south for 15.0 miles, staying east of Bear Lake and Wolf Lake, to Section 15, Township 58N, Range 23W.

From there, the Orange Route continues southwest, utilizing an old Minnesota Power ROW to Section 26, Township 58N, Range 24W. The Orange Route then heads south, between Bass Lake and Lawrence Lake, to Section 11, Township 56N, Range 24W. From there, it follows an existing 115 kV transmission line south to Section 23, Township 56N, Range 24W. The Orange Route continues southeast, between Holman Lake and South Twin Lake, for 4.0 miles to Section 5, Township 55N, Range 23W. From there, the Orange Route heads south for 1.0 mile to the existing Minnesota Power 115 kV transmission line. The Orange Route follows the existing 115 kV transmission line southwest and then south to the **proposed Iron Range 500 kV Substation** location. The Orange Route is 220 miles in length.

2.4.3 Segment Options

Based on comments received from the public and agencies during its route selection process, the Applicant identified two additional route segments as potential options, which it included in its Presidential permit and Route Permit applications (Minnesota Power 2014, reference (1)). These segment options, according to the Applicant, would have the following impacts compared to the primary route.

- The Applicant compared two segments for the Blue Route: Segment Option C1 which is a segment of the Blue Route, and its alternative segment - Segment Option C2. Segment Option C1 is shorter, and goes through undeveloped forest, whereas Segment Option C2 is longer, parallels an existing transmission line, and is closer to residences.
- The Applicant compared two segments for the Orange Route: Segment Option J1 which is a segment of the Orange Route, and its alternative segment - Segment Option J2. Segment Option J1 goes through undeveloped forest, whereas Segment Option J2 is closer to residences.

2.4.3.1 Segment Option C1

Segment Option C1, which is the equivalent part of the Blue Route, begins in Section 22, Township 158N, Range 27W. This segment continues to the southeast, cross-country, for 32 miles to the Minnesota Power 230 kV transmission line in Section 6, Township 65N, Range 25W.

2.4.3.2 Segment Option C2

Segment Option C2 begins in Section 22, Township 158N, Range 27W and follows the Minnkota and Minnesota Power 230 kV transmission line east and then south for 47.0 miles to Section 6, Township 65N, Range 25W.

2.4.3.3 Segment Option J1

Segment Option J1, which is equivalent part of the Orange Route, begins in Section 9, Township 152N, Range 29W. From there, Segment Option J1 heads east for 12.0 miles to Section 8, Township 152N, Range 27W. It then heads southeast for 13.0 miles to Section 5, Township 151N, Range 25W. Segment Option J1 continues east for 5.0 miles; southeast for 4.25 miles; and east for 4.0 miles to Section 11, Township 162N, Range 62W. Segment Option J1 then heads southeast for 5.5 miles, crossing TH 1, to Section 1, Township 161N, Range 26W. Segment Option J1 then heads east for 6.0 miles to Section 6, Township 161N, Range 24W. Segment Option J1 proceeds southeast for 5.0 miles to Section 8, Township 61N, Range 24W.

2.4.3.4 Segment Option J2

Segment Option J2 begins in Section 9, Township 152N, Range 29W. It heads southeast for 2.5 miles; south for 6.0 miles; and then southeast for 2.0 miles to Section 36, Township 151N, Range 29W. Segment Option J2 then heads east for 26.0 miles to Section 24, Township 62N, Range 27W. It then heads southeast for 3.0 miles, crossing TH 1. Segment Option J2 then heads east for 2.0 miles, crossing TH 38, then southeast for 2.0 miles to Section 1, Township 61N, Range 26W. Segment Option J2 heads east for 6.0 miles to Section 6, Township 161N, Range 24W. It then heads southeast for 5.0 miles to Section 8, Township 61N, Range 24W.

2.4.4 Route Alternatives Considered but Rejected by Applicant

The Applicant considered numerous factors when selecting the two proposed route alternatives. Potential western route options were eliminated from further analysis for the following reasons:[51]

Timing Considerations Associated with Public Opposition: Based on the amount of property it would have to acquire, and the likelihood of

51 See Chapter 4 of the Presidential permit/Route Permit Application for a detailed description of the Applicant's route development and screening process.

resistance from landowners, the Applicant estimated the time it would take to construct the transmission line. As part of that estimation, the Applicant took into consideration the possibility that it would have to conduct time-consuming condemnation proceedings, including Minnesota condemnation law.

Because the western-southern routes would involve a larger number of privately owned parcels, many of which are used for residential or agricultural purposes, and because public meeting attendees in the vicinity of the western and southern routes voiced more numerous and strenuous objections, the Applicant concluded that using the western-southern routes would make achieving the contractually-determined June 1, 2020, in-service date unlikely. Not achieving the June 1, 2020, in service date would be inconsistent with the Applicant's statement of purpose and need for the proposed Project. On this basis, the Applicant eliminated the western-southern routes from further consideration.

Impacts on Community: The density of human settlement in the areas west and south of Red Lake is much higher than areas further to the east. The least populated western-southern route had a higher percentage of private land, and more than twice the number of homes within a 3,000-foot potential route width, than the eastern routes (Table 2-1). The least impactful of the western and southern routes on communities also crossed through more than 2,646 acres of agricultural land, as compared to 79 to 90 acres for the eastern routes.

The portion of the route south of Red Lake is an area of particularly dense human settlement, and numerous lakes. In addition, the area is home to a number of wild rice lakes, which are seasonally flooded and provide transitional habitat to several avian species. All of the western-southern routes would have to cross this area south of Red Lake. One of the Applicant's goals when constructing any project is to have a positive impact on the affected communities. The Applicant concluded that the higher population density and negative reaction from residents near the western and southern routes would threaten that goal. The Applicant accordingly concluded that the western-southern routes do not satisfy its objective to positively impact communities. That failure was a second, independent reason to eliminate the western-southern routes from further consideration.

Availability of Western Border-Crossing Options: The proposed Project depends on the alignment of the permitted international border crossings in Manitoba and Minnesota. During the negotiations regarding the international border crossing, the Applicant and Manitoba Hydro agreed to eliminate the western-most international border crossing area because it was less desirable than other international border crossing options for a number of reasons, including effects on human settlement and the environment. The elimination of the western-most international border crossing necessarily eliminated the western-most route alternatives, which were exclusively associated with that international border crossing.

Limited Opportunities for Corridor Sharing: MN PUC's routing criteria for high-voltage transmission lines favor routes that parallel existing high-voltage transmission lines (corridor sharing) to the greatest extent practicable. The Orange and Blue routes that the Applicant presented in its Presidential permit and Route Permit applications both parallel existing transmission lines along large sections of the route (Minnesota Power 2014, reference (1)). The potential western route alternatives, on the other hand, do not parallel any existing high-voltage transmission lines. While this factor did not require the elimination of the western route alternatives, it does make those route alternatives less desirable from the state's regulatory perspective. The Applicant considers the limited opportunities for corridor sharing to be an additional reason for excluding the western routes from further analysis.

2.5 Technical Description

2.5.1 Number of Circuits

The Applicant proposes to construct a single-circuit 500 kV alternating current (AC) overhead transmission line.

2.5.2 Operating Voltage and Frequency

The nominal three-phase operating voltage for the proposed Project will be 500 kV AC. The proposed Project will be operated at a frequency of 60 Hertz (Hz).

2.5.3 Conductor Specifications

The Applicant anticipates using a 3-bundle 1192.5 thousand circular mil (kcmil) aluminum conductor steel reinforced (ACSR) "bunting" with 18 inch sub-spacing as the conductor for the proposed Project. This 3-conductor bundle is the same as that used on the U.S. portion of the existing Riel-Chisago 500 kV transmission line (and so will look the same). The Applicant will, however, perform a conductor

Table 2-1 Comparison of Resources Types in the Western and Eastern Regions

Resource Type	Western Region	Eastern Region
Number of houses/section	1.76	0.5
Acres of farmland/section	---	---
All Agricultural Land(1)	442	65
Prime farmland(2)	89	27
Prime farmland if drained(2)	203	99
Farmland of statewide importance(2)	157	54
Acres of forestland/section	113	395
Acres of wetlands/section	97	435
Acres of forested wetlands/section	43	394
Acres of public land/section	65	482
Acres of private land (does not include corporate land)/section	566	123
Acres of corporate land/section	0.3	29

Source: Minnesota Power 2015, reference (8)

(1) Acreages were calculated using data from Minnesota Department of Natural Resources (MnDNR) Gap Analysis Program (GAP) Level 2 Data for "Farm/Crop".

(2) Acreages were calculated using data from U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) Soil Survey Geographic Database (SSURGO).

optimization study before a final determination is made on conductor selection and bundle configuration.

2.5.4 Typical Supporting Structure

The Applicant is evaluating several structure types and configurations, including a self-supporting lattice structure, a lattice guyed-V structure, and a lattice guyed-delta structure (Figure 2-1). It is currently estimated that 4 to 5 structures will be needed per mile of transmission line. The type of structure in any given location of transmission line will depend on land type and land use.

The structures will typically range in height from 100 to 170 feet, depending on the structure type and the terrain. In some **locations**, such as where the proposed Project crosses an existing transmission line, taller structures may be required. The structures would be placed approximately 1,000 to 1,450 feet apart, with a maximum span of 1,700 feet. Where the transmission line crosses farmland, the Applicant would use self-supporting lattice structures to minimize interference with farm operations.

On cultivated land or in areas of intensive land use, the Applicant anticipates using self-supporting lattice structures. In other areas where guy wires will not significantly interfere with land use, the proposed Project may be installed on one of the guyed structure types. The area of permanent impact for guyed structures is anticipated to be **1,936** square feet per structure with a temporary construction disturbance footprint of approximately 0.92 acres per structure. Structure types are illustrated in Figure 2-1.

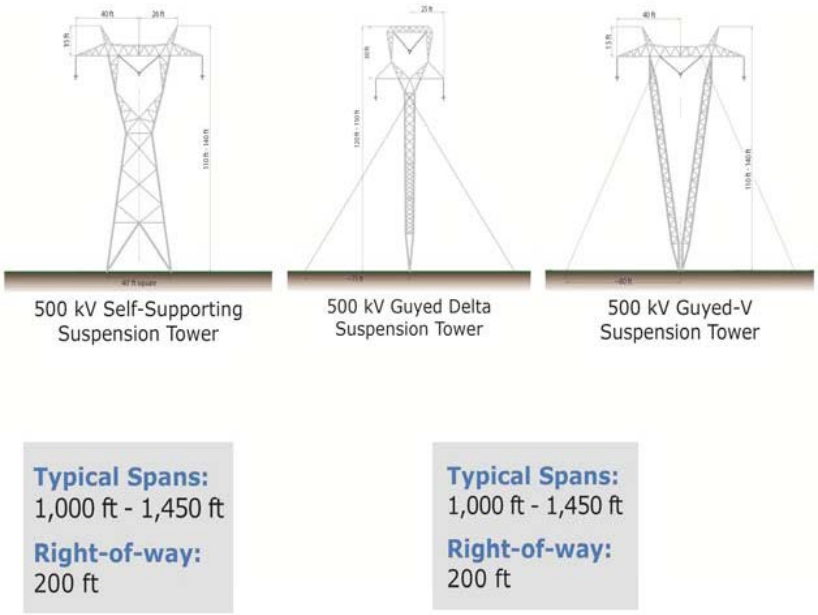
The self-supporting suspension towers (or structures) will be anchored to foundations at each leg of the structure. The guyed-delta and guyed-V structures will utilize a single foundation system at the center of the structure and a set of at least four guys and anchors per structure. The anchors used will vary depending on terrain.

The Applicant anticipates using either a single I-string or a V-string insulator assembly. The structures will support two overhead static ground wires to protect from lightning. In each case, one of the overhead static ground wires will have a fiber optic core to enable communications and system protection functions between the two endpoints.

2.5.5 Structure Spacing

The Applicant anticipates that the proposed Project typically would be located on all new ROW that is approximately 200 feet wide. A wider ROW (250 to 300 feet in width) may be required for longer spans, at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. Generally, structures will be typically be spaced approximately 1,000 to 1,450 feet apart with shorter or longer spans as necessary. Longer spans may be needed to cross areas such as waterbodies or watercourses, or in areas where special design requirements are dictated by

Figure 2-1 Structure Schematics



topography. The maximum span is anticipated to be 1,700 feet with an average span of 1,250 feet.

The Applicant identified that spans would be adjusted such that structures, where practicable, would avoid open water and transportation corridors. To the greatest extent possible, waterways would be spanned in the same location as existing disturbances or ROWs; otherwise, the proposed Project would be designed to cross waterways perpendicularly to the extent practical to minimize visual effects of the proposed Project for recreational users of the waterways.

2.5.6 Conductor Spacing

Lateral spacing of phase conductor bundles would vary with the various types of structures and would range from approximately 25 to 40 feet.

2.5.7 Line to Ground and Conductor Side Clearances

The required clearances at the structure, horizontal distance between each energized phase, and the minimum required ground clearance will be determined based on electrical studies during detailed design of the proposed Project. All clearances would meet or exceed the recommended clearances in the National Electric Safety Code (NESC). Based on preliminary design criteria for the proposed Project, minimum ground clearance for the conductors is estimated to be 40 feet.

2.5.8 Wind and Ice Loading

Wind and ice loading for the proposed Project will incorporate three NESC loading cases required for this area of the U.S.; Rule 250B, Rule 250C, and Rule 250D. Rule 250B, the NESC heavy district loading case, specifies a wind velocity of 40 miles per hour (mph), 0.5 inch of ice, and a wire temperature of 0° Fahrenheit (F). This loading case requires an additional NESC constant of 0.3 pounds per foot for the sag and tension calculations. Additional NESC Rules include:

- NESC Rule 250C considers extreme wind loading. A wind velocity of 90 mph at 60° F is the weather condition that satisfies the NESC Rule 250C loading.
- NESC Rule 250D considers an extreme ice load with a concurrent wind load. For the study area, an ice thickness of one-half inch, a wind gust speed of 50 mph and a wire temperature of 15° F satisfies the conditions of NESC Rule 250D.
- NESC Rules 250C and 250D, as well as American Society of Civil Engineers (ASCE) Manual No. 74: "Guidelines for Electrical Transmission Line Structural Loading," provide default 50-year values for extreme ice and wind. The Applicant will conduct a weather study to identify additional reliability-based wind and ice load cases to be considered during detailed design of the proposed Project.

2.5.9 Requested Route Width

The Applicant's proposed routes vary from 650 to 3,000 feet wide in order to provide flexibility during detailed design to try to accommodate landowner's preferences once the route is selected by the MN PUC. See Section 1.3.1.4 for a summary of the applicable state regulatory definitions of ROW and route that allow flexibility in the Route Permit. The Applicant's requested route widths and anticipated alignments are shown on the detailed maps provided in Appendix A of the Applicant's Route Permit Application.[52]

2.6 Associated Facilities

2.6.1 Iron Range 500 kV Substation

The proposed Project would terminate at the **proposed Iron Range** 500 kV Substation located on the same site as the Applicant's existing Blackberry 230/115 kV Substation, adjacent to and east of the existing substation, and will be designed to accommodate the new 500 kV transmission line, 500/230 kV transformation, existing 230 kV transmission lines, and all associated 500 kV and 230 kV equipment. Existing 230 kV and 115 kV transmission lines currently located on the property will also need to be rerouted. The Applicant has entered a purchase option agreement with the owner of the property adjacent to and east of the existing approximately 8.8 acre Blackberry 230/115 kV Substation. The proposed **Iron Range** 500 kV Substation **would** permanently impact approximately **23** acres.

2.6.2 500 kV Series Compensation Station

The proposed Project would require a 500 kV Series Compensation Station to be located within or adjacent to the final approved route. The Series Compensation Station will include the necessary 500 kV series capacitor banks and all associated 500 kV equipment. The 500 kV Series Compensation Station will permanently impact approximately **6 acres**.

The location of this facility would be determined by several factors that affect the design of the transmission line and the series capacitor equipment, including the voltage profile along the transmission line and the available fault current at the series capacitors. Since both of these factors are directly affected by the overall length of the transmission line between the existing **Dorsey Substation** in Manitoba and the proposed **Iron Range** 500 kV Substation in Minnesota, the final location of the 500 kV Series Compensation Station is dependent on the final route determinations in both the U.S. and Canada.

The Applicant initiated electrical design optimization studies to identify the preferred location for the 500 kV Series Compensation Station. Based on these studies, candidate sites in Minnesota include the overall midpoint of the line.

2.6.3 Regeneration Locations

The Applicant proposes to locate three regeneration stations within or adjacent to the final route approved by the MN PUC. The sites would be 75 feet by 75 feet and located on uplands.

2.6.4 Permanent Access Roads

The Applicant proposes to establish a permanent "2-track" trail on uplands within the permanent 200-foot right-of-way as a result of construction traffic. This "2-track" trail would be an unimproved road and it is assumed that there would be no grading or filling for this permanent access road.

2.6.5 Temporary Access Roads, Laydown Areas, Fly-in Sites, and Stringing Areas

The Applicant has indicated that it would be necessary to construct temporary access roads outside of the ROW and that they would work with local property owners to identify suitable access locations during final design. The Applicant would be required in state and federal approvals to coordinate with the applicable agencies to reduce construction impacts of these temporary access roads. A typical temporary access road width of 16 feet is anticipated.

The Applicant proposes to establish a main staging area for temporary storage of materials and equipment. Such an area would include sufficient space to lay down material and pre-assemble some structural components or hardware. Other staging areas located along the ROW would be limited to a structure site for laydown and framing prior to structure installation. The Applicant will identify specific staging areas during final design. Generally, the laydown areas will be approximately 20 to 40 acres, they will be located along suitable roadways approximately 40 to 50 miles apart, and will be within five miles of the final route approved by the MN PUC. The Applicant has indicated

52 Available at: http://mn.gov/commerce/energyfacilities//resource.html?Id=33849.

that upland areas with prior disturbance will be preferred for siting staging areas; however, there may be some areas where this is not feasible and other areas would be used. Staging areas would be in place for at least one year and will be used to store equipment and materials and include the construction offices.

Similar to laydown areas, the Applicant proposes to establish fly-in sites that would be approximately 10 acres in size, located as near to the ROW as possible, and approximately 5 to 7 miles apart. Upland areas with prior disturbance would be preferred; however, there may be some areas where this is not feasible and other areas would be used. These sites would be in place for less than 1 year (likely 6 months) and will be used to assemble structures for sky crane construction. The Applicant would identify final fly-in sites during final design.

The Applicant proposes to establish temporary stringing sites within or adjacent to the final route approved by the MN PUC. The sites would be 200 feet by 600 feet with a two-mile spacing, normally located near mid-span on the centerline of the ROW. The rope machine, new conductor wire trailers, and tensioner would be located at the wire stringing set- up area. This phase of construction would occur after the structures have been erected, and fitted with stringing blocks (also called dollies or sheaves) and single-leader p-line ropes that reach the ground. Crew members would monitor the progress of stringing to ensure the sock does not get hung up in the dollies. One phase at a time, the conductor wire bundles would be pulled to the appropriate tension. Once all three phases have been tensioned, they would be clipped into place utilizing permanent suspension hardware.

If stringing and hard line set-up areas in wetlands are required when surface conditions are not stable, extensive use of timber matting may be required. The most effective means to minimize impacts on water areas during construction would be to span streams and rivers by placing structures above the normal high water level. Where waterways must be crossed by construction equipment, the Applicant would need to commit to using temporary clear span bridges in the applicable water crossing permit to minimize the impact on the waterway. For those waterways that cannot be crossed with construction equipment, workers might walk across or use boats during wire stringing operations to pull in the new conductors and shield wires, or in the winter drive equipment across the ice. In areas where construction occurs close to waterways, appropriate measures would need to be employed to minimize soil erosion and prevent sedimentation of the waterways. The Applicant would also be required to ensure that equipment fueling and lubricating occurs at a reasonable distance from the waterways.

2.6.6 Establishing the Final Alignment

After working with landowners and completing detailed engineering work, the Applicant would establish the final alignment for the project and structure placements. These plans (known as "plan and profiles") must be provided to the MN PUC so that the MN PUC can confirm that the Applicant's plans are consistent with the Route Permit and to ensure all permit conditions are met prior to construction of the project.

The Applicant indicated that final alignment and structure placement would be coordinated with the following entities to minimize human and environmental impacts:

Individual landowners: The Applicant indicated that during ROW acquisition, the placement of individual structures would be coordinated with property owners, to the extent practicable. Minor shifts to the anticipated alignment would be evaluated once a route is chosen, to minimize visual impacts for landowners.

Mining operators and mineral lessees: The Applicant has indicated they would work with existing mine operators and mineral lessees to identify the extent of current and planned mining operations and develop appropriate mitigation measures. These measures may include adjustments to structure placement or ROW alignment within the route.

Minnesota Department of Transportation (MnDOT): The proposed Project would be designed in accordance with NESC to minimize impacts on transportation. The NESC defines the basic clearance requirements between transmission lines and transportation structures (for example, roadways, and railways). Placement of public utilities on or near state ROW would be designed in accordance with the Utility Accommodation Section of the MnDOT Utility Accommodation and Coordination Manual.

Minnesota Department of Natural Resources (MnDNR) and USFWS: The Applicant has indicated that they would continue to work with the MnDNR to minimize impacts on sensitive forested areas within the state forests through structure placement and ROW alignment. Similarly the Applicant would work with the MnDNR and USFWS to site the transmission line to avoid bird concentration sites, nesting areas, migratory pathways, and geographic features that act as a funnel, and avoid habitats that are breeding

grounds or feeding areas, to the extent practical. The Applicant would work with USFWS to determine structure configuration that is least detrimental to wildlife. Applicant would work with USFWS to ensure that construction and on-going use of the transmission line avoids and minimizes impacts to fish and wildlife to the fullest extent practicable.

U.S. Army Corps of Engineers (USACE): The Applicant would avoid and minimize adverse impacts to wetlands and other aquatic resources during construction. This would be accomplished by spanning wetlands and aquatic resources, where practical, and implementing best management practices (BMPs). These avoidance and minimization measures would be incorporated into a Clean Water Act Section 404 permit and Section 401 certification issued by USACE and Minnesota Pollution Control Agency (MPCA), respectively, prior to construction. The applicant will continue to work with the USACE to develop a compensatory wetland mitigation plan that meets agency requirements for unavoidable wetland impacts.

2.7 Route Width, Right-of-Way, and Anticipated Alignment

The Applicant has requested in their permit applications to have route widths that vary from 650 feet up to 3,000 feet in some limited areas. The new 500 kV structures would require a 200-foot ROW, 100 feet on either side of the of the transmission line alignment. The anticipated alignment–centerline of the transmission line–would be located within the ROW.

2.8 Bulk Power System Information

2.8.1 Expected Power Transfer Capability

The proposed Project is designed to increase the total transfer capability between the U.S. and Manitoba by at least **883** MW. This information is required by DOE's Presidential permit regulations (10 Code of Federal Regulations (CFR) Section 205.322(b)(3)(i)). The Applicant **filed the required sensitivity studies and other reliability-related reports to DOE on July 24, 2014.**

2.8.2 System Power Flow

System power flow plots are schematic diagrams of the flow of electric power in an interconnected system. DOE regulations for a Presidential permit require system power flow plots for the Applicant's proposed service areas for heavy summer and light spring load periods, with and without the proposed international interconnection, for the year the proposed Project is scheduled to be placed in service and for the fifth year thereafter (10 CFR Section 205.322(b)(3)(ii)).

Initial power flow plots for the years 2020 and 2025 are included in Appendix K of the original Presidential permit application. Additional information required under the applicable DOE regulations is found in other sections of the Presidential permit application or will be developed later in accordance with DOE guidance. The Applicant will provide DOE any additional information required under 10 CRF Section 205.322(b)(3)(v).

2.8.3 Weather Events

The Riel–Forbes 500 kV line (described in Section 2.2.2) is the largest of the four existing transmission lines that connect Manitoba and the United States. The Orange Route parallels this existing 500 kV transmission line for 59.9 miles, while the Blue Route parallels this existing 500 kV transmission line for 36.2 miles.

The main impact of locating the Project adjacent to the existing 500 kV transmission line is the perception that the physical proximity of the two 500 kV transmission lines would increase the likelihood of an unexpected simultaneous outage of both lines. In practice, according to the Applicant, unexpected transmission line outages are rare, and simultaneous unexpected outages of parallel transmission lines not sharing a common structure are even rarer (Minnesota Power 2014, reference (1)). Unexpected transmission line outages occur for a number of reasons. In this case, the primary concerns are with extreme weather events and equipment failures.

The electrical reliability impacts of establishing a parallel transmission line corridor depend primarily on the purpose and expected performance of the transmission lines. The alternatives that parallel existing corridors with 69 kV, 115 kV, or 230 kV transmission lines that do not connect Manitoba and the U.S. would not impact electrical system reliability. If the proposed Project parallels the existing 230 kV tie transmission line corridor, the impact of a simultaneous, unexpected outage of the two facilities on electrical reliability would be minimal, but still notable because the lines would share a common load when transferring power from Manitoba to the United States. If the proposed Project parallels the existing 500 kV tie transmission line corridor, a simultaneous unexpected outage would have a greater impact

on electrical system reliability because the transmission lines not only share a common load, but would also carry similar (and greater) amounts of power. Therefore, the Applicant states that if three transmission lines (i.e., the proposed Project, 500 kV tie transmission line, and 230 kV tie transmission line) are located in parallel corridors, a simultaneous unexpected outage of the proposed Project and the two tie transmission lines could have the greatest impact to electrical reliability by reducing the transfer capacity of the transmission lines, which would affect the regional electrical grid (see Comment letter 190).

The Applicant would address potential simultaneous outages of the proposed Project and the existing Riel-Forbes 500 kV transmission line due to weather events by developing a weather study to define and incorporate the appropriate design considerations based on actual weather data. Based on the weather study, the design criteria for the proposed Project may be adjusted to increase the robustness of the design for those lengths where the proposed Project parallels the existing 500 kV transmission line.

Where design criteria cannot fully address potential simultaneous outages due to weather events, as is the case with tornadoes, the Applicant would consider further mitigation as appropriate to enhance restorability. This could include more frequent use of anti-cascade towers, maintaining an increased supply of emergency spare towers, or even locating a permanent storage facility for emergency spares on or near the location where the proposed Project parallels the existing 500 kV transmission line.

The Applicant would address potential simultaneous outages of the proposed Project and the existing 500 kV transmission line due to lightning events by installing shield wires and single pole tripping, a protective relay scheme that allows power to continue being transferred over the line even if one of the three phases is struck by lightning. Since the majority of lightning events only affect one phase of a transmission line, single pole tripping should alleviate any concerns with simultaneous outages due to lightning.

The Applicant would address potential simultaneous outages of the proposed Project and the existing 500 kV transmission line due to equipment failures by maintaining appropriate separation distances between the proposed Project and the existing 500 kV transmission line.

The Applicant would evaluate the steady state and dynamic performance of the regional transmission system after a simultaneous outage of the two 500 kV transmission lines for both north and south flow conditions in the electrical design optimization studies for the proposed Project. These studies should identify any potential electrical problems with this event and if there are any reasonable electrical design considerations that will improve the performance of the system during this event.

Once the proposed Project is in service, the reliability impacts in the United States of a simultaneous outage of the proposed Project and the existing 500 kV transmission line will be addressed by modifying the existing special protection system associated with the four current Manitoba to United States transmission tie lines to include the proposed Project and associated facilities. In the event of an unexpected simultaneous outage of the proposed Project and the existing 500 kV transmission line, the modified special protection system will be set up to preserve the integrity of the system based on the operating studies for the proposed Project.

2.8.4 Interference Reduction Data

Direct and indirect impacts of the proposed Project on radio, television, and cellular telephone signals are addressed in detail under Electrical Interference in Section 5.2.1.5. This information is required under applicable DOE regulations (10 CFR Section 205.322(b)(3)(iii)).

Radio and television interference is generated by corona[53] occurring on the conductors. The Applicant would select conductor size and bundle configuration to minimize corona levels, which will in turn minimize radio and television interference.

This transmission line will use extra high voltage hardware, appropriate construction techniques, and a transmission line configuration that yields a low level of corona, which will minimize the onset of gap discharges, which in turn will minimize television interference. The proposed **Iron Range** 500 kV Substation will also be designed to minimize corona.

If television or radio interference is caused by the operation of the proposed Project in areas where good reception was available prior to construction of the proposed Project, the Applicant will inspect and repair loose or damaged hardware in the transmission line, or take other necessary action to restore reception to the present level, including the appropriate modification of receiving antenna systems if necessary.

53 Corona is defined as small electrical discharges which ionize surrounding air molecules.

If interference from corona discharges does occur for an AM radio station within a station's primary coverage area with good reception before the proposed Project was built, satisfactory reception can be obtained by appropriate modification of the receiving antenna system.

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel transmission line structure) may experience interference because of the signal blocking effects of the structure. Moving either mobile unit by less than 50 feet so that the metallic structure is no longer immediately between the two units should restore communications.

If necessary, the Applicant will work with tower operators to resolve any issues directly related to the proposed Project.

2.8.5 Relay Protection

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

The proposed Project's protective relaying systems will use microprocessor-based devices that conform to the requirements of the Institute for Electrical and Electronics Engineers, North American Electric Reliability Corporation (NERC), and the Midwest Reliability Organization (10 CFR Section 205.322(b)(3)(iv)). Specific protection schemes, equipment, and functional devices will be determined during the proposed Project's detailed design phase.

2.9 Land Acquisition

2.9.1 Transmission Line Right-of-Way

The Applicant would need to acquire easement rights so the 200-foot-wide ROW can cross privately owned land as well as federal land that requires ROW agreements. The evaluation and acquisition process includes examining titles, contacting owners, surveying, preparing documents, and purchasing the property and easements. Each of these activities is described in more detail below.

The first step in the ROW process is to identify all persons and entities that may have a legal interest in the real estate upon which the facilities would be built. To compile this list, an ROW agent or other persons engaged by the utility would complete a public records search of all land involved, to determine the legal description of the property and the owner(s) of record, and to gather information regarding easements, liens, restrictions, encumbrances, and other conditions.

After all private and public owners are identified, an ROW representative would contact each property owner or the property owner's representative. The ROW agent would explain the need for the transmission facilities and how the proposed Project may affect their land. The ROW agent would also ask the landowner if they have any specific construction concerns. The Applicant has indicated that construction activities would be limited to the ROW, and permanent and temporary access roads, unless access permission is obtained from landowners. Fences, gates, and similar improvements that are removed or damaged would be repaired or replaced.

The next step in the acquisition process is to evaluate the specific parcel. For this work, the ROW agent would request permission from the owner for survey crews to enter the property to conduct preliminary survey work. The ROW agent may also ask to take soil borings to assess the soil conditions and determine appropriate foundation design. The soil is analyzed by an experienced geotechnical testing laboratory. Design surveys are conducted to locate the ROW as well as natural features, man-made features, and associated elevations for use during the detailed engineering process.

During the evaluation process, the location of the proposed transmission line may be staked with permission of the property owner. This means that the survey crew would locate each structure on the ground and place a surveyor's stake to mark the structures' anticipated locations. The ROW agent can then show the landowner where the structure(s) would be located on the property. The ROW agent may also delineate the boundaries of the easement area required for operating the transmission line safely.

Prior to acquiring easements, the Applicant (and landowner potentially) would collect appraised land value data for similar properties in the area as described below. Based on how the easement or purchase will affect the market value of each parcel, a fair-market-value offer will be developed. The ROW agent would contact the property owner to present the offer and discuss the amount of just compensation for the rights to build, operate, and maintain the transmission facilities within the easement area. The offer would include an amount

to cover reasonable access to the area. The agent would also provide maps of the transmission line easement or site, as well as maps showing the landowner's parcel.

The landowner would be allowed time to consider the offer and to present any material that the owner believes is relevant to determining the property's value and the value of the easement. In nearly all cases, utilities are able to work with landowners to address their concerns, and an agreement is reached for the utility's purchase of land rights in the form of an easement. When a negotiated settlement cannot be reached, the landowner may choose to have an independent third party determine the value of the rights taken. Such valuation is made through the utility's exercise of the right of eminent domain, pursuant to Minnesota Statutes, chapter 117. The process of exercising the right of eminent domain is called condemnation. State and federal land is not, however, subject to eminent domain. The Applicant would have to obtain permits or licenses to cross these federal and state owned land as described in Section 1.2.3 (federal interest land) and Section 1.3.3 (state land).

Before commencing a condemnation proceeding, the ROW agent must obtain at least one appraisal for the property on which the proposed easement is to be acquired and a copy of that appraisal must be provided to the property owner in accordance with Minnesota Statutes, section 117.036, subdivision 2(a). The property owner may also obtain another property appraisal and the company must reimburse the property owner for the cost of the appraisal according to the limits set forth in Minnesota Statutes, section 117.036, subdivision 2(b). The property owner may be reimbursed for reasonable appraisal costs up to $1,500 for single-family and two-family residential properties, $1,500 for property with a value of $10,000 or less, and $5,000 for other types of properties.

To start the formal condemnation process, a utility would file a petition in the district court where the property is located and would serve the petition on all owners of the property. If the court grants the petition, it would appoint a three-person condemnation commission that will determine the compensation for the easement. Once appointed, the commissioners would schedule a viewing of the property over and across which the transmission line easement is to be located.

Next, the condemnation commission would schedule a valuation hearing where the utility and landowners can testify as to the fair market value of the easement or fee. The condemnation commission would then make an award as to the value of the easement acquired and file it with the court. Each party has 40 days from the filing of the award to appeal to the district court for a jury trial. In the event of an appeal, the jury will hear land-value evidence and render a verdict. At any point in this process, the case can be dismissed if the parties reach a settlement.

As part of the ROW acquisition process, the ROW agent would discuss the construction schedule and construction requirements with the owner of each parcel. To ensure safe construction of the transmission line, fences, crops, or livestock may need special consideration. Fences, for instance, may need to be moved, temporary or permanent gates may need to be installed; crops may need to be harvested early; and livestock may need to be moved. In each case the ROW agent and construction personnel would coordinate these activities with the landowner.

2.9.2 Minnesota PPSA "Buy the Farm" Provision

The Minnesota Power Plant Siting Act provides land owners the option of requiring the utility to condemn a fee interest in land contiguous to the proposed HVTL easement. Known as the "Buy the Farm" provision, it reads in part as follows:

Minnesota Statutes section 216E.12, subdivision 4. Contiguous land. "(a) When private real property that is an agricultural or nonagricultural homestead, nonhomestead agricultural land, rental residential property, and both commercial and noncommercial seasonal residential recreational property, as those terms are defined in section 273.13 is proposed to be acquired for the construction of a site or route for a high-voltage transmission line with a capacity of 200 kilovolts or more by eminent domain proceedings, the owner shall have the option to require the utility to condemn a fee interest in any amount of contiguous, commercially viable land which the owner wholly owns in undivided fee and elects in writing to transfer to the utility within 60 days after receipt of the notice of the objects of the petition filed pursuant to section 117.055. Commercial viability shall be determined without regard to the presence of the utility route or site. Within 60 days after receipt by the utility of an owner's election to exercise this option, the utility shall provide written notice to the owner of any objection the utility has to the owner's election, and if no objection is made within that time, any objection shall be deemed waived."

2.9.3 Iron Range 500 kV Substation

Land for the proposed **Iron Range** 500 kV Substation has been secured adjacent to and east of the Applicant's existing Blackberry Substation. The Applicant has entered a purchase option agreement with the owner of the property. The purchase agreement would be executed upon receiving the necessary regulatory permits.

2.9.4 500 kV Series Compensation Station

Additional property would also be required for the proposed Project's 500 kV Series Compensation Station. Based on electrical design optimization studies and route selection, the Applicant has identified a **preferred** site for the compensation station that is located at the approximate midpoint of the transmission line. **The Applicant has indicated that the proposed candidate site for the 500 kV Series Compensation Station is only appropriate for the Proposed Blue Route or the Proposed Orange Route (Map 2-1).**

Based on detailed engineering analysis, the Applicant may seek purchase option agreements on some or all of these candidate sites. Once the final route has been selected by the MN PUC, the Applicant will execute the appropriate purchase agreement for the 500 kV Series Compensation Station site.

2.9.5 Regeneration Site Locations

Additional property would also be required for the proposed Project's regeneration sites. Based on electrical design optimization studies and route selection, the Applicant has identified seven candidate sites for the regeneration sites that are located along both the Proposed Blue Route and Proposed Orange Route.

Based on detailed engineering analysis, the Applicant may seek purchase option agreements on some or all of these candidate sites. Once the final route has been selected by the MN PUC, the Applicant will execute the appropriate purchase agreement for the regeneration station sites.

2.9.6 Permanent Access Roads

The Applicant anticipates that a permanent, unimproved "2-track" access trail would be established on uplands within the ROW as a result of construction traffic. This "2-track" trail would be unimproved with no grading or filling.

2.9.7 Temporary Access Roads, Laydown Areas, Fly-in Sites, and Stringing Areas

Preliminary site selection is underway by the Applicant, however the Applicant would not determine locations for the temporary access roads, laydown areas, fly-in sites, or stringing areas until the route has been chosen and permitted by the MN PUC. The fly-in sites would accommodate the use of helicopters (sky cranes) for personnel transportation, structure and conductor installation, and transport of materials such as insulator assemblies, foundation materials, anchors, mats, or other equipment.

2.10 Preconstruction Activities

Preconstruction activities include preparation and approval of the certificate of need and the route permit applications, completing the required environmental review and surveys, coordinating and obtaining all other necessary permits and approvals, performing the studies, surveys, and engineering necessary for the design of all transmission line and substation facilities, and acquiring ROW easements.

2.11 Construction Procedures

The Applicant has indicated that they would retain an environmental inspector during project construction, responsible for understanding all of the conditions of the proposed Project's environmental permits and ensuring that contractors abide by these conditions. These Applicant proposed measures are potential MN PUC Route Permit conditions.

The Applicant has indicated that construction crews would follow local, state, and federal regulations with regard to construction noise, dust, and timing. Construction crews would comply with local, state, and NESC standards regarding installation of facilities and standard construction practices. Established Applicant and industry safety procedures would be followed during and after construction of the proposed Project, including clear signage during all construction activities.

2.11.1 Transmission Line ROW

2.11.1.1 Landowners

Once access to the land has been granted and all necessary approvals have been obtained, the Applicant would coordinate with landowners to prepare the ROW for construction.

2.11.1.2 Coordination with Local Utilities

The Applicant would also coordinate with local utilities to identify and locate underground utility lines to minimize conflicts. As construction progresses, information would be provided to local emergency services to inform personnel of upcoming activity and impacts of the work as well as to plan for emergency situations on the construction site, should they occur. The Applicant would coordinate and provide the necessary requirements for any short term road or lane closure with the appropriate authority, including emergency services. Prior to construction, the Gopher State One-Call utility locating service will be utilized to identify buried utilities that must be avoided during construction, including pipelines and any associated distribution lines.

The Applicant would also coordinate the appropriate construction measures to protect buried pipelines or electric lines where they must be crossed by heavy equipment. If any disruptions to the electrical system are required during construction, the Applicant or the contractor will contact the appropriate utility or electric cooperative to schedule planned disruptions.

2.11.1.3 Coordination with Transportation Authorities

Preparation for construction begins with developing access points from existing roads. The Applicant would work with state and local officials to coordinate and minimize any impacts during construction and operation of the proposed Project. The Route Permit will direct the Applicant to comply with Minnesota MnDOT and all applicable road authorities' management standards and policies during construction. The Route Permit also will direct the Applicant to provide written notice of construction to MnDOT and applicable city, township, and county road authorities. Under the Route Permit, the Applicant would be required to restore the ROW, temporary work space, access roads, abandoned ROW, and any other lands affected by construction. This could include the replacement of living snow fences affected by construction activities.

Installation of additional temporary access points would be subject to review and approval of highway officials. Construction staff will implement traffic control measures in accordance with the MnDOT Manual on Uniform Traffic Control Devices. Stringing of new overhead conductors over highways may require installation of temporary wooden pole guard structures or other measures to safeguard the public and construction forces during the stringing process.

The Applicant has indicated that construction activities and timing would be announced through their proposed Project website[54] in an effort to minimize conflicts with local recreational activities.

2.11.1.4 Vegetation Clearing

The Applicant would have to clear all woody vegetation and brush within the 200-foot-wide ROW requested for the transmission line to ensure that facilities can be safely and efficiently constructed, operated, and maintained. **The Applicant has proposed to leave low-growing woody vegetation in wetlands within the outer one-third of the ROW.** A reasonably level temporary access path is necessary so construction equipment can pass safely. At structure locations, a stable working surface free of tripping hazards is necessary for installing foundations and guy anchors and for assembling and erecting structures.

Vegetation would be cut at or slightly above the ground surface. Rootstock would be left in place to stabilize existing soils and to regenerate vegetation after construction. With the approval of the landowner or land manager, stumps of tall-growing species would be treated with an approved herbicide to discourage re-growth.

Surveys will be conducted prior to vegetation removal to avoid impacts on nesting birds and to avoid active nest sites of sensitive species. Detailed survey procedures and monitoring processes would be negotiated with the USFWS and MnDNR as appropriate to minimize and avoid impacts on resident and migratory wildlife. For example, the appropriate construction windows would be incorporated into the construction schedule to minimize impacts on species such as bald eagle and goshawk in areas where these species are found to be present.

The Applicant proposed the following mitigation measures regarding forest clearing to minimize impacts to birds and bats:

- Surveys would be conducted prior to vegetation removal to avoid impacts on nesting birds and to avoid active nest sites of sensitive species.
- Appropriate construction windows would be incorporated into the construction schedule to minimize impacts on species such as bald

54 Available at: http://greatnortherntransmissionline.com/.

eagle and goshawk in areas where these species are found to be present.

- The Applicant would work with USFWS and MnDNR to identify potential locations for line marking, such as areas of high avian use, nest sites, feeding areas, and migratory corridors. The Applicant will incorporate industry best practices, which are consistent with the APLIC's 2012 guidelines.
- The Applicant would select a transmission line alignment during detailed design to avoid bird concentration sites, nesting areas, migratory pathways, and geographic features that act as a funnel, and avoiding habitats that act as breeding grounds or feeding areas to the extent practical.

With regard to rare and unique species, USFWS first preference is to only allow the ROW to be cleared or mowed in the fall or winter before the breeding season. If this is not possible, under limited circumstances the Applicant would have a qualified biologist conduct surveys for active nesting birds and bats prior to construction. If active nesting locations are identified during the surveys, the Applicant proposes to avoid nest sites during the breeding season and to identify construction restraints that would avoid disturbance to nesting birds.

The Applicant would conduct surveys for sensitive plants during appropriate periods of the growing season to properly identify their presence and/or absence along the selected ROW before clearing begins. If sensitive plants or communities are identified during surveys, individual avoidance and minimization measures would be evaluated and submitted to the appropriate regulatory agencies.

The Applicant would conduct surveys for native prairie areas and other sensitive plant communities such as calcareous fens along the selected ROW. These areas can be first refined through a desktop analysis. If sensitive resources are encountered, construction plans that minimize the impacts, such as shifting structure locations or implementing construction techniques that avoid or minimize impacts on these resources, would be developed and submitted to the appropriate regulatory agencies.

To minimize the potential for tire and chassis damage to construction equipment, and to maintain a safe, level, temporary access path during construction, incidental stumps would be removed.

Merchantable timber would be cut to standard log lengths and stacked along the ROW. To the extent practical, the Applicant will work with the landowner to determine a mutually agreeable means of disposing of the cleared material, such as chipping, burning, or stacking for landowner use or sale. Vegetation clearing debris (that is, un-merchantable trees, brush, and slash) may be cut and scattered, placed in windrow piles, chipped, or burned, depending on location.

Finally, the Applicant proposes the following mitigation measures to reduce the spread of non-native plant species during construction:

- The Applicant would retain an environmental inspector during Project construction. Working on behalf of the Applicant, the environmental inspector would be responsible for understanding all of the conditions of the Project's environmental permits and to ensure that the contractors abide by these conditions.
- Regular, frequent cleaning of construction equipment and vehicles.
- Minimization of ground disturbance to the greatest degree practicable; and rapid revegetation of disturbed areas with native or appropriate non-native, seed mixes.
- The environmental inspector would conduct a field survey of the ROW prior to construction to identify areas that currently contain noxious weeds. Weed surveys during construction would identify infestations of the ROW and staging sites.
- New infestations within the ROW would be addressed and eradicated as soon as practicable in conjunction with property owners input.

Also, construction vehicles, including the undercarriage, would be inspected for weed seed and dirt prior to construction start particularly when traveling from an area identified as contaminated by noxious weeds to an uncontaminated area. The introduction and establishment of noxious weeds would be minimized by prompt revegetation of disturbed areas using regional genotype native species where appropriate or by seed based on landowner agreements. No Minnesota Department of Agriculture (MDA) or MnDNR prohibited noxious weed seeds will be allowed in any revegetation seed mix. Seed mix composition will be coordinated with MnDNR on all state lands. Seed mixes used for the proposed Project will be certified as weed free. Only clean straw mulch will be used; meadow hay would not be allowed as mulch.

2.11.1.5 Soil Management

The Applicant has indicated that to the extent practical, soil disturbance and excavation activities in steep slope areas would be avoided. Where disturbance and excavation cannot be avoided entirely, the Applicant has indicated it will be minimized by using BMPs such as matting, ice roads, and low ground pressure equipment to the extent practical to minimize impacts during construction. Sediment and erosion control plans will be developed that specify the types of BMPs necessary. Depending on the site, BMPs may include installation of silt fence, straw bales, or ditch blocks, and/or covering bare soils with mulch, plastic sheeting, or fiber rolls to protect drainage ways and streams from sediment runoff. Erosion control practices will be inspected during construction, especially during significant precipitation events. Environmentally sensitive areas or areas susceptible to soil erosion would require special construction techniques. These techniques may include using low ground pressure equipment, matting, terracing, water bars, bale checks, rock checks, or temporary mulching and seeding of disturbed areas exposed during long pauses in construction activity.

The Applicant has indicated that construction of the proposed Project would occur in wetlands and wet soils during frozen conditions to the extent practical to minimize soil compaction. Construction mats would be used to help protect wet soils where encountered during construction. Regular, frequent cleaning of construction mats on the ROW would be performed as appropriate to avoid the introduction and minimize the spread of invasive species.

Permanent soil erosion control measures may include permanent seeding, mulching, erosion control mats, or other measures depending on site conditions. Temporary silt fences, sedimentation ponds, and other measures may be used to prevent sediment from running off into wetlands or other surface waters.

2.11.1.6 Spill Management

Construction equipment would be inspected frequently to ensure hydraulic systems and oil pans are in good condition and free of leaks. Portable spill containment kits would be required for each piece of construction equipment with the potential to discharge a significant amount of oil into the environment. Operators would be present at the nozzle at all times when refueling is in progress.

To minimize the potential for contamination of groundwater, Spill Prevention Control and Countermeasure (SPCC) plans will be developed and maintained during the construction and operation of the proposed Project. Oil products and hazardous materials will be stored inside appropriate containment, and any spills of oil or hazardous materials will be mitigated immediately in accordance with the procedures in the SPCC plan. In the event of a spill, the source of the spill would be identified and contained as soon as it is discovered. The spill and contaminated soils would be collected, treated, and disposed of in accordance with all applicable federal, state, and local requirements.

If a significant spill were to occur to surface waters, methods for containing and recovering released material such as floating booms and skimmer pumps would be used. Noticeably contaminated soils would be excavated, placed on, and covered by plastic sheeting in bermed areas. An emergency response contractor would be secured, if necessary, to further contain and clean up a severe spill. **As a BMP,** equipment would not be refueled in wetlands. In addition, no petroleum products, herbicides or pesticides or hazardous chemicals of any kind should be mixed or poured or otherwise handled in wetland areas.

2.11.1.7 Cultural Resource Management

In the event that archaeological sites, historic architectural resources, or resources of cultural importance to Native Americans are encountered during construction activities, project management personnel would consult with regulatory authorities regarding appropriate construction procedures and mitigation measures, which would be determined through applicable regulatory procedures. Any cultural resource issues that might arise, would be addressed by using agreed-upon methods as outlined in a Programmatic Agreement (**Draft PA,** Appendix V). The National Historic Preservation Act (NHPA) Section 106 process, which is summarized in applicable sections of Chapter 5, will be undertaken to identify and avoid resources of potential concern. This effort includes identifying and avoiding **archaeological sites or historic architectural resources. This effort also includes identifying and avoiding areas containing locations for spiritual rituals or ceremonies, associated hunting, fishing, or gathering plant and animal species by tribes, as well as areas with sites or subsistence or other resources which can be considered important cultural resources to tribes, such as trails, campsites, grave sites, locations containing wild rice, berries, sugar bushes, medicinal plants, or locations of eagle nests.**

2.11.1.8 Structure Construction

Construction materials would be hauled either directly to structure sites from the local highway or railroad network, or brought first to material staging areas and then to the structure sites.

The transmission line components, including the structures, conductor, and hardware, are normally brought to the temporary staging areas on flatbed trucks. These materials are stored until needed and then loaded on flatbed trailers or special structure trailers for delivery to the structure site where they are unloaded for installation.

Where reinforced concrete foundations are required, large rubber-tired or track-mounted auger equipment is used to excavate a circular hole of the appropriate diameter and depth. In upland areas, excavated material would be spread evenly around the structure base to promote site drainage. Reinforcing steel and anchor bolts are set in position. Ready-mixed concrete is then placed in the excavation.

In wetland areas, a telescoping temporary steel caisson would be placed in the foundation hole to stabilize the soil walls. Water pumped from the excavation would be either 1) appropriately filtered prior to discharge at the site, 2) placed in tanker trucks or empty concrete trucks and hauled to a specially designated upland disposal area, or 3) brought back to the concrete batch plant for discharge. Concrete truck wash-water would be discharged only in specially designated upland disposal areas or at the concrete batch plant.

After the concrete is poured, the steel caisson is removed. In some situations, a permanent caisson may be required to stabilize the excavation. During drilling, a minimal amount of granular material (from an outside source) may be placed in the area between the caissons and the matting (if required at that location) to provide safe footing for construction personnel.

The Applicant and its contractors would remove construction waste and scrap on a regular schedule or at the end of each construction phase to minimize short-term visual impacts. Regular, frequent cleaning of construction equipment and vehicles on the ROW would occur. Restoration of cleared ROWs, storage areas, and access roads would minimize the extent of disturbed areas and limit the potential for dust generation.

When the site is later restored, the granular material would be leveled or removed to reinstate the original ground contours for re-vegetation of native species. Once the foundation concrete has been placed, excess excavated materials would be transported by truck to a suitable upland site for disposal. After allowing adequate curing time, the baseplate structures are bolted to the concrete foundations.

In some cases driven-piling foundations may be required, as well as temporary and permanent guy anchors, large rubber-tired or track-mounted pile-driving equipment would be used to install the foundation. Additional fixtures or a concrete pile cap may also be attached to the piling foundation as necessary for structure setting. Piling foundations generally result in little or no generation of spoils or dewatering requirements.

Once the structures have been completed and appropriate stringing equipment has been installed, wires can be strung. The wire-stringing process would begin in a set-up area prepared to accommodate the stringing equipment and materials, normally located near mid-span on the centerline of the ROW.

Using stringing blocks, pulley ropes and other equipment, and with careful monitoring by the construction crew, the wires are finally strung and clipped into place. If set-up areas in wetlands have unstable surface conditions, timber matting may need to be used. The Presidential permit and Route Permit applications provide a more detailed description of the wire-stringing process (Minnesota Power 2014, reference (1)).

2.11.1.9 Management of Water Resource Impacts

The most effective means of minimizing impacts on water areas during construction is to span streams and rivers by placing structures above the normal high water level, restrict vehicular activity within riparian corridors, and minimize use of heavy equipment when clearing riparian corridors. The Applicant has indicated that structure spans would be adjusted such that structures, where practicable, would avoid open water and stockpiled material would be contained away from stream banks and lake shorelines. Where construction equipment must cross waterways, the Applicant would seek the appropriate permits and use temporary clear span bridges to minimize adverse effects. Turbidity control methods would be implemented prior to discharging wastewater from concrete batching or other construction operations to streams or other surface waters.

For those waterways that construction equipment cannot cross, workers might walk across or use boats during wire stringing operations, or in the winter drive equipment across the ice. In areas where construction occurs close to waterways, appropriate measures would be employed to minimize soil erosion and prevent sedimentation of the waterways. The Applicant would ensure that equipment is only fueled and lubricated at a reasonable distance from waterways, depending on terrain.

Structures would be located outside of floodplains to the extent practicable. The Applicant would work with the jurisdictional agencies to determine the best ways to minimize impacts and create appropriate mitigation measures (Section 1.3.1).

Temporary impacts during construction may occur if dewatering is necessary to install the transmission structures or if pumping wells are installed to supply water for concrete batch plant operations. If dewatering or pumping is necessary, water appropriations permits would be obtained from MnDNR. If the dewatered groundwater contains substantial quantities of suspended sediments, then the water would be filtered through silt fence or bio-rolls prior to discharge.

The Applicant expects to avoid constructing the transmission line over existing wells. If crossing over wells cannot be avoided, the Applicant would work with existing landowners to develop appropriate mitigation measures.

2.11.1.10 Restoration/Revegetation

When the site is later restored, the granular material would be leveled or removed to reinstate the original ground contours for revegetation. Where rutting occurs, the Applicant would repair the surface before restoring ground vegetation. Soil compaction in cultivated areas would be treated and restored through tillage operations, for example using a subsoiler.[55]

All areas of ground disturbance not permanently altered would be prepared for restoration and reseeded with an appropriate seed mix recommended by the appropriate agency's management or according to landowner requirements. The Applicant has indicated that they would continue to coordinate with MnDNR to minimize and avoid impacts on plant communities on state lands through adjustments to the anticipated ROW, permit conditions, and mitigation. Where forested areas are cleared, appropriate herbaceous native seed mixes from sources as close as possible to the impacted area would be used to re-vegetate, as rapidly as possible, to prevent encroachment by non-native and noxious weed species. Where possible, reliance on natural re-vegetation would be encouraged (particularly in wetland areas).

As described above regarding vegetation clearing procedures, regular, frequent cleaning of construction equipment and vehicles on the ROW would be performed as appropriate to minimize spread of invasive species. In addition, spread of invasive species would be limited through the minimization of ground disturbance to the greatest degree practicable and rapid re-vegetation of disturbed areas with native or appropriate non-native, seed mixes. The environmental inspector would conduct a field survey of the ROW prior to construction to identify areas that currently contain noxious weeds. Weed surveys during construction would identify infestations of the ROW and staging sites. New infestations within the ROW would be addressed and eradicated as soon as practicable in conjunction with property owners input. Construction vehicles, including the under carriage, would be inspected for weed seed and dirt prior to construction start particularly when traveling from an area identified as contaminated by noxious weeds to an uncontaminated area. Only clean straw mulch would be used; meadow hay would not be allowed as a mulch material because of its potential to contain seeds of invasive species.

2.11.2 Iron Range 500 kV Substation

The site of the proposed **Iron Range 500 kV Substation** is located to the east of the existing Blackberry Substation near Grand Rapids. The new substation facilities would be constructed in compliance with the applicable requirements of NESC, Occupational Safety and Health Administration (OSHA), and state and local regulations. Designs would be completed by professional engineers who are licensed in Minnesota and have relevant experience. Contractors would be committed to safe working practices.

The final designs would consider local conditions and access considerations, and where warranted, would include safety provisions beyond the minimum requirements established in the various applicable safety codes. The designs would also strive to facilitate future maintenance.

Standard construction and mitigation practices developed from experience with past projects as well as industry-specific BMPs would be employed.

55 A subsoiler is a tillage tool that would loosen and break up soil at depths about twice that of a common farming tiller or rototiller.

They would be based on the specific construction design, prohibitions, maintenance guidelines, inspection procedures, and other activities involved in constructing the substation facilities, and they would take into account environmentally sensitive areas.

Once construction has been completed, the Applicant would restore the remainder of the site by removing and disposing of debris, removing all temporary structures (including staging areas), and employing appropriate erosion control measures.

If areas outside the substation site are disturbed by construction activities, they would be reseeded with vegetation similar to that which was removed, within certain height restrictions so they won't interfere with the substation or the transmission lines entering the substation.

2.11.3 500 kV Series Compensation Station

The proposed 500 kV Series Compensation Station would be constructed in compliance with the applicable requirements of NESC, OSHA, and state and local regulations. Designs would be completed by professional engineers who are licensed in Minnesota and have relevant experience. Contractors would be committed to safe working practices.

The final designs would consider local conditions and access considerations, and where warranted, would include safety provisions beyond the minimum requirements established in the various applicable safety codes. The designs would also strive to facilitate future maintenance.

Standard construction and mitigation practices developed from experience with past projects as well as industry-specific BMPs would be employed. They would be based on the specific construction design, prohibitions, maintenance guidelines, inspection procedures, and other activities involved in constructing the proposed 500 kV Series Compensation Station, and they would take into account environmentally sensitive areas.

Once construction has been completed, the Applicant would restore the remainder of the site by removing and disposing of debris, removing all temporary structures (including staging areas), and employing appropriate erosion control measures.

If areas outside the proposed 500 kV Series Compensation Station site is disturbed by construction activities, they would be reseeded with vegetation similar to that which was removed, within certain height restrictions so they won't interfere with the proposed 500 kV Series Compensation Station.

2.11.4 Regeneration Site Locations

The proposed regeneration sites would be constructed in compliance with the applicable requirements of NESC, OSHA, and state and local regulations. Designs would be completed by professional engineers who are licensed in Minnesota and have relevant experience. Contractors would be committed to safe working practices.

The final designs would consider local conditions and access considerations, and where warranted, would include safety provisions beyond the minimum requirements established in the various applicable safety codes. The designs would also strive to facilitate future maintenance.

Standard construction and mitigation practices developed from experience with past projects as well as industry-specific BMPs would be employed. They would be based on the specific construction design, prohibitions, maintenance guidelines, inspection procedures, and other activities involved in constructing the proposed regeneration sites, and they would take into account environmentally sensitive areas.

Once construction has been completed, the Applicant would restore the remainder of the sites by removing and disposing of debris, removing all temporary structures (including staging areas), and employing appropriate erosion control measures.

If areas outside the proposed regeneration sites are disturbed by construction activities, they would be reseeded with vegetation similar to that which was removed, within certain height restrictions so they won't interfere with the proposed regeneration sites.

2.11.5 Permanent Access Roads

The Applicant anticipates that a permanent, unimproved "2-track" trail would be established on uplands within the ROW as a result of construction traffic. This "2-track" trail would be unimproved with no grading or filling.

2.11.6 Temporary Access Roads, Laydown Areas, Fly-in Sites, and Stringing Areas

To the extent practicable, laydown areas, fly-in sites, and stringing areas would be located and arranged in a manner to preserve trees and vegetation and restored to preconstruction conditions.

Temporary access roads outside of the ROW would be required. The Applicant would work with local property owners to identify suitable access

locations. Temporary roads and other temporarily impacted areas would be restored as appropriate once construction is completed.

2.12 Maintenance and Operation

2.12.1 Transmission Line

A transmission line must be inspected, maintained, and repaired over the entire life of the facility. The 500 kV transmission lines are generally inspected annually by foot, all-terrain vehicle, truck, or snowmobile, or by air. Inspections are limited to the ROW and to those areas where obstruction or terrain may require off-ROW access. The proposed transmission line would be expected to be in operation in perpetuity,

If inspectors find any problems, the Applicant would make an effort to notify the landowner before making the repairs. If damages are incurred during maintenance or repairs, the landowner would be compensated appropriately. The structures for the proposed Project would be new, so very little maintenance would be expected for many years. **In any locations where the Applicant would need to access the transmission line from a trunk highway, or trim vegetation in a trunk highway ROW, the Applicant would need to coordinate these activities with MnDOT's Roadside Vegetation Management Unit and obtain any necessary approvals for these activities from MnDOT.**

Vegetation in the ROW that could interfere with operations must be removed. In most cases, the ROW would need to remain free of trees throughout construction and operation of the proposed Project; however, the Applicant has indicated that bushy shrubs and low-growing vegetation could be allowed to regenerate in portions of the ROW to reduce, though not eliminate, the visual impacts. Planting of visual screening would be considered on a case-by-case basis.

Vegetation maintenance for 500 kV transmission lines is typically on a 2- to 5-year cycle. Vegetation may be cleared using a combination of mechanical and hand clearing, and herbicides may be applied where allowed and approved by the landowner. Prior to maintaining vegetation in a particular area, the Applicant would make an effort to notify affected landowners. Vegetation clearing could be scheduled to avoid bird nesting periods, with the ongoing vegetation clearing schedule included as part of state or federal permits. **In locations where maintenance activities would occur in a MnDOT ROW or require access from a MnDOT highway, the Applicant would need to coordinate activities with MnDOT's Roadside Vegetation Management Unit.**

In addition, the Applicant would work with the USFWS and MnDNR to identify potential locations for line marking, such as areas of high avian use, nest sites, feeding areas, and migratory corridors. The Applicant would incorporate industry best practices, which are consistent with Avian Powerline Interaction Committee's (APLIC's) 2012 guidelines.

2.12.2 Iron Range 500 kV Substation

Substation facilities must be regularly inspected, maintained, and repaired over the life of the facilities, and vegetation that might interfere with the safe and reliable operation of the facilities must be removed.

In order to minimize potential safety impacts, the substation facilities would have appropriate signage, would be fenced, and access would be limited to authorized personnel.

2.12.3 500 kV Series Compensation Station

The 500 kV Series Compensation Station site must be regularly inspected, maintained, and repaired over the life of the facility, and vegetation that might interfere with the safe and reliable operation of the facility must be removed.

In order to minimize potential safety impacts, the 500 kV Series Compensation Station would have appropriate signage, would be fenced, and access would be limited to authorized personnel.

2.12.4 Regeneration Sites

Regeneration sites must be regularly inspected, maintained, and repaired over the life of the facilities, and vegetation that might interfere with the safe and reliable operation of the facilities must be removed.

In order to minimize potential safety impacts, the Regeneration sites would have appropriate signage, would be fenced, and access would be limited to authorized personnel.

2.12.5 Permanent Access Roads

The Applicant has committed to using the minimum area required for permanent access roads. Permit conditions and procedures for maintenance along permanent access roads to minimize impacts would

be similar to those required for the transmission line ROW.

2.13 Summary of Applicant Proposed Measures to Minimize Environmental Impacts

Table 2-2 provides a summary of the Applicant proposed measures intended to minimize potential environmental impacts.

2.14 Estimated Costs

The Applicant has continued to refine its cost estimates since they filed their original certificate of need application in October 2013. Based on preliminary engineering considerations, the Applicant currently estimates that the construction of the proposed Project on the route alternatives or any combination of proposed segment options, including substation facilities, would cost between **$558** million and **$710** million (2013 dollars).

If the MN PUC selects other routes, these cost estimates may change. The major components of these preliminary estimates are shown in Table 2-3.

2.15 Project Schedule

The Applicant requires an in-service date of June 1, 2020, as agreed upon in the contract between the Applicant and Manitoba Hydro. Currently, the Presidential permit and Route Permit approval process (including federal and state environmental review) would be completed by early 2016. Depending on the timing of other permits, **the Applicant currently anticipates beginning construction in 2017** (Table 2-4).

Table 2-2 Applicant Proposed Measures to Minimize Environmental Impacts

Proposed Project Phase		Applicant-Proposed Measure	Resource Impacts Addressed
Routing / Design	General Design	Incorporation of safety measures into design: • Design in accordance with local, state and NESC safety standards (clearances, material strengths, ROW widths, minimization of transportation impacts) • Protective devices including circuit breakers and relays located where the transmission line connects to the substation • Signage, fencing and limited access at substation	Human Settlement
		Design considerations to address simultaneous outages of the proposed Project and the existing 500 kV line	Public Services & Utility Systems
		Design to minimize impact area: • Minimization of area and coordination of location with landowners for access road • Siting Blackberry 500 kV Substation facilities	Land Use, forestry
		Design to minimize visible impacts at specific sites (e.g., travel ways, recreation sites, Big Bog State Recreation Area, and bodies of water with access and residences)	Aesthetics
		Coordination with the USFWS and MnDNR to minimize avian impacts: • Identification of potential locations for line marking, such as areas of high avian use, nest sites, feeding areas, and migratory corridors • Incorporation of industry best practices, consistent with APLIC's 2012 guidelines.	Wildlife
		Coordination with owners of private airstrips and with aerial applicators to determine methods to improve visibility, such as installing markers on the transmission line.	Transportation
	Applicant Routing	Paralleling existing ROWs to the extent practical	Aesthetics, recreation and tourism, wildlife
		Avoidance of/maximizing distance from residences in routing to the extent practical	Aesthetics
		Perpendicular crossing of Water of the Dancing Sky Scenic Highway (Minnesota Highway 11) parallel to existing 500 kV line	Aesthetics
	Final Alignment	Shifts in alignment to avoid construction over existing wells, aesthetic impacts, floodplains, wetlands and bird concentration sites to the extent practical and avoidance of cultural resources in accordance with the Programmatic Agreement	Water Resources, Aesthetics, Wetlands, Wildlife, Rare and Unique Species and Communities, Archaeological and Historic Resources
		Coordination with regulatory agencies to avoid and minimize effects on forest resources (including sensitive forested areas and **high-conservation-value forests**) on federal, state, and county-owned properties, plant communities on state lands	Forestry, Rare and Unique Species and Communities, Land Use
		Placement near MnDOT ROW in accordance with MnDOT's Accommodation Policy	Transportation
		Coordination with owners of private airstrips and with aerial applicators	Transportation
		Coordination with existing mining operators and mineral lessees to identify the extent of current and planned mining operations	Mining
	Final Structure Placement	Adjustment of span and pole placement to avoid waterways (perpendicularly), wetlands, sensitive resources, and transportation corridors to the extent practical and to avoid of cultural resources in accordance with the Programmatic Agreement	Aesthetics, Water Resources, wildlife, recreation, Rare and Unique Species and Communities, Transportation, Archaeological and Historic Resources
			Human settlement, Land Use
ROW Acquisition		Property or easement acquisition will be conducted in accordance with applicable state and federal regulations.	Human Settlement
		Coordination with landowners through the ROW acquisition process to address unauthorized access concerns.	Recreation and Tourism
Permitting		Agency Coordination: Development of PA with DOE and consulting parties Development of AIMP with MDA Coordination with railroad authorities Coordination with MnDOT, FAA, and MnDOT Office of Aeronautics	Archaeological and Historic Resources, Agricultural Production, Transportation

Proposed Project Phase	Applicant Proposed Measure	Resource Impacts Addressed
Construction	Construction in accordance with local, state and NESC safety standards (clearances, material strengths, ROW widths, construction practices including signage)	Human Settlement (Public Health and Safety)
	Coordination with local public service, utility and transportation authorities: • Lane closure coordination with local emergency services • Identification/protection of buried utilities • Scheduling planned disruptions • Installation of temporary access points • Safeguards during stringing process • Construction near railways	
	Preconstruction surveys for rare and unique natural resources: • Identification and avoidance of nest sites during breeding season and implementation of restraints to avoid disturbance to nesting birds • Identification of sensitive plants and coordination with regulatory agencies to develop individual avoidance and minimization measures • Identification of native prairie and other sensitive communities such as calcareous fens along the selected ROW and coordination with regulatory agencies to develop individual avoidance and minimization measures	Rare and Unique Species and Communities
	Minimization of construction disturbance to the extent practical: • Avoidance or soil disturbance and excavation in steep slope areas • Coordination with MnDNR to minimize impacts on sensitive forested areas • Limiting construction activities to ROW unless landowner permission is granted • Minimization of ground disturbance • Spanning wetlands and drainage systems where practical • Accessing wetland via shortest practical route	Soils, Water Resources, Vegetation, Land Use, Wetlands
	Development/implementation of construction BMPs: • Agricultural impact mitigation plans (in consultation with MDA) • Development of SWPPP required by the NPDES permitting process specifying BMPs (e.g., silt fence, straw bales, or ditch blocks, and/or covering bare soils with mulch, plastic sheeting, or fiber rolls, containment of stockpiled material away from stream banks and lake shorelines, use of turbidity control methods, silt fence or bio-roll filter prior to wastewater discharge to surface waters, spreading of topsoil and seeding in a timely manner, restriction of vehicular activity within riparian corridors) • Regular inspections of soil and erosion control BMPs particularly during significant precipitation events • BMPs to minimize soil disturbance and compaction (matting, ice roads, low ground pressure equipment, construction during frozen conditions on wet soils) BPMs to minimize impacts to wild rice	Soils, Agricultural Production, Water Resources, Wetlands, Cultural Values (wild rice related)
	• Development/implementation of SPCC and related BMPs • Refueling at sites away from wetlands and waters • Storage of oil products and hazardous materials inside appropriate containment • Immediate mitigation of spill in accordance with the procedures in the SPCC plan	Water Resources, Wetlands
	• Minimization of opportunity for noxious weed infestation/establishment • Weed surveys • Prompt eradication of infestations • Inspection of construction vehicles	Noxious Weeds and Exotic Organisms
	• Adherence to PA for cultural resource management • **Adherence to PA for identification and treatment of Native American resources, including identification and treatment of NRHP-eligible properties of traditional religious and cultural importance to a federally recognized Indian tribe, traditional cultural properties, or traditional cultural landscapes**	**Archaeological and Historic Resources, Native American/ Tribal Resources, and Cultural Values**
	Announcement of construction activities and timing via the Applicant's project website to minimize conflicts with local recreational activities.	Cultural Values, Recreation and Tourism
	Regular, frequent cleaning of construction equipment and vehicles on the ROW	Air quality, Noxious Weeds
	Removal of construction waste and scrap on a regular schedule or at the end of each construction phase	Aesthetics
Restoration	Restoration of rutted or compacted soil	Soils
	Prompt revegetation of all areas of ground disturbance not permanently altered (including temporary roads and staging areas: • Soil preparation including repairing ruts and restoration of compacted soil • Reseeding with an appropriate seed mix recommended by the appropriate agency's management or according to landowner requirements • Restoration of temporarily impacted wetlands to pre-construction conditions to the extent practical • Restoration of MnDNR PWI wetlands according to provisions in Land and Water Crossing permits • Use of clean straw mulch	Soils, Agricultural Production, Vegetation, Cultural Values, Noxious Weeds and Exotic Organisms, Water Resources, Wetlands
	Repair of Fences, gates, and similar improvements that are removed or damaged	Land Use
	Regeneration of bushy shrubs and low-growing vegetation could be allowed to regenerate in portions of the ROW to reduce, though not eliminate, the visual impacts. Planting of visual screening will be considered on a case-by-case basis	Aesthetics
	Coordination with landowner on disposal method for cleared material (chipping, burning, or stacking)	Forestry
Operation and maintenance	Restoration of television or radio reception to pre-project conditions	Radio, Television, and Cellular Telephone

(1) The Applicant proposed measures, along with industry BMPs, are potential MN PUC Route Permit conditions.

Table 2-3 Proposed Project Cost Estimates

Proposed Project Components	Low End (in millions)	High End (in millions)
500 kV Transmission Line	$425.6	**$601.9**
Iron Range 500 kV Substation	**$38.0**	**$48.3**
500 kV Series Compensation Station	**$43.2**	**$55.1**
Existing 230 kV Transmission System Modifications	**$3.8**	**$4.8**
Proposed Project Total	**$557.9**	**$710.1**

Source: Minnesota Power 2015, reference (9)

Table 2-4 Proposed Project Schedule

Year	Month	Activity
2013	December	Certificate of Need Completeness Hearing
2015	February	Certificate of Need Environmental Report Scoping Meetings
	April	File Route Permit Application
	April	File Presidential Permit Application
	June	Route Permit/Presidential Permit Scoping Meetings
	June	Certificate of Need Environmental Report Released
	October	Certificate of Need Public Hearings
2015	April	Certificate of Need Decision
	June	Draft EIS Published
	June	Draft EIS Comment Meetings
	October	Final EIS Published
	November	State Final EIS Hearing
2016	January	Presidential Permit Issued
	February	Route Permit Issued
	March	Construction Permitting Starts
2017		**Construction Begins**
2020	June	Project in Service

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Federal National Environmental Policy Act (NEPA) implementing regulations require an analysis of the No Action alternative as a baseline for analyzing and comparing potential environmental impacts from U.S. Department of Energy's (DOE) proposed Federal action.[56]

Under the No Action Alternative, DOE would not issue a Presidential permit and the proposed Project would not be built. In general, if the proposed Project was not permitted, the environmental impacts associated with the proposed Project **as described in Chapter 5 and Chapter 6 of this EIS would not occur. Along with the project-specific environmental impacts related to this proposal, there are other considerations related to the No Action alternative.**

If the proposed Project were not constructed, future wind generation could be adversely impacted. According to the Midcontinent Independent System Operator (MISO) Manitoba Hydro Wind Synergy Study[57], the proposed new 500 kV interconnection with Manitoba would provide "significant benefits" to the entire MISO footprint, including substantial reductions in wind curtailments and better utilization of both wind and hydro resources, meaning increased efficiency of the energy supply system as a whole. Over a 20-year time frame, these benefits were valued at approximately $1.6 billion in 2012 dollars for the northern MISO region.[58]

In addition, if the proposed Project were not constructed, the Applicant would not take delivery from Manitoba Hydro under the MN PUC-approved 250 MW power purchase agreement and the 133 MW Renewable Optimization Agreements. According to the MN PUC findings in its certificate of need proceeding, the Applicant's current facilities are not likely to be sufficient to meet future electrical demand on its system. Therefore, if the proposed Project were not constructed, the Applicant would have to implement one or more other options to meet future demand. Also, the proposed Project would not be available during a contingency on the existing 500 kV transmission line to reduce loading and improve performance.[59]

56 40 Code of Federal Regulations (CFR) 1502.14(d).

57 Available at: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CB4QFjAAahUKEwj_h5XtIMPIAhULxoAKHeAHDhM&url=https%3A%2F%2Fwww.misoenergy.org%2F_layouts%2FMISO%2FECM%2FDownload.aspx%3FID%3D160821&usg=AFQjCNGZxZvRrDELHEJkJ1nnNoKh_hWTRA&sig2=U83nVSqD5Xe9rC7_n2qJQw.

58 Ex. 19 in CN docket, Hoberg Direct, (Midcontinent Independent System Operator (MISO) Hydro Wind Synergy Study.

59 Ex. 19 in CN docket, Hoberg Direct, (Midcontinent Independent System Operator (MISO) Hydro Wind Synergy Study).

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4.1 Federal and State Alternative Review

U.S. Department of Energy (DOE) and Minnesota Department of Commerce – Energy Environmental Review and Analysis (DOC-EERA) conducted the joint scoping process as described in Section 1.4. This chapter describes the alternatives—which include the proposed Project routes and variations—proposed during the public scoping process selected for detailed study in this Environmental Impact Statement (EIS). A discussion of all the alternatives suggested and/or developed through the public scoping process and considered by DOE and DOC-EERA for purposes of environmental review is provided in Appendix C.[60]

4.1.1 Federal Action Alternatives Reviewed Under this EIS

As described in its Notice of Intent (NOI), DOE uses the scoping process "both to help define the environmental issues to be analyzed and to identify the range of reasonable alternatives" (79 Federal Register 36497; see also 40 Code of Federal Regulations [CFR] 1501). The scope of this EIS includes the range of alternatives, including no action (Chapter 3), reasonable alternatives, including DOE's preferred alternative, and impacts to be considered by DOE and cooperating agencies in the federal environmental review of the proposed Project.

DOE's proposed federal action is the granting of the Presidential permit for the international border crossing. DOE's Presidential permit decision is solely for the international border crossing, while the proposed construction, operation, maintenance, and connection of the portion of the transmission line within the United States is a "connected action" to DOE's proposed action.

DOE's preferred alternative is to grant a Presidential permit to Minnesota Power's proposed international border crossing at latitude 49° 00' 00.00" N and longitude 95° 54' 50.49" W, roughly 2.9 miles east of Highway 89 in Roseau County, Minnesota.

During the scoping process, commenters proposed five alternative international border crossings. DOE evaluated the five alternative international border crossings and determined that four of them, should be considered for detailed analysis in this EIS. These alternatives include the Border Crossing Pine Creek Variation, Border Crossing Hwy 310 Variation, Border Crossing 230 kV Variation, and the Border Crossing 500 kV Variation. **The border crossing alternatives are included in the scope of the EIS for purposes of the analysis supporting MN PUC's Route Permit decision, and are not currently being considered by DOE as action alternatives in its response to the international border crossing proposed by the Applicant in its Amended Presidential permit application to DOE (October 2014).**

The fifth international border crossing alternative commenters proposed during scoping was the International Boundary Alternative Route Segment. DOE evaluated this international border crossing alternative and determined that it would not be carried forward for more detailed analysis in the EIS. DOE eliminated this alternative because it requires the proposed transmission line to cross the Pine Creek Peatland, which is a Minnesota Department of Natural Resources (MnDNR) Scientific and Natural Area (SNA) protected under state regulation with regard to transmission line crossings.[61]

In addition to the proposed federal action and border crossing alternatives, the proposed construction, operation, maintenance, and connection of the portion of the transmission line within the United States is analyzed in the EIS because it is a "connected action"; an action closely related to the DOE's international border crossing decision. See 40 CFR 1508.25(a)(1). The Applicant's proposed route, the Applicant's alternative routes, the 22 alternative route segments, and nine alignment modifications that were proposed by agencies and the public during scoping were analyzed by DOE in coordination with the DOC-EERA, and were jointly determined to be within the scope of this EIS, and will therefore be studied in detail as described below. More importantly, the analysis of these alternatives related to the construction, operation, maintenance, and connection of the proposed transmission line in this joint federal-state EIS is necessary because the EIS also supports the proposed actions of DOE's federal cooperating agencies (Section 1.4.2) and the

60 The full text of the Scoping Summary Report is available at: http://www.greatnortherneis.org (http://www.greatnortherneis.org/Files/Scoping%20Summary%20Report%20NOV2014%20v2.pdf) and on e-Dockets (eDockets Numbers: 201411-104621-01 to 10, 104622-01 to 09, 104623-01 to 10, 104624-01 to 08, 104625-01 to 07, and 104626-01 to 03) at: http://mn.gov/commerce/energyfacilities/Docket.html?Id=33847#edocketFiles.

61 State regulations prohibit crossing the Pine Creek Peatland Scientific and Natural Area (SNA) unless no feasible and prudent alternative exists. Minnesota Rules, part 7850.4300, subpart 2. There are existing potential feasible and prudent alternatives for this crossing; therefore, DOE rejected this alternative.

Minnesota Public Utility Commission's (MN PUC) Route Permit decision.[62]

The DOE's Scoping Summary Report (Appendix C) provides details on the alternative route segments and alignment modifications proposed during scoping.[63] Only one of the five alternative border crossing alternatives suggested during scoping, the International Boundary Alternative Route Segment, was determined by DOE to not be a reasonable alternative for purposes of this EIS. This border crossing alternative was eliminated because it would have crossed a State of Minnesota SNA – an area through which transmission infrastructure is prohibited by Minnesota Rules, part 7850.4300. During the scoping process, 11 additional alternative route segments were proposed in addition to the 22 alternative route segments previously discussed. But DOE, in cooperation with the DOC-EERA and the federal cooperating agencies, eliminated them from further consideration based on the rationale provided in the DOC-EERA comments to the MN PUC (including, but not limited to, considerations related to technical, legal, and economic feasibility of an alternative route segment or whether an alternative route would mitigate a potential impact from the proposed Project).[64]

Non-transmission alternatives and one route alternative were proposed during the public comment period on the Draft EIS and were considered by DOE but eliminated from detailed analysis because they are outside the scope of the purpose of and need for DOE's federal action, which is to respond to the Applicant's request for a Presidential Permit. Non-transmission alternatives that are out of scope for this EIS are addressed through the MN PUC's certificate of need process.

62 Section 1506.2 of National Environmental Policy Act (NEPA) strongly encourages relevant federal, state, and local agencies to cooperate fully with each other. In such cases the Council on Environmental Quality's (CEQ's) Memorandum to Agencies, Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations (46 FR 18026; March 23, 191), Question 23A states: "The EIS must contain a complete discussion of scope and purpose of the proposal, alternatives and impacts so that they [EIS] discussion is adequate to meet the needs of local, state, and federal decision makers." DOE's NEPA implementing regulations at 10 CFR part 1021.341(b) also direct DOE programs to, in consultation with other agencies, incorporate any relevant information and requirements in coordinated environmental reviews to the extent possible.

63 Available in electronic format at: http://www.greatnortherneis.org/Files/Scoping%20Summary%20Report%20NOV2014%20v2.pdf.

64 Available at: http://mn.gov/commerce/energyfacilities/documents/33847/EERA%20Packet%20-%20cltr-C-R-Route%20Alternatives%20(12-5-14).pdf.

4.1.2 State Alternatives Reviewed Under this EIS

The MN PUC route permit regulations allow anyone to suggest alternative routes during the scoping process for evaluation in the EIS. The DOC-EERA then recommends which of the alternative routes, if any, to study in detail in the EIS. The alternatives selected for detailed study and the routes proposed by the Applicant must be evaluated in the EIS. There were 33 alternative route segments proposed by the public during scoping (including five new border crossings) and nine alignment modifications. Following DOC-EERA evaluation[65] and MN PUC's consideration, the DOC issued its Scoping Decision on January 8, 2015.[66] The Scoping Decision specifies that the EIS will evaluate the Applicant's proposed border crossing, route(s) and associated facilities, four new border crossings, 22 new alternative route segments, and nine new alignment modifications (defined below).

4.2 Definitions of Key Terms

The key terms used in this section as well as in the following chapters of the EIS are defined below.

Sections — The proposed Project is divided into three geographic sections: West Section, Central Section, and East Section. Within each section, multiple variation areas were developed to address local issues (Map 4-1, Table 4-1). The EIS evaluates the issues within each section, progressing from west to east across the project area.

Variation Areas — The variation areas are smaller geographic areas that allow evaluation and comparison of local issues, such as wildlife management areas or location of transmission lines, across alternatives (Table 4-1). Each variation area includes the Applicant's proposed routes and local route alternatives or "variations." The EIS evaluates the local issues within each variation area, progressing from west to east across each section.

Variations — The variations are specific combinations of segments within a variation area designed to avoid specific local issues. These variations were developed from alternative route segments identified during the scoping process, as described in Chapter 1 (Table 4-2). The EIS evaluates the potential environmental impacts and presents the results for the variation(s) and the proposed route(s) within each variation area.

65 Available at http://mn.gov/commerce/energyfacilities/documents/33847/EERA%20Packet%20-%20cltr-C-R-Route%20Alternatives%20(12-5-14).pdf.

66 Available at http://mn.gov/commerce/energyfacilities/documents/33847/Scoping%20Decision-SIGNED%20(1-8-15).pdf.

Table 4-1 Sections and Corresponding Variation Areas

West Section	Central Section	East Section
Border Crossing Variation Area	Pine Island Variation Area	Effie Variation Area
Roseau Lake WMA Variation Area	Beltrami South Central Variation Area	East Bear Lake Variation Area
Cedar Bend WMA Variation Area	Beltrami South Variation Area	Balsam Variation Area
Beltrami North Variation Area	North Black River Variation Area	Dead Man's Pond Variation Area
Beltrami North Central Variation Area	C2 Segment Option Variation Area	Blackberry Variation Area
	J2 Segment Option Variation Area	
	Northome Variation Area	
	Cutfoot Variation Area	

Hops — The connector segments, or hops, connect the end of one variation to the beginning of another variation. These hops generally connect variations from west to east from one variation area to a different variation area. The exception is one hop that connects the end of a variation from east to west in order to allow additional flexibility for a complete route alternative. The EIS uses the hops to develop complete route alternatives.

Alignment Modifications — Alignment modifications are minor adjustments of the transmission line alignment (centerline and associated right-of-way (ROW)) within the proposed routes. During the scoping process, commenters developed and proposed these alignment modifications. **During the Draft EIS comment period, no commenters provided additional alignment modifications.** The purpose for each alignment modification is to provide a potential alternative for analysis that avoids a specific issue raised by commenters (e.g., sensitive lands, residences, airstrips, etc.). The EIS evaluates issues identified during the scoping process and presents the results for the alignment modification and the comparable segment of the Applicant's proposed route alternative.

4.3 Presentation of Alternatives in the EIS

The West Section, Central Section, and East Section route variations and alignment modifications are discussed in Sections 4.3, 4.4, and 4.5, respectively (Map 4-1). These sections provide tables that include the naming convention used in this EIS as well as the corresponding name used in the DOE Scoping Summary Report and DOC Scoping Decision. Chapter 5 and Chapter 6 provide detailed results of the potential environmental impacts analysis.

4.3.1 West Section

There are five variation areas within the West Section: Border Crossing, Roseau Lake WMA, Cedar Bend WMA, Beltrami North, and Beltrami North Central (Table 4-2, Map 4-2). In addition, there are five connector segments, or hops, that connect variations between the Cedar Bend WMA, Beltrami North, and Beltrami North Central variation areas. The variation areas are described in the following sections.

4.3.1.1 Border Crossing Variation Area

The Border Crossing Variation Area is located in the northwestern portion of the West Section (Map 4-2). The primary issues identified by commenters in this variation area included the location of the border crossing, crossing the large peatland complexes, and the need for the transmission line to avoid the SNAs. The Border Crossing Variation Area is bounded by the U.S.–Canada International Border to the north, overlapped by the Roseau Lake WMA Variation Area to the south, and overlapped by the Cedar Bend WMA Variation Area to the southeast. Table 4-2 and Map 4-3 provide details for the Border Crossing Variation Area.

International Border Crossings

There is one proposed international border crossing and four variations within the Border Crossing Variation Area as identified in Table 4-3. These alternatives include the Border Crossing Pine Creek Variation, Border Crossing Hwy 310 Variation, Border Crossing 230 kV Variation, and the Border Crossing 500 kV Variation (Map 4-3). DOE is considering issuance of a Presidential permit for only the international border crossing as proposed by the Applicant, at latitude 49° 00' 00.00" N and longitude 95° 54' 50.49" W, however all alternative international border crossings are analyzed discussed in this EIS.

Variations

There are five route alternatives within the Border Crossing Variation Area: the Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, Border Crossing Hwy 310 Variation, Border Crossing 230 kV Variation, and the Border Crossing 500 kV Variation (Table 4-2, Map 4-3). The four variations begin at different international border

Table 4-2 Proposed Routes and Variations in the West Section

Variation Area	Name in the EIS	Name(s) in the Scoping Decision Document	Length (mi)
Border Crossing	Proposed Border Crossing—Blue/Orange Route	Blue/Orange Shared	25.0
	Border Crossing Pine Creek Variation	Pine Creek Border Crossing Alternative Route Segment	25.7
	Border Crossing Hwy 310 Variation	Hwy 310 Border Crossing Alternative Route Segment	18.6
	Border Crossing 500 kV Variation	500 kV Border Crossing Alternative Route Segment	10.1
	Border Crossing 230 kV Variation	230 kV Border Crossing Alternative Route Segment	8.2
Roseau Lake WMA	Proposed Blue/Orange Route	Blue/Orange Shared Route	30.7
	Roseau Lake WMA Variation 1	Roseau Lake WMA Alternative Route Segment 1	44.1
	Roseau Lake WMA Variation 2	Roseau Lake WMA Alternative Route Segment 2	37.5
Cedar Bend WMA	Proposed Blue/Orange Route	Blue/Orange Route	24.7
	Cedar Bend WMA Variation	Cedar Bend WMA Alternative Route Segment	19.6
Beltrami North	Proposed Blue/Orange Route	Blue/Orange Route	16.5
	Beltrami North Variation 1	Beltrami WMA Alternative Route Segment 1 North	15.8
	Beltrami North Variation 2	Beltrami WMA Alternative Route Segment 2	19.7
Beltrami North Central	Proposed Blue/Orange Route	Blue/Orange Route	11.6
	Beltrami North Central Variation 1	Beltrami WMA Alternative Route Segment 4 & 5	13.7
	Beltrami North Central Variation 2	Beltrami WMA Alternative Route Segment 3	12.6
	Beltrami North Central Variation 3	Beltrami WMA Alternative Route Segment 1 South & 5	12.2
	Beltrami North Central Variation 4	Beltrami WMA Alternative Route Segment 1 South	13.5
	Beltrami North Central Variation 5	Beltrami WMA Alternative Route Segment 4 & 1 South	15.0

Table 4-3 Proposed International Border Crossings and Variations in the West Section

Variation Area	Name in the EIS	Location of Proposed International Border Crossing	
		Latitude (degrees, minutes, seconds)	Longitude (degrees, minutes, seconds)
Border Crossing	Proposed Border Crossing-Blue/Orange Route	49° 00' 00.00" N	95° 54' 50.49" W
	Border Crossing Pine Creek Variation	49° 00' 00.00" N	95° 55' 35.79" W
	Border Crossing Hwy 310 Variation	49° 00' 00.00" N	95° 46' 8.82" W
	Border Crossing 500 kV Variation	49° 00' 00.00" N	95° 32' 23.96" W
	Border Crossing 230 kV Variation	49° 00' 00.00" N	95° 30' 26.18" W

crossing locations than the Proposed Border Crossing-Blue/Orange Route. Each variation in this variation area shares a portion of its alignment with the Proposed Border Crossing-Blue/Orange Route in this variation area. The Proposed Border Crossing-Blue/Orange Route and the variations have a common endpoint near Minnesota Highway 11 in the southeastern portion of the Border Crossing Variation Area.

As shown in Table 4-2, the Proposed Border Crossing-Blue/Orange Route and the four variations in the Border Crossing Variation Area have different lengths because they start at different locations along the Canadian border but end at a common location in this variation area. The Border Crossing Pine Creek Variation begins furthest west on the border and is longest, while the Border Crossing 230 kV Variation begins furthest east on the border, and is the shortest.

4.3.1.2 Roseau Lake WMA Variation Area

The Roseau Lake WMA Variation Area is located in the northwestern portion of the West Section (Map 4-2). The primary issue identified in this variation area is a need for the proposed transmission line to avoid the Roseau Lake Wildlife Management Area (WMA). The Roseau Lake WMA Variation Area is overlapped by the Border Crossing Variation Area to the north, the Cedar Bend WMA Variation Area to the east, and the Beltrami North Variation Area to the southeast (Map 4-2). Table 4-2 and Map 4-4 provide details for the Roseau Lake WMA Variation Area.

Variations

There are three route alternatives within the Roseau Lake WMA Variation Area: the Proposed Blue/Orange Route, Roseau Lake WMA Variation 1, and Roseau Lake WMA Variation 2 (Table 4-2, Map 4-4). The Proposed Blue/Orange Route and the two variations have a common start point where the Proposed Blue/Orange Route turns east at County Road 118 in the northwestern portion of the Roseau Lake WMA Variation Area. Variation 2 shares a portion of its alignment with the Proposed Blue/Orange Route in this variation area. The Proposed Blue/Orange Route and the two variations have a common endpoint located southeast of where the Proposed Blue/Orange Route crosses CSAH 2 in the southeastern portion of the Roseau Lake WMA Variation Area. Roseau Lake WMA variations 1 and 2 are longer than the Proposed Blue/Orange Route by 14 and 7 miles, respectively (Table 4-2).

4.3.1.3 Cedar Bend WMA Variation Area

The Cedar Bend WMA Variation Area is located in the central portion of the West Section (Map 4-2). The primary issue identified in this variation area is a need for the proposed transmission line to **consider avoiding** U.S. Fish and Wildlife Service (USFWS) **Interest Land** and the Cedar Bend WMA. The Cedar Bend WMA Variation Area is overlapped by the Border Crossing Variation Area to the northwest, the Roseau Lake WMA Variation Area to the west, the Beltrami North Variation Area to the south, and the Beltrami North Central Variation Area to the southeast (Map 4-2). Table 4-2 and Map 4-5 provide details for the Cedar Bend WMA Variation Area.

Variations

There are two route alternatives within the Cedar Bend WMA Variation Area: the Proposed Blue/Orange Route and Cedar Bend WMA Variation (Table 4-2, Map 4-5). The Proposed Blue/Orange Route and Cedar Bend WMA Variation have a common start point just north of the intersection of the Proposed Blue/Orange Route with Minnesota 11, in the northwestern portion of the Cedar Bend WMA Variation Area. The Cedar Bend WMA Variation does not share any portion of its alignment with the Proposed Blue/Orange Route in this variation area. The Proposed Blue/Orange Route and Cedar Bend WMA Variation have a common endpoint located in the area where the existing 500 kilovolt (kV) and 230 kV transmission lines are closest to each other in the southeastern portion of the Cedar Bend WMA Variation Area. The Cedar Bend WMA Variation is about 5 miles longer than the Proposed Blue/Orange Route (Table 4-2).

Hops

There are three connecting segments, or hops, located in the southeastern portion of this variation area: Hop 1, Hop 2, and Hop 3 (Map 4-5). These hops provide a connection for the Proposed Blue/Orange Route and Variation in the Cedar Bend WMA Variation Area to the variations in the Beltrami North and Beltrami North Central variation areas.

The Proposed Blue/Orange Route could use the Hop 3 to connect to Beltrami North variation 3 or 4 in the Beltrami North Central Variation Area (Map 4-5). Hop 3 begins where the Proposed Blue/Orange Route turns south to follow the existing 500 kV transmission line, crosses the existing 500 kV transmission line, and connects to the north end of either Beltrami North variation 3 or 4 in the Beltrami North Central Variation Area, which parallel the west side of the existing 230 kV transmission line.

The Cedar Bend WMA Variation could use Hop 1 to connect to the Proposed Blue/Orange Route in the Cedar Bend WMA Variation Area (Map 4-5). Hop 1 begins where the Cedar Bend WMA Variation is just north of where the Proposed Blue/Orange Route turns south to follow the existing 500 kV transmission line. Hop 1 crosses the existing 500 kV transmission line, and connects to the Proposed Blue/Orange Route, which parallels the west side of the existing 500 kV transmission line.

The Cedar Bend WMA Variation could alternatively use the Hop 2 to connect to Beltrami North Central variation 3 or 4 in the Beltrami North Central Variation Area (Map 4-5). Hop 2 begins where the Cedar Bend WMA Variation is just north of where the Proposed Blue/Orange Route turns south to follow the existing 500 kV transmission line, continues south along the west side of the existing 230 kV transmission line, and connects to the north end of either Beltrami North Central Variation 3 or 4 in the Beltrami North Central Variation Area, which continue to parallel the west side of the existing 230 kV transmission line.

4.3.1.4 Beltrami North Variation Area

The Beltrami North Variation Area is located in the central portion of the West Section (Map 4-2). The primary issue identified in this variation area is a need by USFWS to consider avoidance of USFWS

Interest Lands.[67] The Beltrami North Variation Area is overlapped by the Roseau Lake WMA Variation Area to the west, the Cedar Bend WMA Variation Area to the north, and the Beltrami North Central Variation Area to the east (Map 4-2). Table 4-2 and Map 4-6 provide details for the Beltrami North Variation Area.

Variations

There are three route alternatives within the Beltrami North Variation Area: the Proposed Blue/Orange Route, Beltrami North Variation 1, and Beltrami North Variation 2 (Table 4-2, Map 4-6). The Proposed Blue/Orange Route and these two variations have a common start point just south of where the Proposed Blue/Orange Route intersects CSAH 2 in the northwestern portion of the Beltrami North Variation Area. The Beltrami North Variation 1 and Beltrami North Variation 2 variation both share a portion of its alignment with the Proposed Blue/Orange Route in this variation area. The Proposed Blue/Orange Route and the two variations have a common endpoint in the area where the existing 500 kV and 230 kV transmission lines are closest to each other in the eastern portion of the Beltrami North Variation Area. Beltrami North Variation 1 is less than a mile shorter than the Proposed Blue/Orange Route, while Beltrami North Variation 2 is over 3 miles longer than the Proposed Blue/Orange Route (Table 4-1).

Hops

There are two connecting segments, or hops, located in the eastern portion of this variation area: Hop 3 and Hop 4 (Map 4-6). These hops provide a connection for the Proposed Blue/Orange Route and Beltrami North Variation 1 in the Beltrami North Variation Area to the Beltrami North Central Variations 3 and 4 in the Beltrami North Central Variation Area.

The Proposed Blue/Orange Route could use the Hop 3 to connect to Beltrami North Central Variations 3 or 4 in the Beltrami North Central Variation Area (Map 4-5). Hop 3 begins where the Proposed Blue/Orange Route turns south to follow the existing 500 kV transmission line, crosses the existing 500 kV transmission line, and connects to the north end of either Beltrami North Central Variations 3 or 4 in the Beltrami North Central Variation Area, which parallel the west side of the existing 230 kV transmission line.

The Beltrami North Variation 1 could use the Hop 4 to connect to Beltrami North Central Variations 3 or 4 in the Beltrami North Central Variation Area (Map 4-5). Hop 4 begins at the east end of the Beltrami North Variation and connects to the north end of either Beltrami North Central variations 3 or 4 in the Beltrami North Central Variation Area, which parallel the west side of the existing 230 kV transmission line. Hop 4 would not require crossing over the existing transmission lines.

4.3.1.5 Beltrami North Central Variation Area

The Beltrami North Central Variation Area is located in the southeastern portion of the West Section (Map 4-2). The primary issue identified in this variation area is a need by USFWS to consider avoidance of USFWS **Interest Lands**. The Beltrami North Central Variation Area is overlapped by the Cedar Bend WMA and Beltrami North variation areas to the northwest (Map 4-2). Table 4-2 and Map 4-7 provide details for the Beltrami North Central Variation Area.

Variations

There are six route alternatives within this variation area: the Proposed Blue/Orange Route, Beltrami North Central Variation 1, Beltrami North Central Variation 2, Beltrami North Central Variation 3, Beltrami North Central Variation 4, and Beltrami North Central Variation 5 (Table 4-2, Map 4-7). The Proposed Blue/Orange Route and these variations have a common start point where the existing 500 kV transmission line turns southeast east of Township Road 465 in the northwestern portion of the Beltrami North Central Variation Area. All variations, except Beltrami North Central Variation 3, share a portion of its alignment with the Proposed Blue/Orange Route in this variation area. The Proposed Blue/Orange Route and three of the variations have a common endpoint in the area where the Proposed Blue/Orange Route splits in the southeastern portion of the Beltrami North Central Variation Area; Beltrami North Central variations 4 and 5 have a common endpoint where they intersect the Proposed Blue Route near 53rd Avenue Southwest in the southeastern portion of the Beltrami North Central Variation Area. All variations are longer than the Proposed Blue/Orange Route (Table 4-2).

67 USFWS letter to DOC-EERA that finalizes their route alternative recommendations for the proposed Project. FWS Tails # 03E19000-2013-CPA-0045. November 26, 2014. The letter states that this review is requested by the USFWS because all "ROW requests on Service lands can only be considered after all other alternatives are full examined, as well as the potential impacts to refuge lands. In order for this analysis to be complete, all alternatives must be analyzed and available to the Service for review."

Hop

There is one connecting segment, or hop, located in the southwestern portion of the Beltrami North Central Variation Area: Hop 5 (Map 4-7). Hop 5 provides a connection from the south end of Beltrami North Central variations 4 and 5 west to the Proposed Orange Route. This hop requires crossing over the existing 500 kV transmission line to rejoin the Proposed Orange Route.

4.3.2 Central Section

There are eight variation areas within the Central Section: Pine Island, Beltrami South Central, Beltrami South, North Black River, C2, J2, Northome, and Cutfoot (Table 4-4, Map 4-8). In addition, there are four alignment modifications (minor adjustments of the transmission line alignment centerline and associated ROW) within the proposed routes: Silver Creek WMA, Airstrip, Mizpah, and Gravel Pit (Table 4-4, Map 4-8). The variation areas are described in the following sections.

4.3.2.1 Pine Island Variation Area

The Pine Island Variation Area encompasses the entire Central Section (Map 4-8). The primary issues identified by commenters in this variation area include the presence of large peatland complexes, sharing of transmission line corridors, and a need for the proposed transmission line to avoid SNAs. The Pine Island Variation Area includes the Beltrami South Central, Beltrami South, North Black River, C2, J2, Northome, and Cutfoot variation areas (Map 4-8). Table 4-4 and Map 4-9 provide details for the Pine Island Variation Area.

Variations

There are two route alternatives within the Pine Island Variation Area: the Proposed Blue Route and the Proposed Orange Route (Table 4-4, Map 4-9). The proposed routes have a common start point where the Proposed Blue and Proposed Orange routes split east of Aichele Forest Road in the northwestern portion of the Pine Island Variation Area. The proposed routes do not share any portion of their alignments in this variation area.

Table 4-4 Proposed Routes, Variations, and Alignment Modifications in the Central Section

Variation Area	Variation Names in the EIS	Name(s) in the Scoping Decision Document	Length (mi)
Pine Island	Proposed Blue Route	Blue Route	109.8
	Proposed Orange Route	Orange Route	105.4
	Silver Creek WMA Alignment Modification	Silver Creek WMA Alignment Modification	1.0
	Proposed Blue Route	Blue Route	1.0
Beltrami South Central	Proposed Orange Route	Orange Route	1.2
	Beltrami South Central Variation	Beltrami WMA Alternative Route Segment 7	1.7
Beltrami South	Proposed Orange Route	Orange Route	5.6
	Beltrami South Variation	Beltrami WMA Alternative Route Segment 8	7.5
North Black River	Proposed Blue Route	Blue Route	8.4
	North Black River Variation	North Black River Alternative Route Segment	9.2
C2 Segment Option	Proposed Blue Route	Blue Route	32.8
	C2 Segment Option Variation	C2 Proposed Alternative	46.0
	Airstrip Alignment Modification	Airstrip Alignment Modification	1.5
	C2 Segment Option Variation	C2 Proposed Alternative	1.5
J2 Segment Option	Proposed Orange Route	Orange Route	42.2
	J2 Segment Option Variation	J2 Proposed Alternative	45.2
	Mizpah Alignment Modification	Mizpah Alignment Modification	2.8
	Proposed Orange Route	Orange Route	2.8
	Gravel Pit Alignment Modification	Gravel Pit Alignment Modification	1.2
	Proposed Orange Route	Orange Route	1.2
Northome	J2 Segment Option Variation	J2 Proposed Alternative	3.7
	Northome Variation	Northome Alternative Route Segment	4.0
Cutfoot	Proposed Orange Route	Orange Route	4.2
	Cutfoot Variation	Cutfoot Alternative Route Segment	4.8

The proposed routes have a common endpoint in the southeast corner of the Pine Island Variation Area, just west of Bass Lake Campground, in the southeastern portion of the Pine Island Variation Area. The Proposed Blue Route is longer than the Proposed Orange Route.

Alignment Modification

The Silver Creek WMA Alignment Modification is located along the Proposed Blue Route in the north-central portion of the Pine Island Variation Area (Map 4-9). This alignment modification is the same length as the comparable segment of the Proposed Blue Route (Table 4-4). The alignment modification shifts the ROW south from private, state forest, and federal lands onto state lands in order to avoid the USFWS **Interest Land** and the Silver Creek WMA. Section 6.5.2.1 provides additional information on the Silver Creek Alignment Modification.

4.3.2.2 Beltrami South Central Variation Area

The Beltrami South Central Variation Area is located in the northwestern portion of the Central Section (Map 4-8). The primary issue identified in this variation area is a need by USFWS to consider avoidance of USFWS **Interest Land**. The Beltrami South Central Variation Area is within the Pine Island Variation Area and bordered by the Beltrami South Variation Area to the southeast (Map 4-8). Table 4-4 and Map 4-10 provide details for the Beltrami South Central Variation Area.

Variations

There are two route alternatives within the Beltrami South Central Variation Area: the Proposed Orange Route and the Beltrami South Central Variation (Table 4-4, Map 4-10). The Proposed Orange Route and Beltrami South Central Variation have a common start point where the 500 kV corridor crosses Aichele Forest Road in the northwestern portion of the Beltrami South Central Variation Area. The Proposed Orange Route and Beltrami South Central Variation do not share their alignments in this variation area. The Proposed Orange Route and Beltrami South Central Variation have a common endpoint located approximately 1.25 miles to the southeast of their common start point, in the southeastern portion of the Beltrami South Central Variation Area. The Beltrami South Central Variation is less than one-half mile longer than the Proposed Orange Route (Table 4-4).

4.3.2.3 Beltrami South Variation Area

The Beltrami South Variation Area is located in the northwestern portion of the Central Section (Map 4-8). The primary issue identified in this variation area is a need by USFWS to consider avoidance of USFWS **Interest Land**. The Beltrami South Variation Area is within the Pine Island Variation Area and bordered by the Beltrami South Central Variation Area to the northwest (Map 4-8). Table 4-4 and Map 4-10 provide details for the Beltrami South Variation Area.

Variations

There are two route alternatives within the Beltrami South Variation Area: the Proposed Orange Route and the Beltrami South Variation (Table 4-4, Map 4-10). The Proposed Orange Route and Beltrami South Variation have a common start point located approximately 2.5 miles southeast of where the 500 kV corridor crosses Aichele Forest Road in the northwestern portion of the Beltrami South Variation Area. The Proposed Orange Route and Beltrami South Variation do not share their alignments in this variation area. The Proposed Orange Route and Beltrami South Variation have a common endpoint located approximately 1.25 miles to the southeast of Stony Corners Trail in the southeastern portion of the Beltrami South Variation Area. The Beltrami South Variation is about 2 miles longer than the Proposed Orange Route (Table 4-4).

4.3.2.4 North Black River Variation Area

The North Black River Variation Area is located in the north-central portion of the Central Section (Map 4-8). The primary issues identified by the commenters in this variation area were the avoidance of **the non-ferrous mineral areas** and whether to share the existing 230 kV transmission line corridor or to develop an alternative that requires a new corridor. The North Black River Variation Area is within the Pine Island Variation Area and bordered by the C2 Variation Area to the south (Map 4-8). Table 4-4 and Map 4-11 provide details for the North Black River Variation Area.

Variations

There are two route alternatives within the North Black River Variation Area: the Proposed Blue Route and the North Black River Variation (Table 4-4, Map 4-11). The Proposed Blue Route and North Black River Variation have a common start point located just west of Town Road 118 in the northern portion of the North Black River Variation Area. The Proposed Blue Route and North Black River Variation do not share their alignments in this variation area. The Proposed Blue Route and North Black River Variation have a common endpoint located north of the intersection of Sandsmark Trail and CSAH 32 in the southern portion of the North Black River Variation Area. The North Black River Variation is about one mile longer than the Proposed Blue Route (Table 4-4).

4.3.2.5 C2 Segment Option Variation Area

The C2 Segment Option Variation Area is located in the northeastern portion of the Central Section (Map 4-8). The primary issue identified by commenters in this variation area are whether to share the existing 230 kV transmission line corridor or to develop variations that require new corridors. The C2 Segment Option Variation Area is within the Pine Island Variation Area and bordered by the North Black River Variation Area to the northwest (Map 4-8). Table 4-4 and Map 4-12 provide details for the C2 Segment Option Variation Area.

Variations

There are two route alternatives within the C2 Segment Option Variation Area: the Proposed Blue Route and the C2 Segment Option Variation (Table 4-4, Map 4-12). The Proposed Blue Route and C2 Segment Option Variation have a common start point located north of the intersection of Sandsmark Trail and CSAH 32 in the northwestern portion of the C2 Segment Option Variation Area. The Proposed Blue Route and C2 Segment Option Variation do not share their alignments in this variation area. The Proposed Blue Route and C2 Segment Option Variation have a common endpoint located approximately two miles south of the intersection of Town Road 67 and CSAH 31 in the southeastern portion of the C2 Segment Option Variation Area. The C2 Segment Option Variation is about 13 miles longer than the Proposed Blue Route (Table 4-4).

Alignment Modification

The Airstrip Alignment Modification is located along the C2 Segment Option Variation in the eastern portion of the C2 Segment Option Variation Area (Map 4-12). The alignment modification is the same length as the comparable segment of the C2 Segment Option Variation (Table 4-4). The modification shifts the alignment west to allow additional space to use the runway at a private airstrip. The land ownership remains a mix of private, corporate, and state lands. Section 6.5.2.2 provides additional information on the Airstrip Alignment Modification.

4.3.2.6 J2 Segment Option Variation Area

The J2 Segment Option Variation Area is located in the southern portion of the Central Section (Map 4-8). The primary issue identified by commenters in this variation area is the presence of large peatland complexes. The J2 Segment Option Variation Area is within the Pine Island Variation Area (Map 4-8). Table 4-4 and Map 4-13 provide details for the J2 Segment Option Variation Area.

Variations

There are two route alternatives within this variation area: the Proposed Orange Route and the J2 Segment Option Variation (Table 4-4, Map 4-13). The Proposed Orange Route and J2 Segment Option Variation have a common start point located north of Flowing Well Trail and east of Forest Road 54 in the northwestern portion of the J2 Segment Option Variation Area. The Proposed Orange Route and J2 Segment Option Variation do not share their alignments in this variation area. The Proposed Orange Route and J2 Segment Option Variation have a common endpoint located southeast of Effie near County Road 288 in the southeastern portion of the J2 Segment Option Variation Area. The J2 Segment Option Variation is about 3 miles longer than the Proposed Orange Route (Table 4-4).

Alignment Modifications

The Mizpah Alignment Modification is located along the Proposed Orange Route in the northwestern portion of the J2 Segment Option Variation Area (Map 4-13). This alignment modification is the same length as the comparable segment of Proposed Orange Route (Table 4-4). The alignment modification shifts the ROW north from the private and state lands onto only state land. Section 6.5.2.3 provides additional information on the Mizpah Alignment Modification.

The Gravel Pit Alignment Modification is located along the Proposed Orange Route in the southeastern portion of the J2 Segment Option Variation Area (Map 4-13). The alignment modification is the same length as the comparable segment of the Proposed Orange Route (Table 4-4). The modification shifts the alignment east from the Proposed Orange Route to avoid private land with a gravel pit. The land ownership changes from private, corporate, and state lands to a mix of corporate and state lands. Section 6.5.2.4 provides additional information on the Gravel Pit Alignment Modification.

4.3.2.7 Northome Variation Area

The Northome Variation Area is located in the south-central portion of the Central Section (Map 4-8). The primary issue identified in this variation area is a need by USFWS to consider avoidance of USFWS **Interest Land**. The Northome Variation Area is within the Pine Island and J2 variation areas (Map 4-8). Table 4-4 and Map 4-13 provide details for the Northome Variation Area.

Variations

There are two route alternatives within the Northome Variation Area: the J2 Segment Option Variation and the Northome Variation (Table 4-4, Map 4-13). The J2 Segment Option Variation and Northome Variation have a common start point located just north of the intersection of Stone Road and CSAH 24 in the western portion of the Northome Variation Area. The J2 Segment Option Variation and Northome Variation do not share their alignments in this variation area. The J2 Segment Option Variation and Northome Variation have a common endpoint located north of Little Constance Lake in the eastern portion of the Northome Variation Area. The Northome Variation is about one-half mile longer than the comparable segment of the J2 Segment Option Variation (Table 4-4).

4.3.2.8 Cutfoot Variation Area

The Cutfoot Variation Area is located in the southeastern portion of the Central Section (Map 4-8). The primary issue identified by commenters in this variation area is a desire by commenters to avoid private land with old cedar stands. The Cutfoot Variation Area is within the Pine Island and J2 variation areas (Map 4-8). Table 4-4 and Map 4-13 provide details for the Cutfoot Variation Area.

Variations

There are two route alternatives within this variation area: the Proposed Orange Route and the Cutfoot Variation (Table 4-4, Map 4-13). The Proposed Orange Route and Cutfoot Variation have a common start point located west of Minnesota Highway 6 in the northwestern portion of the Cutfoot Variation Area. The Proposed Orange Route and Cutfoot Variation do not share their alignments in this variation area. The Proposed Orange Route and Cutfoot Variation have a common endpoint located south of Cutfoot Sioux Trail in the southeastern portion of the Cutfoot Variation Area. The Cutfoot Variation is about one-half mile longer than the Proposed Orange Route (Table 4-4).

4.3.3 East Section

There are five variation areas within the East Section: Effie, East Bear Lake, Balsam, Dead Man's Pond, and Blackberry (Map 4-14, Table 4-5). In addition, there are five alignment modifications: Bass Lake, Wilson Lake, Grass Lake, Dead Man's Pond, and Trout Lake (Map 4-14, Table 4-5). The variation areas are described in the following sections.

4.3.3.1 Effie Variation Area

The Effie Variation Area is located in the northern portion of the East Section (Map 4-14). The primary issues identified by commenters in this variation area are whether to share the existing 230 kV or 500 kV transmission line corridors or to develop variations that require new corridors. The Effie Variation Area includes the East Bear Lake Variation Area. The Balsam Variation Area overlaps the Effie Variation Area to the south (Map 4-15). Table 4-5 and Map 4-15 provide details for the Effie Variation Area.

Variations

There are three route alternatives within the Effie Variation Area: the Proposed Blue Route, Proposed Orange Route, and the Effie Variation (Table 4-5, Map 4-15). The proposed Blue Route and Effie Variation have a common start point where the existing 500 kV and 230 kV transmission line corridors converge near Lofgrin Truck Trail in the northwestern portion of the Effie Variation Area. The Proposed Orange Route begins in the west-central portion of the Effie Variation Area. The Proposed Blue and Orange routes share one portion of their alignment in the central portion of this variation area. The Proposed Orange Route and Effie Variation share one portion of their alignment in this variation area. The Proposed Blue and Orange routes and the Effie Variation have a common endpoint located southeast of Wolf Lake in the southern portion of the Effie Variation Area. The Effie Variation is 8 miles longer than the Proposed Blue Route and about 5 miles longer than the Proposed Orange Route; the Proposed Orange Route is about 3 miles longer than the Proposed Blue Route (Table 4-5).

Alignment Modifications

The Bass Lake Alignment Modification is located along the Proposed Blue/Orange Route in the central portion of the Effie Variation Area (Map 4-15). The alignment modification is slightly longer than the comparable segment of the Proposed Blue/Orange Route in the Effie Variation Area (Table 4-5). The alignment modification shifts the ROW southwest to avoid the Bass Lake County Park and Campground (Itasca County) and the George Washington State Forest campground on Larson Lake. The alignment modification modifies the proportion of land ownership to a mix of slightly less corporate land and slightly more state land. Section 6.5.3.1 provides additional information on the Bass Lake Alignment Modification.

Table 4-5 Proposed Routes, Variations, and Alignment Modifications in the East Section

Variation Area	Variation Names in the EIS	Name(s) in the Scoping Decision Document	Length (mi)
Effie	Proposed Blue Route	Blue and Blue/Orange Routes	41.1
	Proposed Orange Route	Blue, Blue/Orange, and Orange Routes	44.6
	Effie Variation	Effie Alternative Route Segment	49.8
	Bass Lake Alignment Modification	Bass Lake Alignment Modification	2.5
	Proposed Blue/Orange Route	Blue/Orange Route	2.4
	Wilson Lake Alignment Modification	Wilson Lake Alignment Modification	2.4
	Proposed Blue Route	Blue Route	2.4
East Bear Lake	Proposed Orange Route	Orange Route	8.9
	East Bear Lake Variation	East Bear Lake Alternative Route Segment	10.5
Balsam	Proposed Blue Route	Blue and Blue/Orange Routes	12.9
	Proposed Orange Route	Orange and Blue/Orange	13.7
	Balsam Variation	Balsam Alternative Route Segment 1	17.8
	Grass Lake Alignment Modification	Grass Lake Alignment Modification	1.3
	Proposed Blue Route	Blue Route	1.3
Dead Man's Pond	Proposed Blue Route	Blue Route	2.2
	Dead Man's Pond Variation	Dead Man's Pond Alternative Route Segment	2.3
	Dead Man's Pond Alignment Modification	Dead Man's Pond Alignment Modification	1.6
	Proposed Blue Route	Blue Route	1.6
Blackberry	Proposed Blue Route	Blue Route	5.4
	Proposed Orange Route	Orange Route	6.1
	Trout Lake Alignment Modification	Trout Lake Alignment Modification	1.0

The Wilson Lake Alignment Modification is located along the Proposed Blue Route in the central portion of the Effie Variation Area (Map 4-15). The alignment modification is the same length as the comparable segment of the Proposed Blue Route (Table 4-5). The modification shifts the alignment east to avoid corporate land; land ownership changes from corporate and state lands to mostly state lands. Section 6.5.3.2 provides additional information on the Wilson Lake Alignment Modification.

4.3.3.2 East Bear Lake Variation Area

The East Bear Lake Variation Area is located in the east-central portion of the East Section (Map 4-14). The primary issue identified by commenters in this variation area is the presence of the Bear-Wolf Peatland. The East Bear Lake Variation Area is within the Effie Variation Area (Map 4-15). Table 4-5 and Map 4-16 provide details for the East Bear Lake Variation Area.

Variations

There are two route alternatives within the East Bear Lake Variation Area: the Proposed Orange Route and the East Bear Lake Variation (Table 4-5, Map 4-16). The Proposed Orange Route and East Bear Lake Variation have a common start point located just north of Bear Lake Forest Road E in the northwestern portion of the East Bear Lake Variation Area. The Proposed Orange Route and East Bear Lake Variation do not share their alignments in this variation area. The Proposed Orange Route and East Bear Lake Variation have a common endpoint located southeast of Wolf Lake in the southern portion of the East Bear Lake Variation Area. The East Bear Lake Variation is over one mile longer than the Proposed Orange Route (Table 4-5).

4.3.3.3 Balsam Variation Area

The Balsam Variation Area is located in the central portion of the East Section (Map 4-14). The primary issue identified by commenters in this variation area is concern over potential impacts from the proposed transmission line on the town of Balsam. The Balsam Variation Area is overlapped by the Effie Variation Area to the north (Map 4-15). Table 4-5 and Map 4-17 provide details for the Balsam Variation Area.

Variations

There are three route alternatives within the Balsam Variation Area: the Proposed Blue Route, Proposed Orange Route, and the Balsam Variation (Table 4-5, Map 4-17). The proposed routes and Balsam Variation have a common start point along

the existing 230 kV transmission line corridor approximately one mile north of County Road 539 in the northeastern portion of the Balsam Variation Area. The Proposed Blue and Orange routes share one portion of their alignment in this variation area. The Proposed Orange Route and the Balsam Variation share one portion of their alignment in this variation area. The proposed routes and Balsam Variation have a common endpoint located near Diamond Lake Road in the southern portion of the Balsam Variation Area. The Balsam Variation is 5 miles longer than the Proposed Blue Route and about 4 miles longer than the Proposed Orange Route; the Proposed Orange Route is about one mile longer than the Proposed Blue Route (Table 4-5).

Alignment Modification

The Grass Lake Alignment Modification is located along the Proposed Blue Route in the northeastern portion of the Balsam Variation Area (Map 4-17). The alignment modification is the same length as the comparable segment of the Proposed Blue Route (Table 4-5).The alignment modification shifts the ROW east to avoid crossing Grass Lake, a MnDNR Public Waters Inventory (PWI) lake and a wild rice waterbody. The land ownership changes from private, corporate, and state forest lands to just corporate and state forest lands. Section 6.5.3.3 provides additional information on the Grass Lake Alignment Modification.

4.3.3.4 Dead Man's Pond Variation Area

The Dead Man's Pond Variation Area is located in the south-central portion of the East Section (Map 4-14). The primary issue identified by commenters in this variation area is the use of corporate and state fee lands instead of private land. The Dead Man's Pond Variation Area is located within the Balsam Variation Area (Map 4-15). Table 4-5 and Map 4-17 provide details for the Dead Man's Pond Variation Area.

Variations

There are two route alternatives within the Dead Man's Pond Variation Area: the Proposed Blue Route and the Dead Man's Pond Variation (Table 4-5, Map 4-17). The Proposed Blue Route and Dead Man's Pond Variation have a common start point just north of where the Proposed Blue Route crosses CSAH 8 in the northeastern portion of the Dead Man's Pond Variation Area. The Proposed Blue Route and Dead Man's Pond Variation do not share their alignments in this variation area. The Proposed Blue Route and Dead Man's Pond Variation have a common endpoint located approximately 0.5 miles south of CSAH 57 in the southwestern portion of the Dead Man's Pond Variation Area. The Dead Man's Pond Variation is slightly longer than the Proposed Blue Route (Table 4-5).

Alignment Modification

The Dead Man's Pond Alignment Modification is located along the Proposed Blue Route in the south-central portion of the Dead Man's Pond Variation Area (Map 4-17). The alignment modification is the same length as the comparable segment of the Proposed Blue Route (Table 4-5). The modification shifts the alignment west and away from one residence; however, the shift is to private land that requires crossing a MnDNR PWI waterbody. Section 6.5.3.4 provides additional information on the Dead Man's Pond Alignment Modification.

4.3.3.5 Blackberry Variation Area

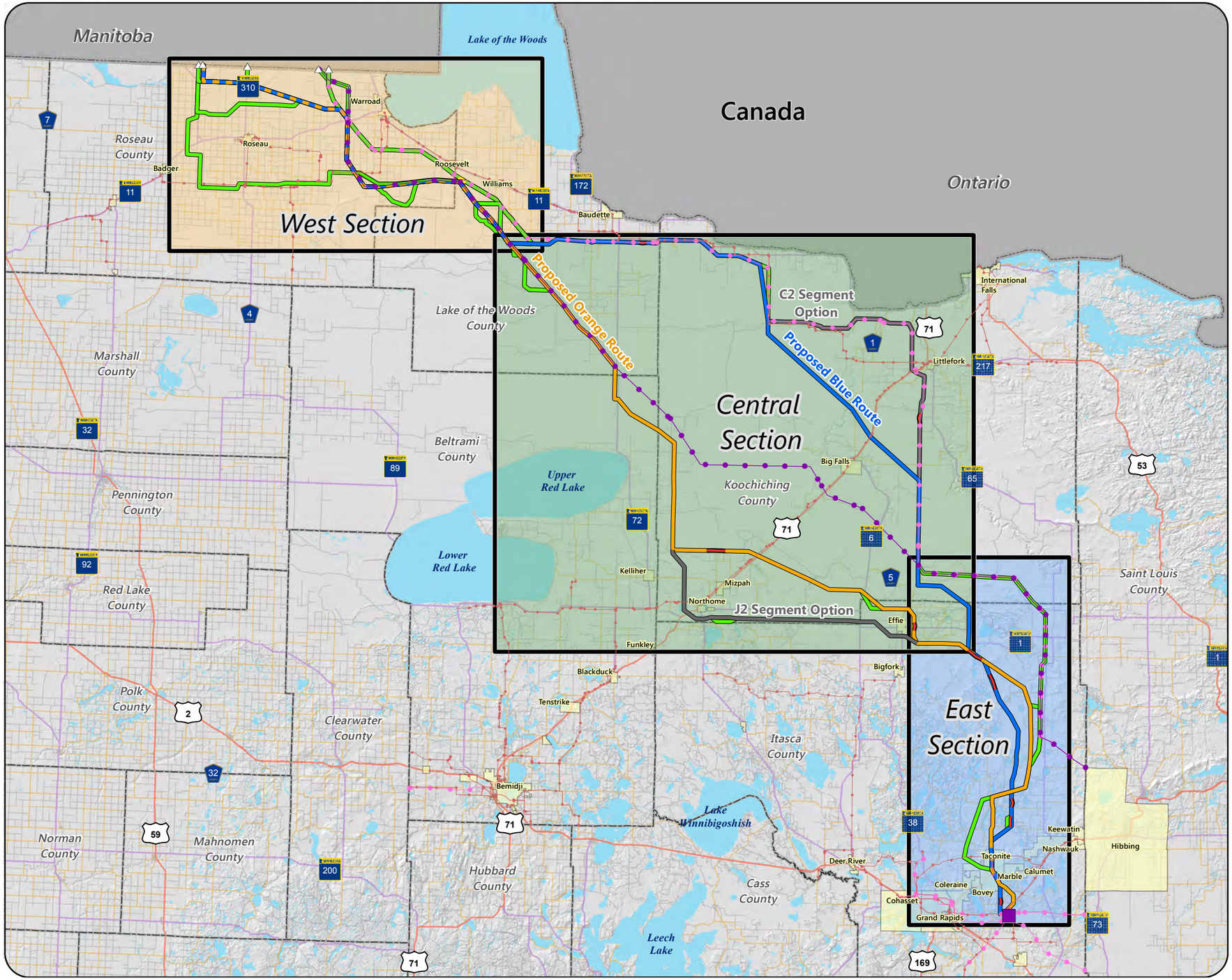
The Blackberry Variation Area is located in the southern portion of the East Section (Map 4-14). The primary issues identified by commenters in this variation area are the presence of the Mesabi Iron Range (with associated mining) and existing Blackberry Substation. The Blackberry Variation Area is located south of the Balsam Variation Area (Map 4-15). Table 4-5 and Map 4-17 provide details for the Blackberry Variation Area.

Variations

There are two route alternatives within the Blackberry Variation Area: the Proposed Blue Route and the Proposed Orange Route (Table 4-5, Map 4-17). These proposed routes have a common start point located west of Twin Lakes where the Proposed Blue/Orange Route diverges in the northwestern portion of the Blackberry Variation Area. The Proposed Blue and Orange routes do not share their alignments in this variation area. The proposed routes have a common endpoint located at the proposed **Iron Range 500 kV** Substation in the southern portion of the Blackberry Variation Area. The Proposed Orange Route is less than one mile longer than the Proposed Blue Route (Table 4-5).

Alignment Modification

The Trout Lake Alignment Modification is located along the Proposed Blue Route in the western portion of the Blackberry Variation Area along the Proposed Blue Route (Map 4-17). This alignment modification is the same length as the comparable segment of the Proposed Blue Route (Table 4-5). The alignment modification shifts the alignment east from a mix of private and corporate lands to all corporate lands. Section 6.5.3.5 provides additional information on the Trout Lake Alignment Modification.



- Border Crossing Point
- Proposed Iron Range 500 kV Substation

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Route Variation Hop
- Alignment Modification

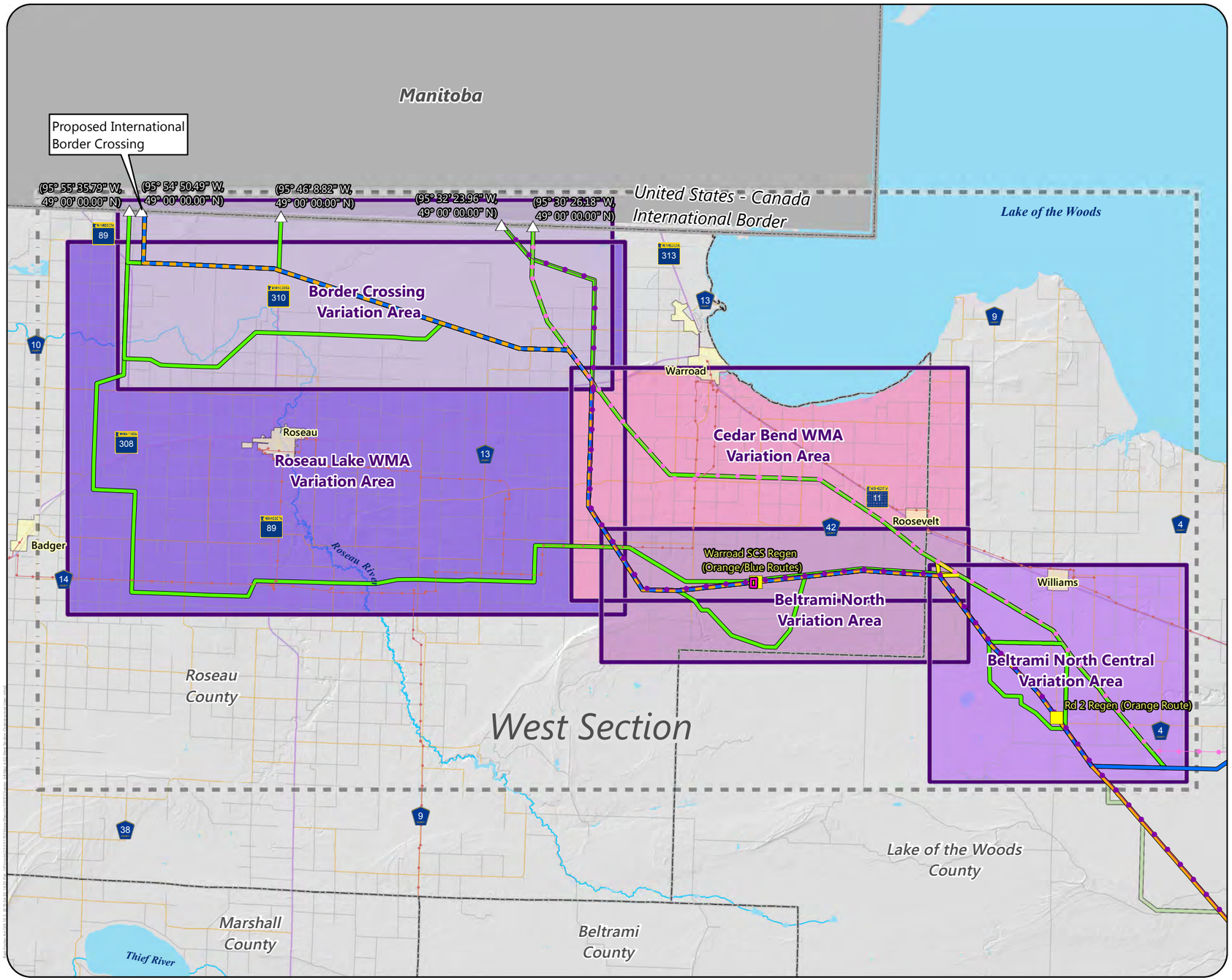
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways
- US Highway
- State Trunk Highway
- County State Aid Highway
- Local Road
- Project Section
- Municipal Boundary
- County Boundary
- International Boundary

Miles
14 7 0 14

Map 4-1

PROJECT SECTIONS OVERVIEW
Great Northern Transmission Line
Final Environmental Impact Statement



- Border Crossing Point
- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives
- Route Variation
- Route Variation Hop
- Proposed Series Compensation Station

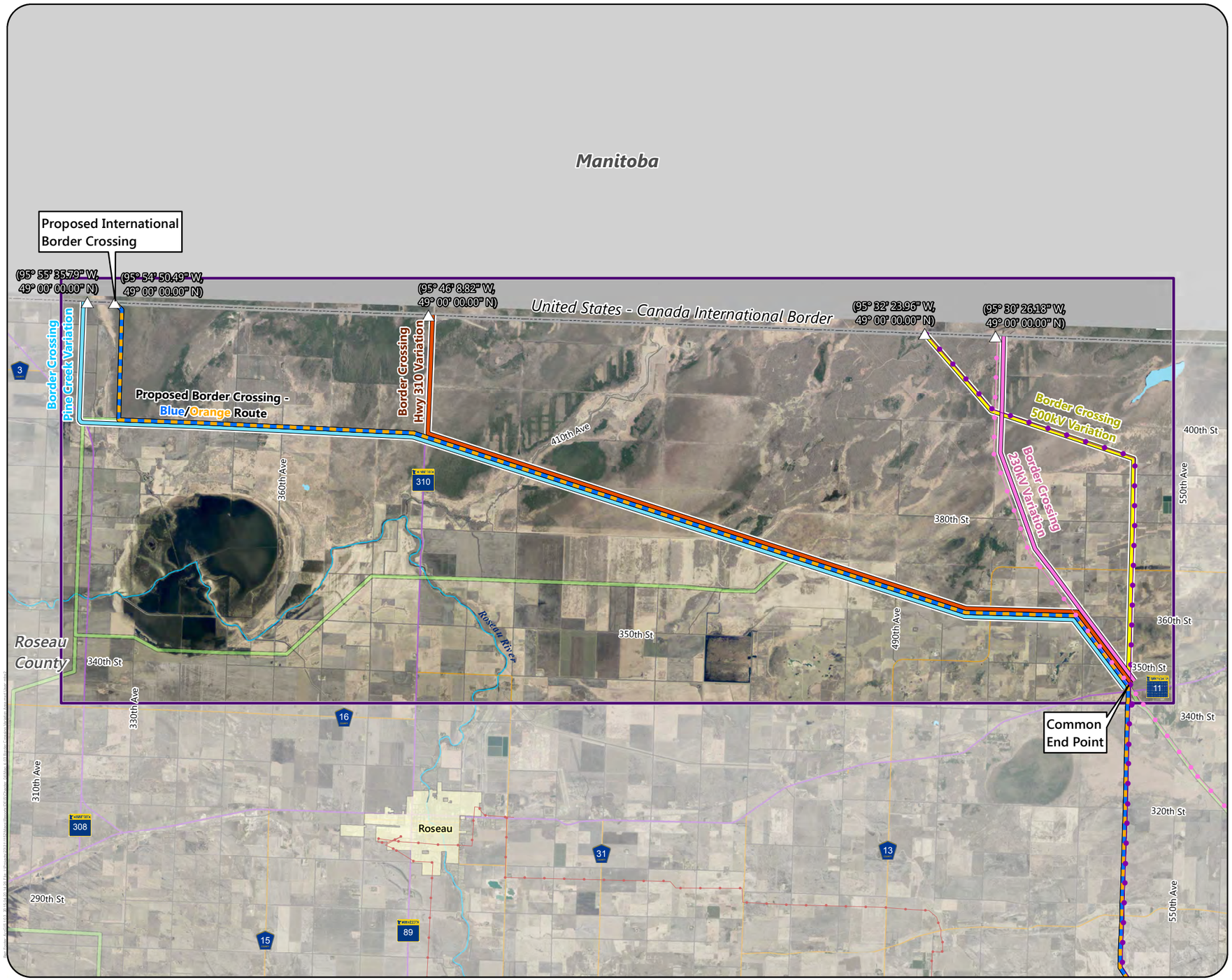
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways
- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- Project Section
- Municipal Boundary
- County Boundary
- International Boundary

Miles
4.5 0 4.5

Map 4-2

WEST SECTION OVERVIEW
Great Northern Transmission Line
Final Environmental Impact Statement



- Border Crossing Point

Proposed Routes

- Blue/Orange Route

Alternatives

- Border Crossing 230kV Variation
- Border Crossing 500kV Variation
- Border Crossing Hwy 310 Variation
- Border Crossing Pine Creek Variation

Existing Transmission Lines

- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways

- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- Municipal Boundary
- International Boundary

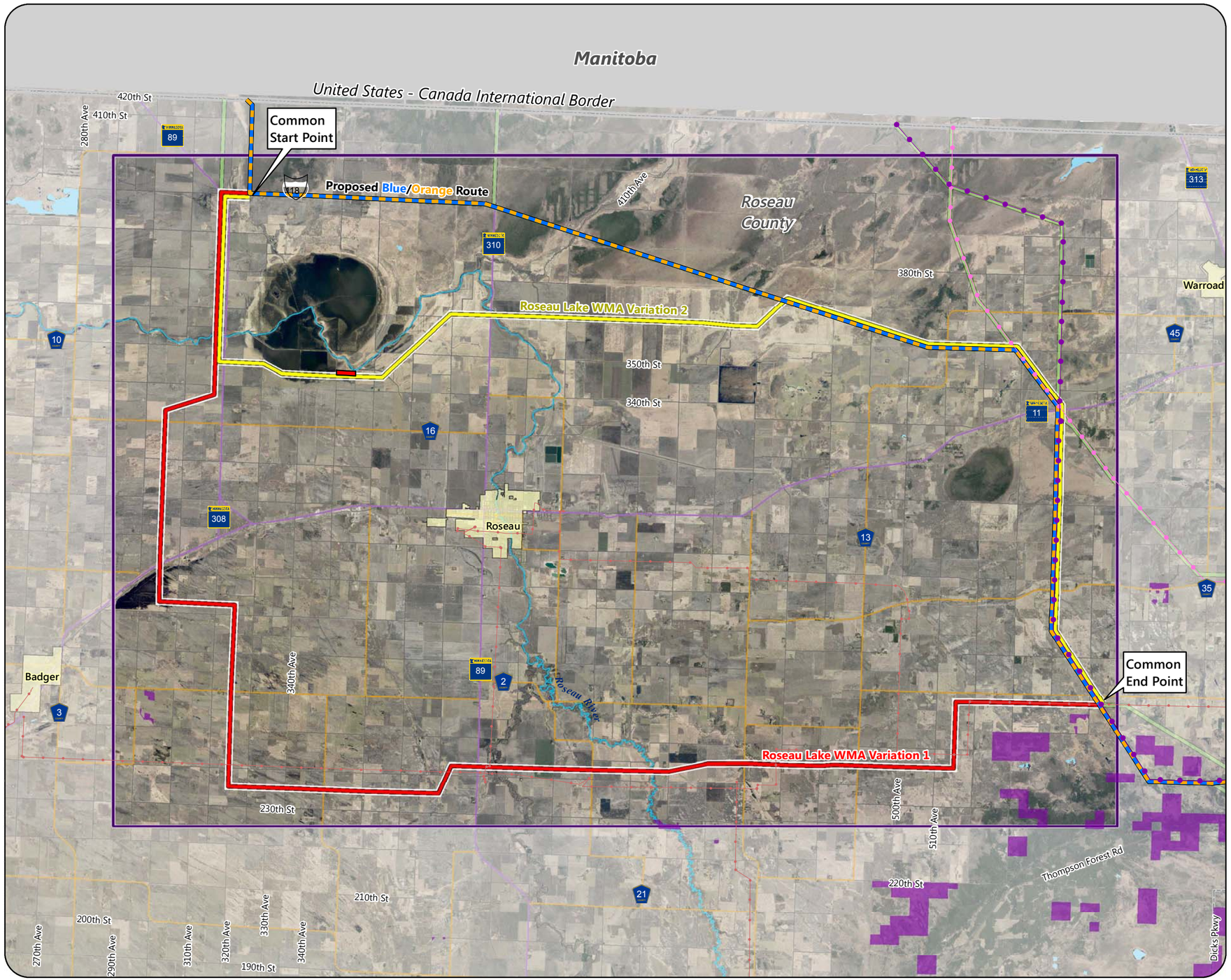
Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
2 0 2

Map 4-3

BORDER CROSSING VARIATION AREA
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue/Orange Route

Alternatives
- Roseau Lake WMA Variation 1
- Roseau Lake WMA Variation 2

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways
- State Trunk Highway
- County State Aid Highway
- Local Road

- Variation Area
- Municipal Boundary
- NAWCA* Federal Aid Parcels
- USFWS Interest Lands
- International Boundary

* North American Wetland Conservation Act

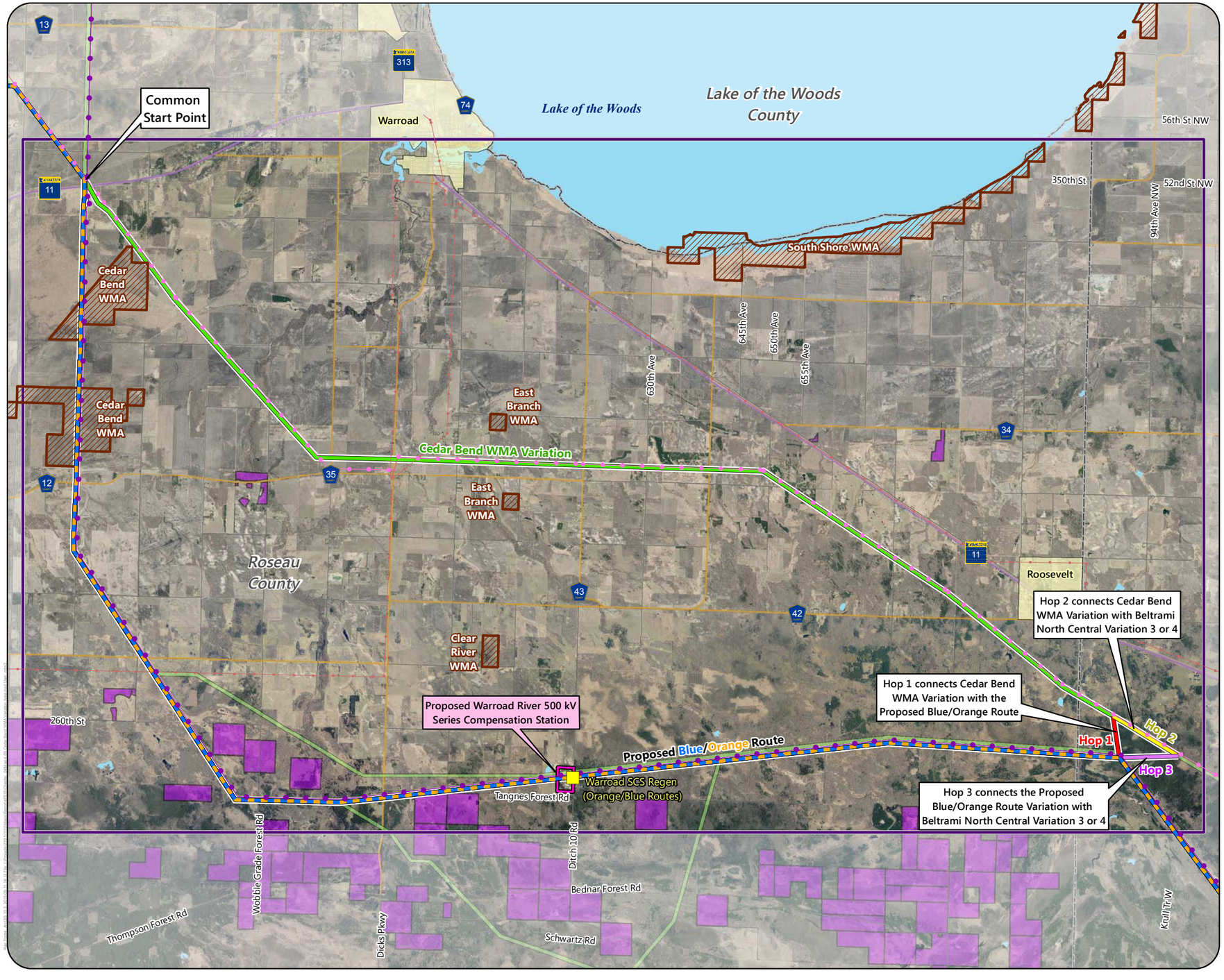
Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
2.5 0 2.5

Map 4-4

ROSEAU LAKE WMA VARIATION AREA
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Regeneration Site

Proposed Routes

Blue/Orange Route

Alternatives

Cedar Bend WMA Variation

Hop 1

Hop 2

Hop3

Proposed Series Compensation Station

Wildlife Managment Area

USFWS Interest Land

Existing Transmission Lines

69 or 115 kV

230 kV

500 kV

Streets and Highways

State Trunk Highway

County State Aid Highway

Local Road

Variation Area

Municipal Boundary

County Boundary

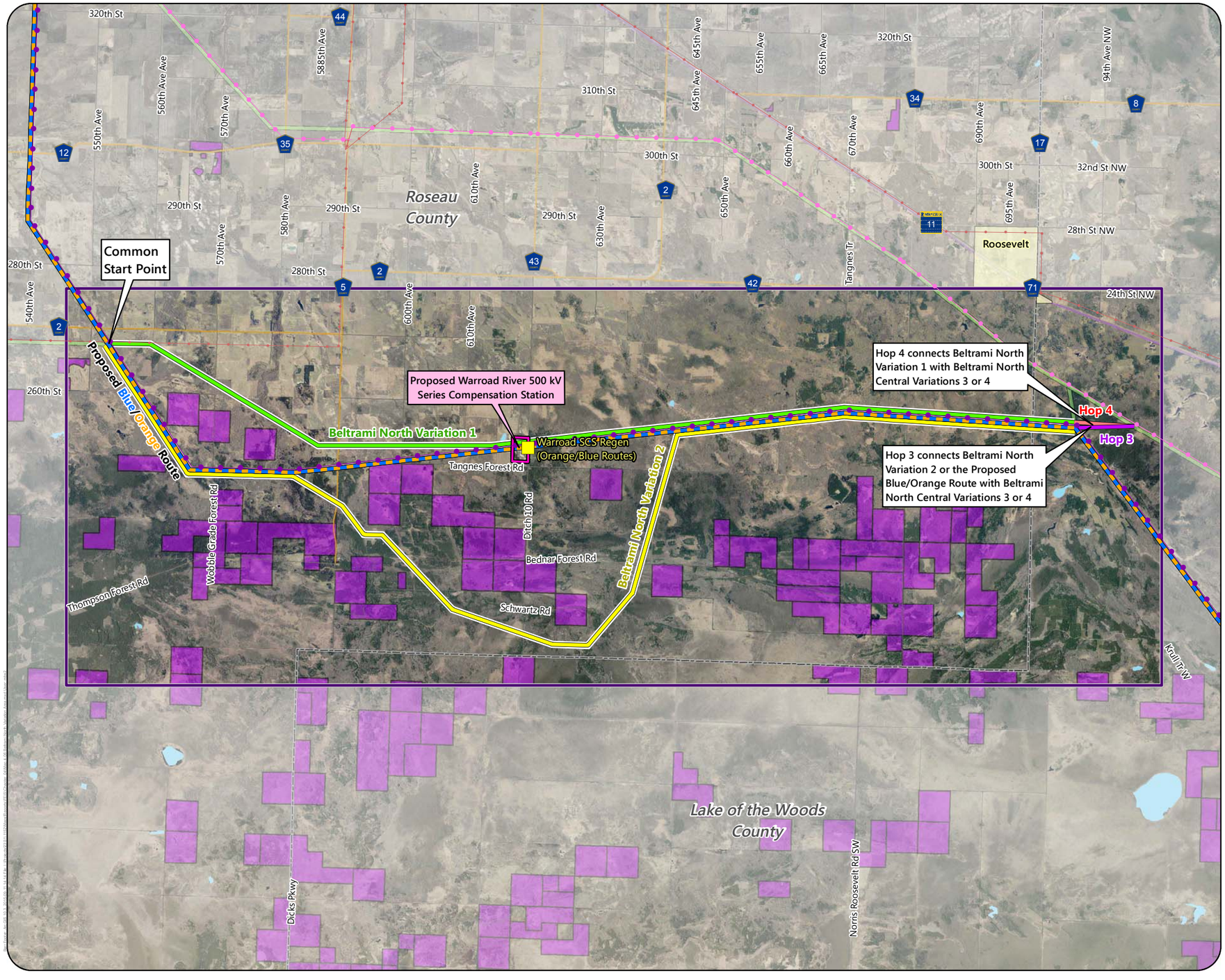
Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
1.5 0 1.5

Map 4-5

CEDAR BEND WMA VARIATION AREA
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route

Alternatives
- Beltrami North Variation 1
- Beltrami North Variation 2
- Hop 3
- Hop 4
- Proposed Series Compensation Station
- USFWS Interest Land

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways
- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- Municipal Boundary
- County Boundary

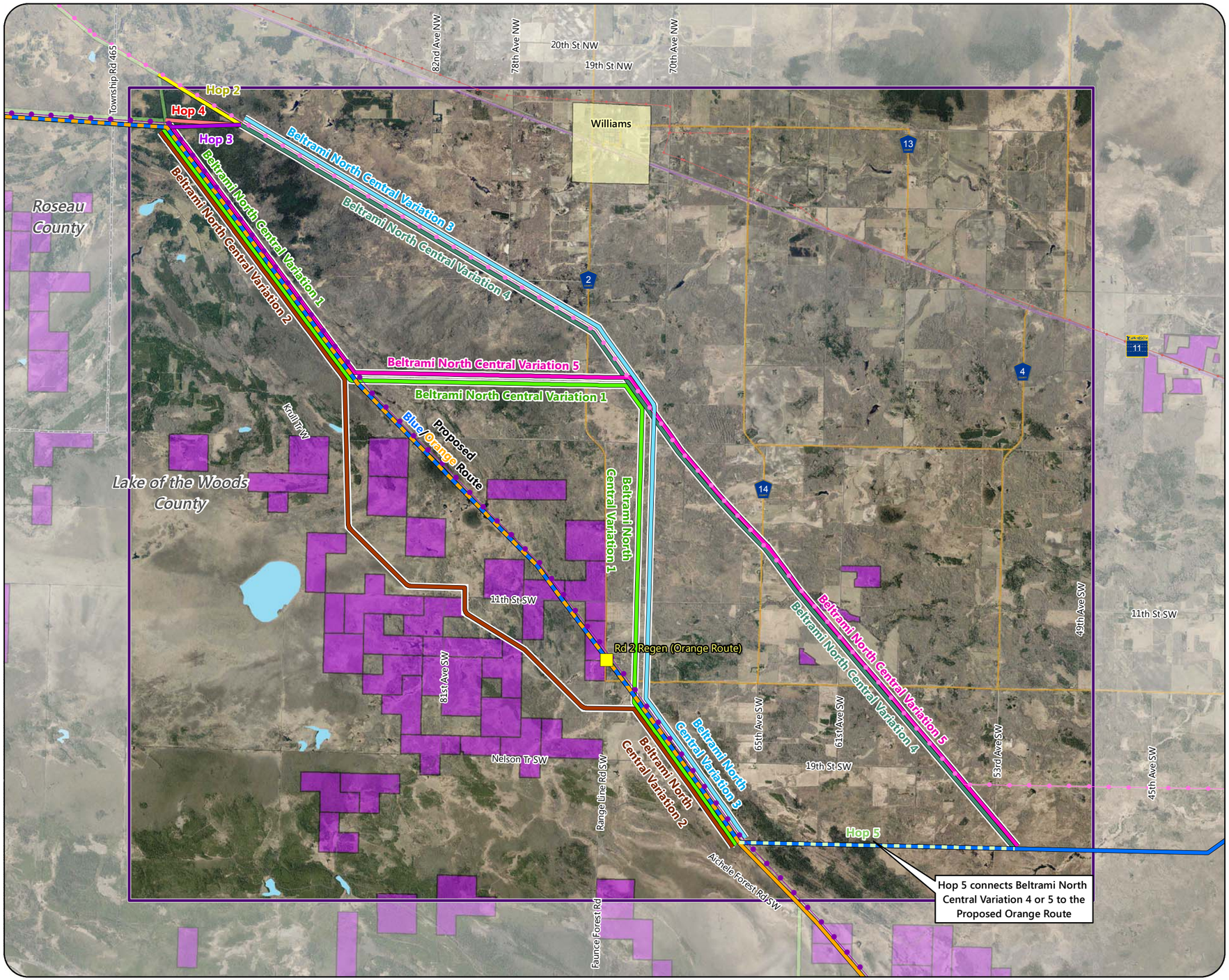
Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
1.5 0 1.5

Map 4-6

BELTRAMI NORTH VARIATION AREA
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes

- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives

- Beltrami North Central Variation 1
- Beltrami North Central Variation 2
- Beltrami North Central Variation 3
- Beltrami North Central Variation 4
- Beltrami North Central Variation 5
- Hop 2
- Hop 3
- Hop 4
- Hop 5
- USFWS Interest Land

Existing Transmission Lines

- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways

- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- Municipal Boundary
- County Boundary

Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

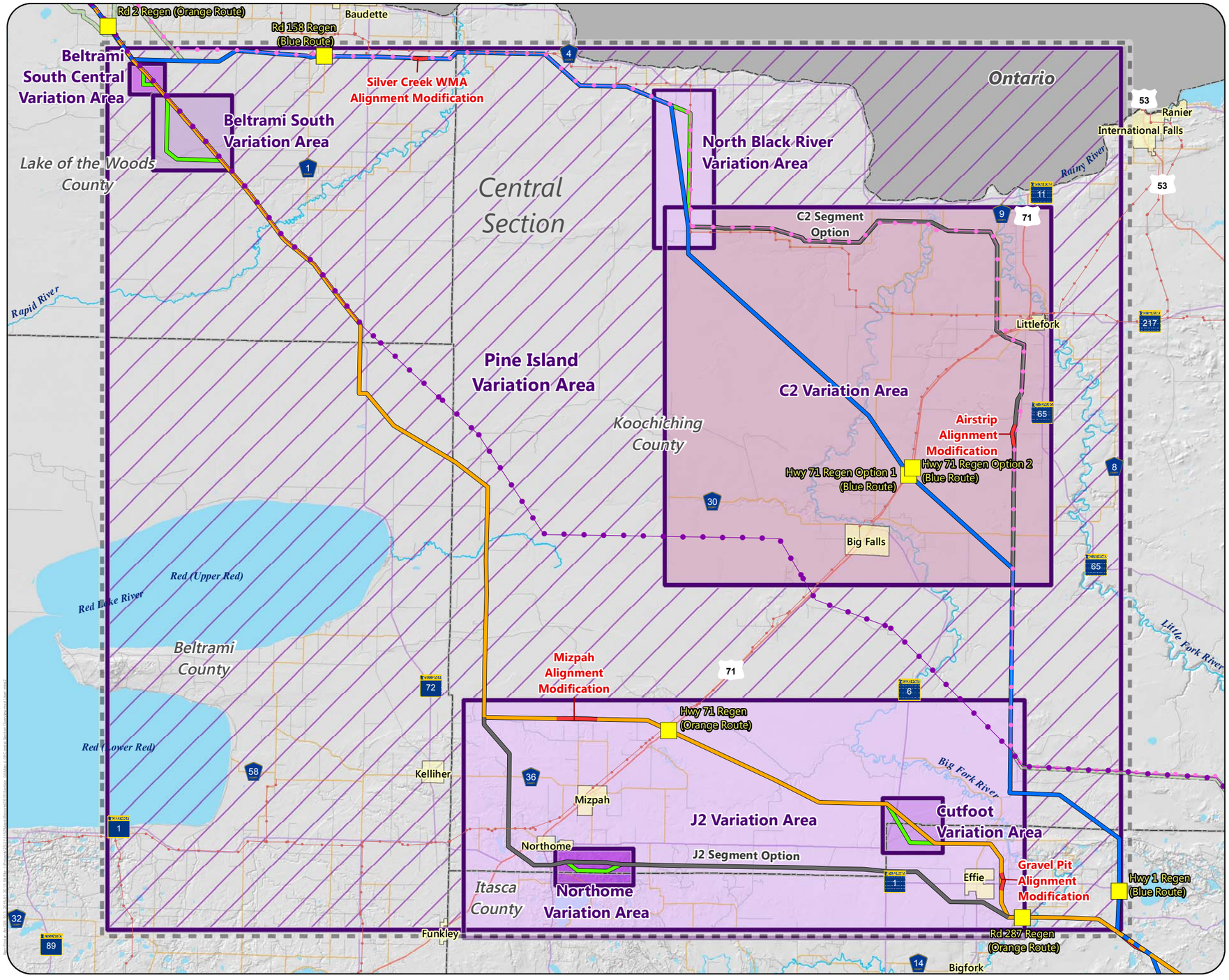
The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
1.2 0 1.2

Map 4-7

BELTRAMI NORTH CENTRAL VARIATION AREA

Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

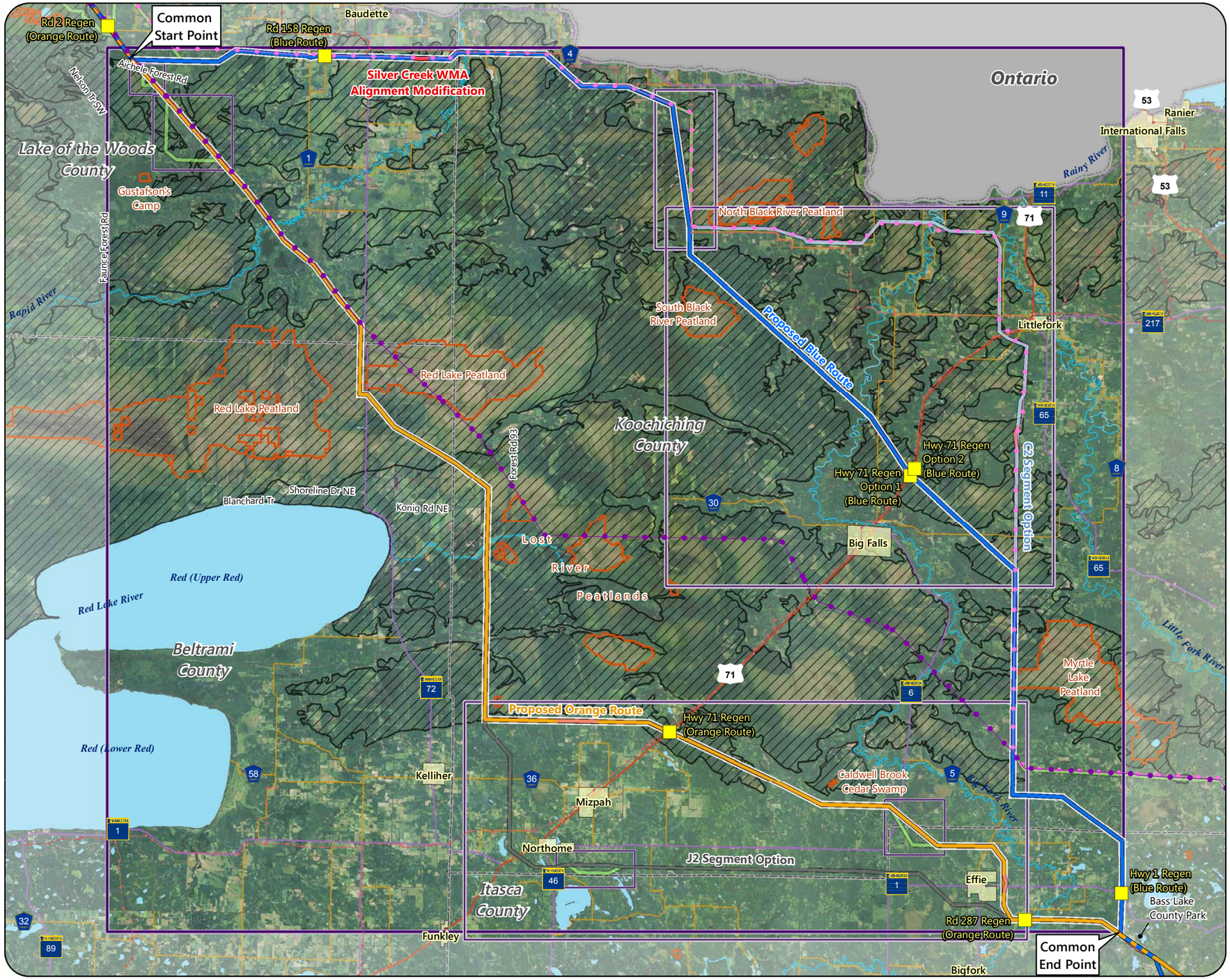
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways
- US Highway
- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- Project Section
- Municipal Boundary
- County Boundary

Miles
6.5 0 6.5

Map 4-8

CENTRAL SECTION OVERVIEW
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- C2 Segment Option
- J2 Segment Option

Alternatives
- Silver Creek WMA Alignment Modification
- Scientific and Natural Area (SNA)
- Peatland Complex

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways
- US Highway
- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- Municipal Boundary
- County Boundary
- International Boundary

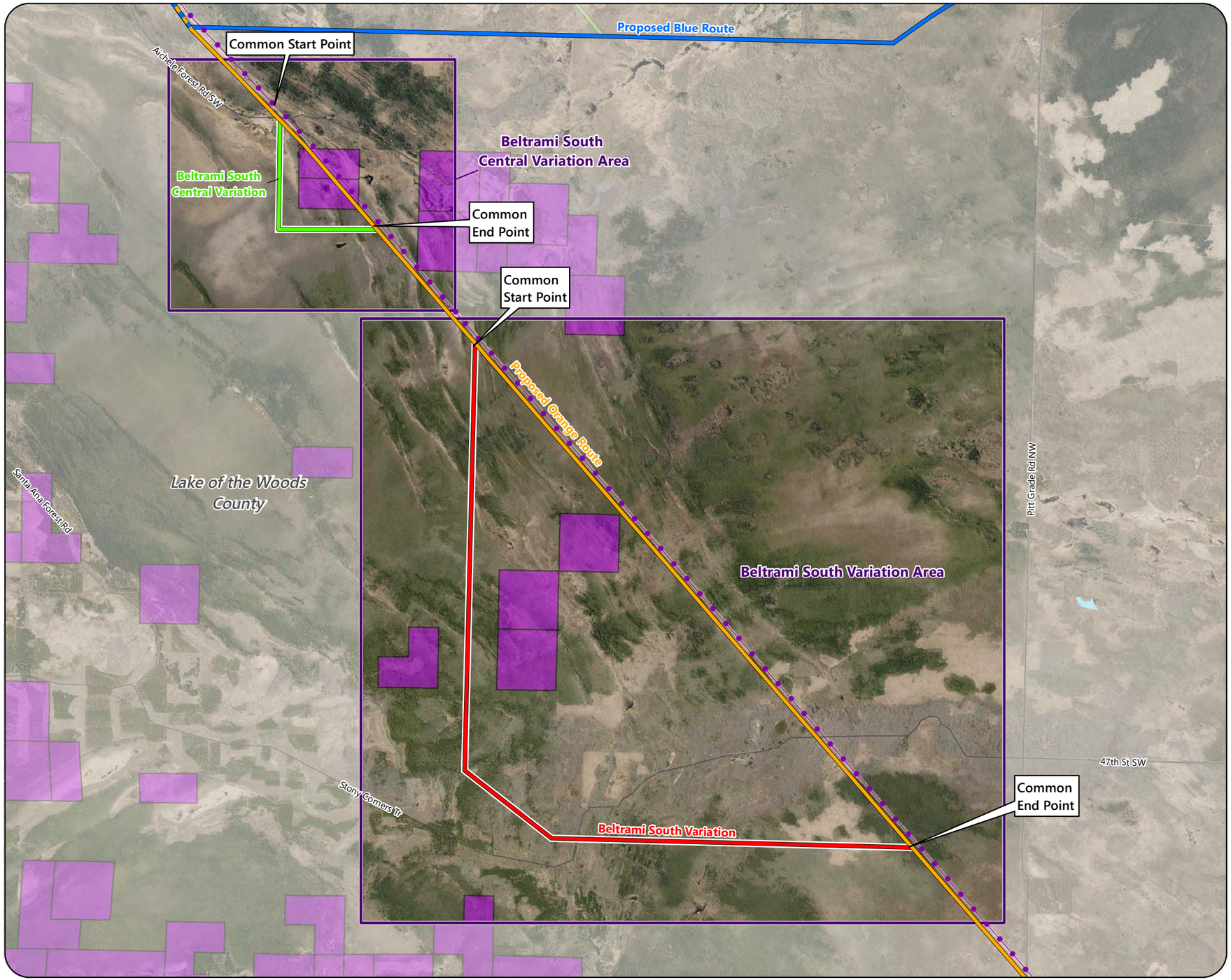
Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
6.5 0 6.5

Map 4-9

PINE ISLAND VARIATION AREA
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives
- Beltrami South Central Variation
- Beltrami South Variation
- USFWS Interest Land

Existing Transmission Lines
- 500 kV

Streets and Highways
- Local Road
- Variation Area

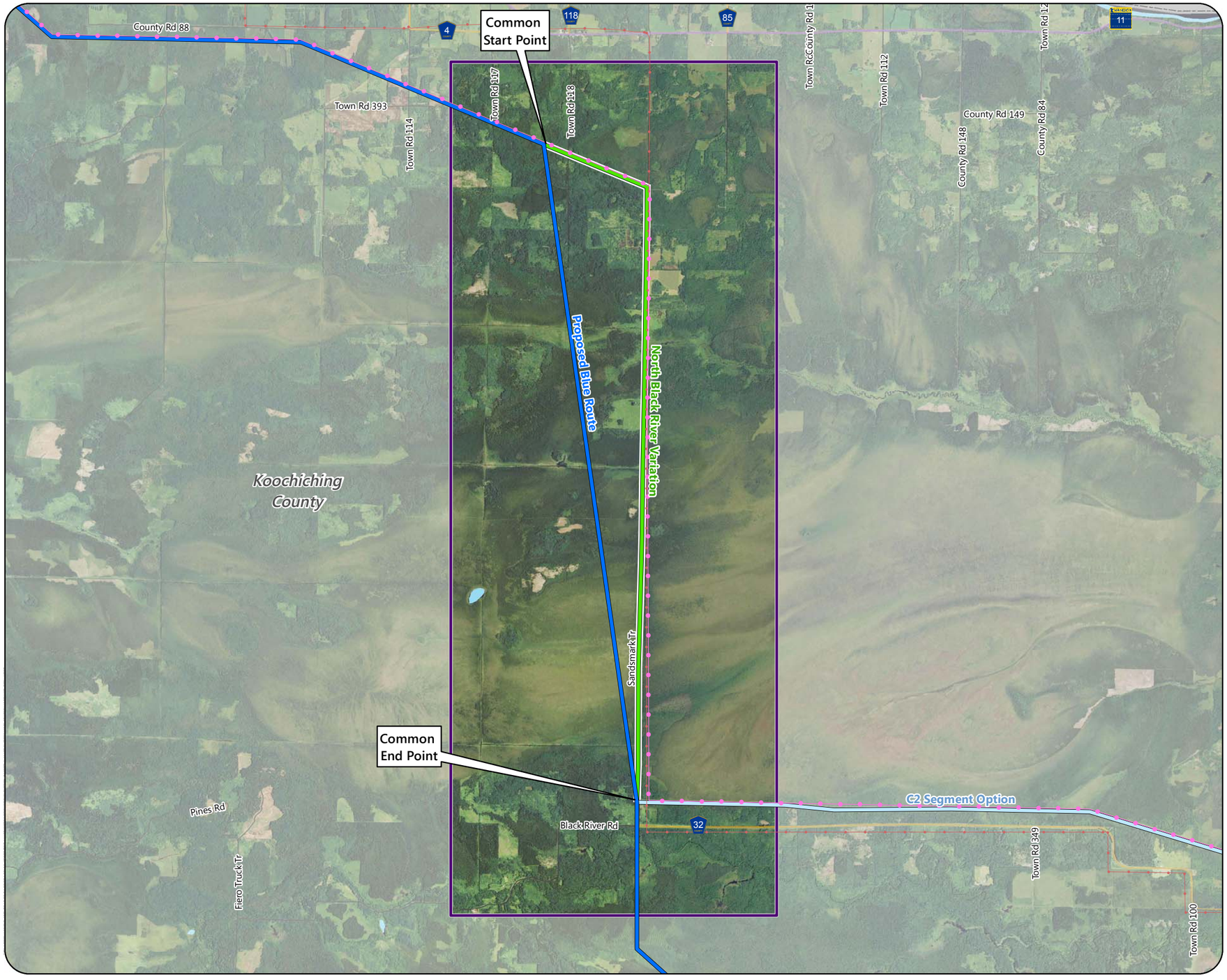
Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
0.8 0 0.8

Map 4-10

BELTRAMI SOUTH CENTRAL AND BELTRAMI SOUTH VARIATION AREAS
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue Route
- C2 Segment Option

Alternatives
- North Black River Variation

Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Streets and Highways
- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- International Boundary

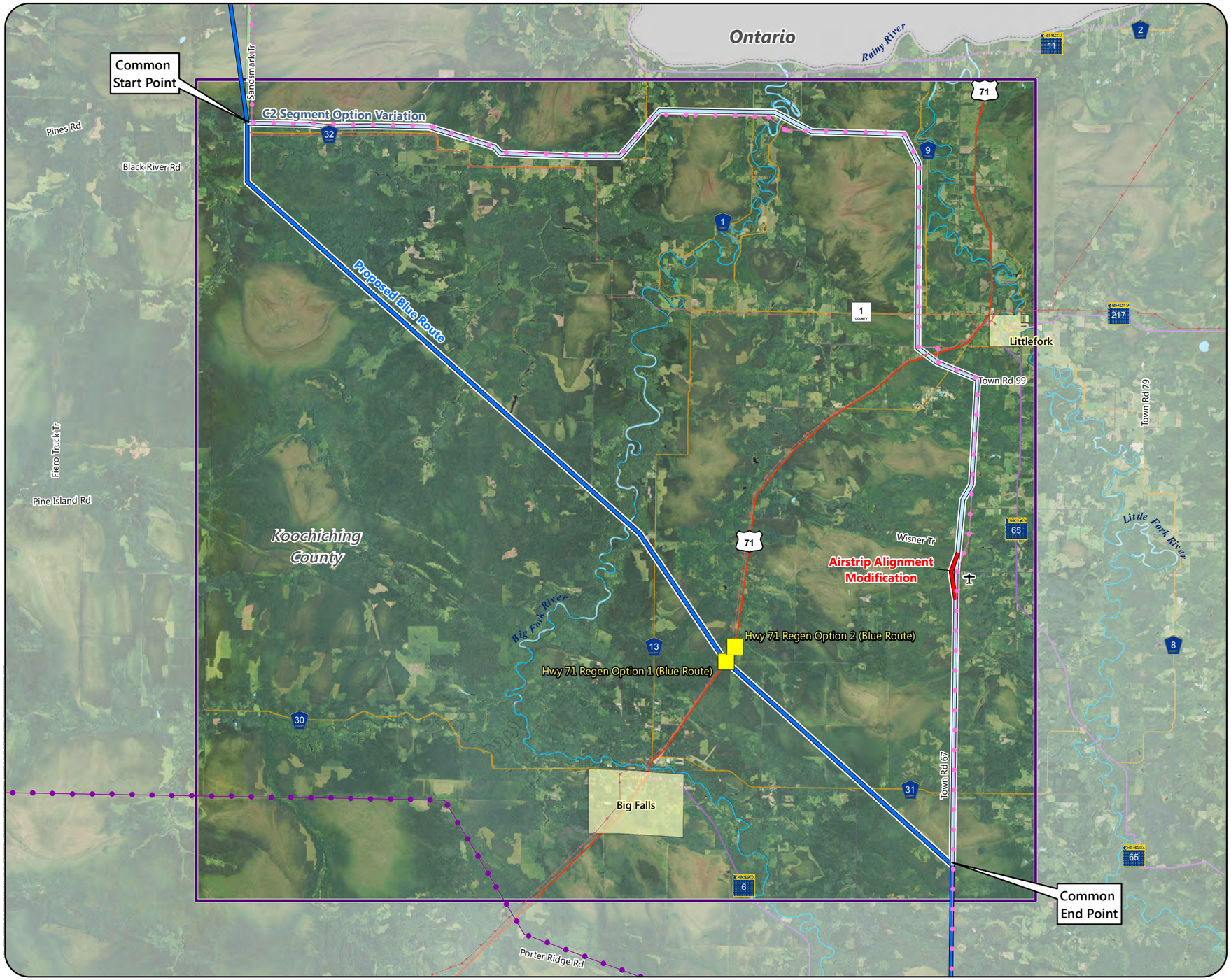
Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
1.2 0 1.2

Map 4-11

NORTH BLACK RIVER VARIATION AREA
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Regeneration Site

Proposed Routes

Blue Route

Alternatives

C2 Segment Option Variation

Airstrip Alignment Modification

Airstrip

Existing Transmission Lines

69 or 115 kV

230 kV

500 kV

Streets and Highways

US Highway

State Trunk Highway

County State Aid Highway

Local Road

Variation Area

Municipal Boundary

International Boundary

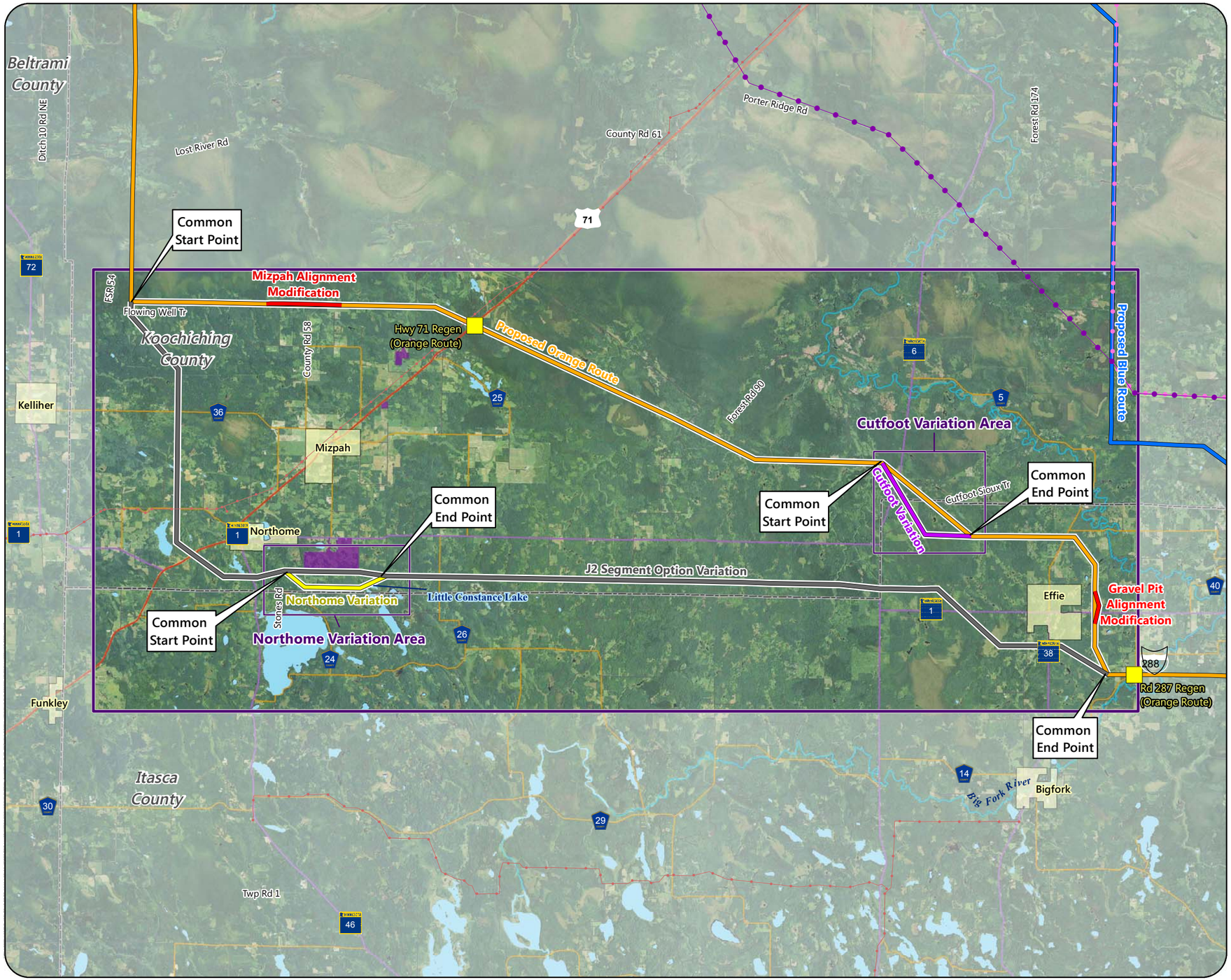
Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
3 0 3

Map 4-12

C2 SEGMENT OPTION VARIATION AREA
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Blue Route
- Orange Route

Alternatives
- J2 Segment Option Variation
- Northome Variation
- Cutfoot Variation
- Alignment Modification

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways
- US Highway
- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- USFWS Interest Lands
- Municipal Boundary
- County Boundary

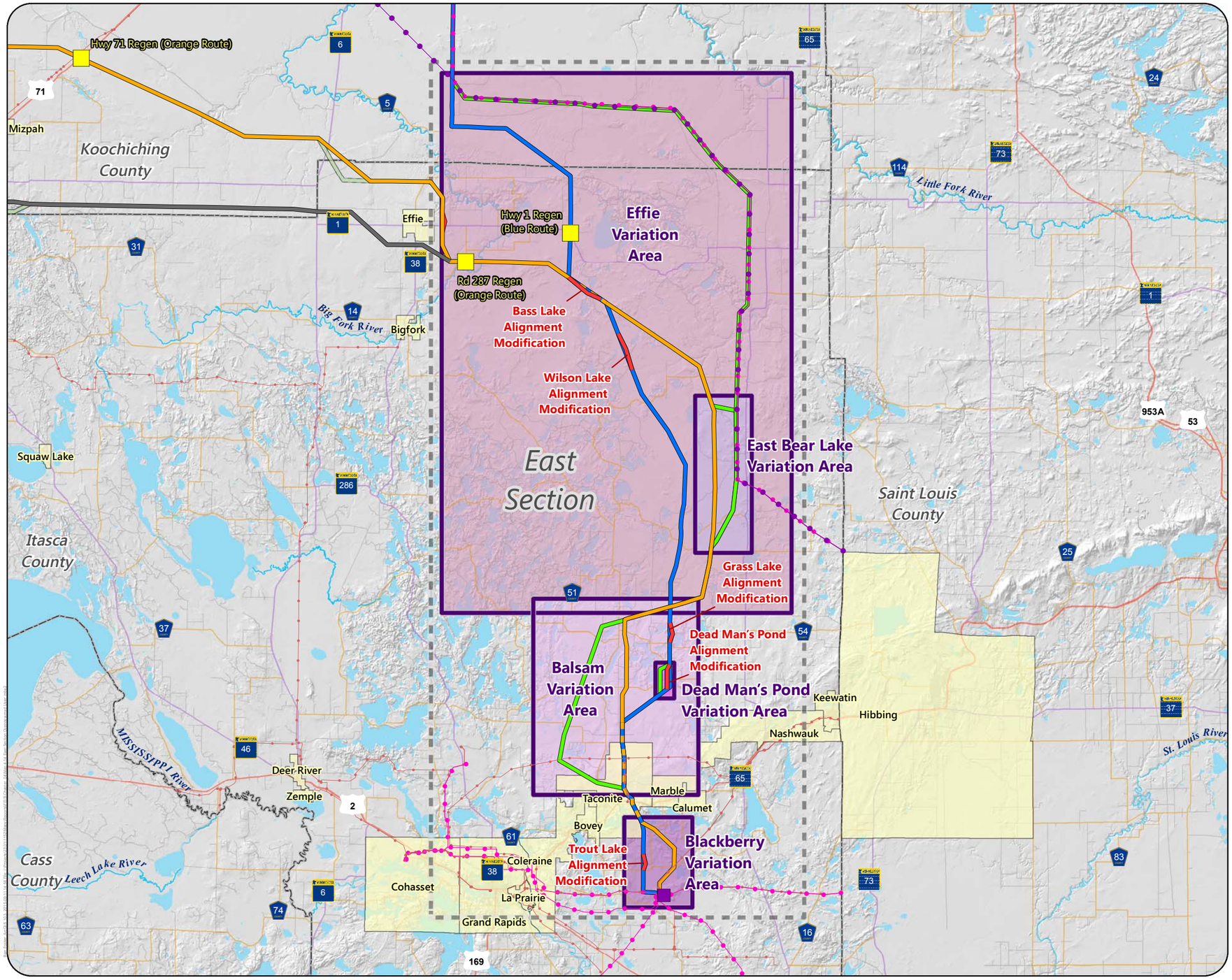
Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
3.5 0 3.5

Map 4-13

J2 SEGMENT OPTION, NORTHOME AND CUTFOOT VARIATION AREAS
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site
- Proposed Iron Range 500 kV Substation

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

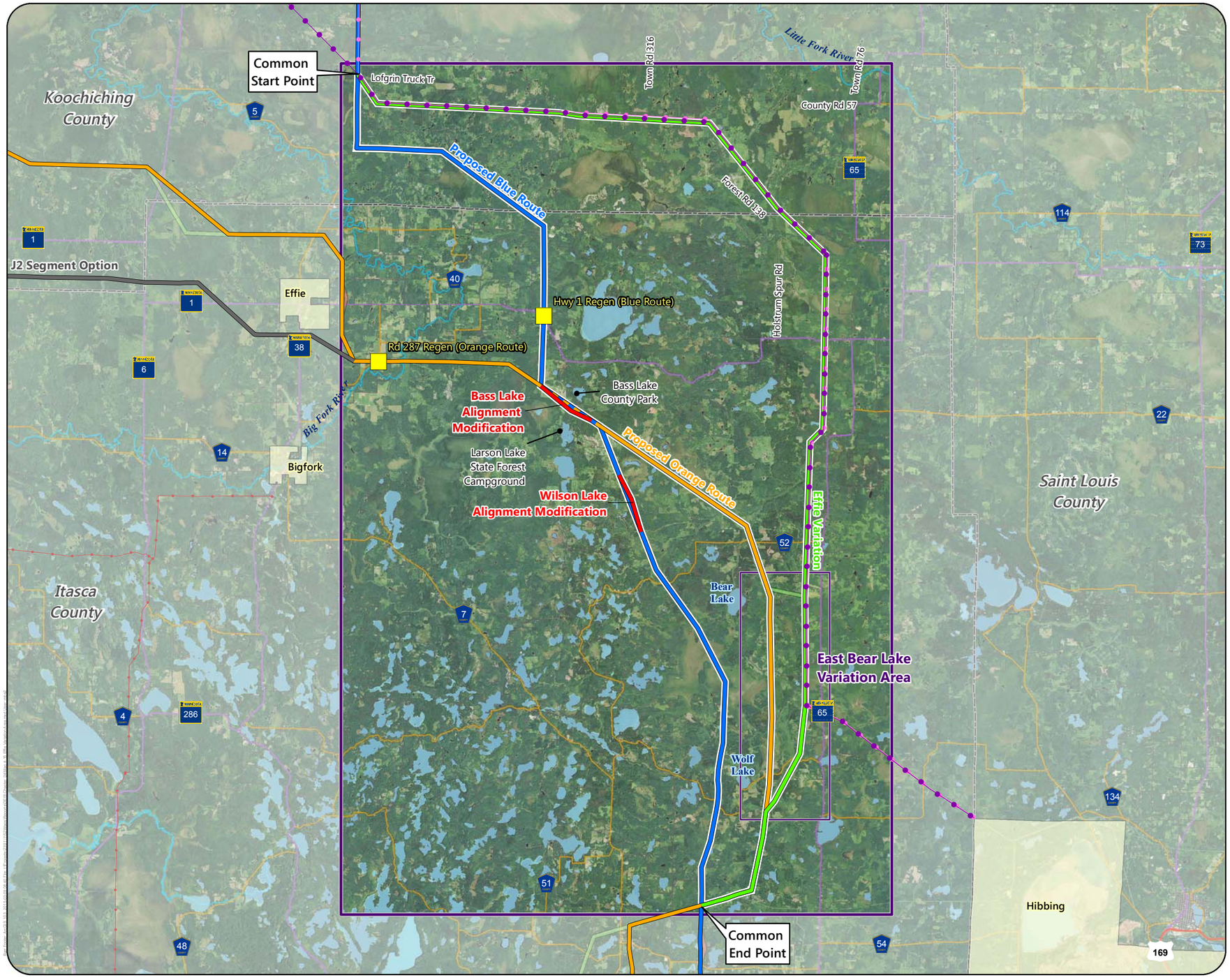
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways
- US Highway
- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- Project Section
- Municipal Boundary
- County Boundary

Miles
6 0 6

Map 4-14

EAST SECTION OVERVIEW
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- J2 Segment Option

Alternatives
- Effie Variation
- Alignment Modification

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways
- US Highway
- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- Municipal Boundary
- County Boundary

Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
3.8 0 3.8

Map 4-15

EFFIE VARIATION AREA
Great Northern Transmission Line
Final Environmental Impact Statement

Proposed Routes
- Blue Route
- Orange Route

Alternatives
- East Bear Lake Variation

Existing Transmission Lines
- 230 kV
- 500 kV

Streets and Highways
- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area

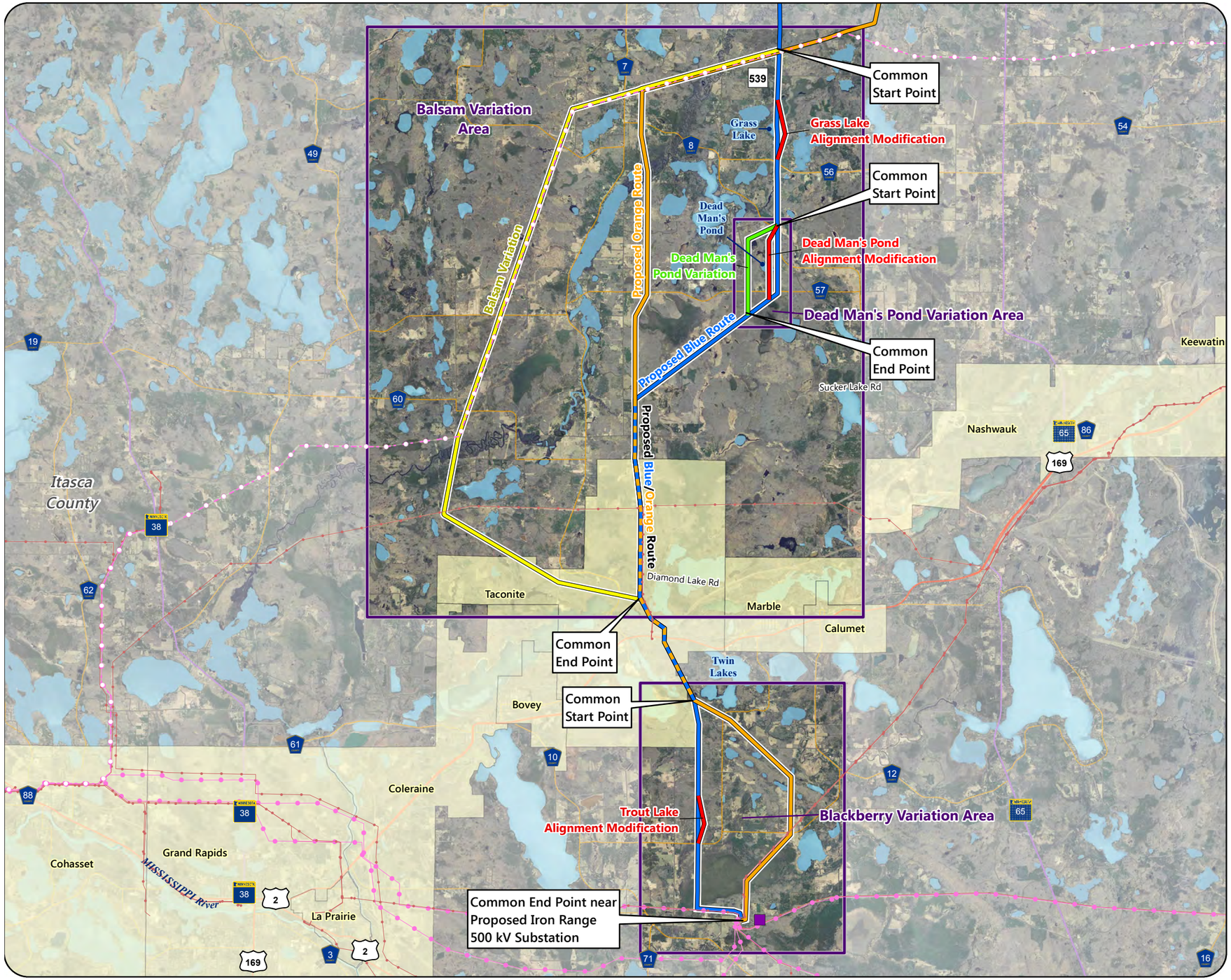
Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
1 0 1

Map 4-16

EAST BEAR LAKE VARIATION AREA
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Iron Range 500 kV Substation

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives
- Balsam Variation
- Dead Man's Pond Variation
- Alignment Modification
- Abandoned 230 kV Transmission Line Corridor

Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Streets and Highways
- US Highway
- State Trunk Highway
- County State Aid Highway
- Local Road
- Variation Area
- Municipal Boundary

Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed maps for precise alignment placement.

The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Miles
2 0 2

Map 4-17

BALSAM, DEAD MAN'S POND, AND BLACKBERRY VARIATION AREAS
Great Northern Transmission Line
Final Environmental Impact Statement

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5.1 Introduction

Chapter 5 describes the affected environment for the proposed Project, including descriptions for each resource and customary impacts expected to those resources from the construction, operation, maintenance, and connection of the proposed Project. Specifically, Chapter 5 is organized in the following way:

- Section 5.2 discusses the customary impacts of the proposed Project that do not vary by geographic section and that are common to all proposed routes and variations, such as noise, property values, and electric and magnetic fields (EMF).
- Section 5.3 through Section 5.5 discuss the customary impacts of the proposed Project that vary by geographic section and may be different for all proposed routes and variations, such as aesthetics, wetlands, and corridor sharing.
- **Maps referenced in the text are located at the end of the chapter.**

Chapter 5 also states the laws, regulations, and guidelines that are potentially applicable to the impacts of the proposed Project. Affected resources that do not vary by geographic section and whose potential impacts are not expected to be significant[68] are only discussed in Chapter 5. In contrast, the affected resources presented in Chapter 5 that either (1) vary by geographic section, or (2) whose potential impacts are potentially significant, are carried through to the comparative analysis in Chapter 6.

Affected resources that are only discussed in Chapter 5 include: displacement, noise, air quality, greenhouse gas emissions, and climate change, property values, electronic interference, transportation and public services, environmental justice, socioeconomics, recreation and tourism, cultural values, electric and magnetic fields, implantable medical devices, stray voltage, induced voltage, intentional destructive acts, environmental contamination, and worker health and safety.

Affected resources that are carried through into Chapter 6 include: aesthetics, land use compatibility, agriculture, forestry, mining and mineral resources, archaeology and historic resources, water resources, vegetation, wildlife, rare species, rare communities, corridor sharing, and costs of construction, operation, and maintenance.

Chapter 6 provides a detailed analysis of all affected resources that differ in geographic sections or variation areas; it also provides a comparative analysis of the environmental consequences for the proposed routes and variations.[69] Therefore, the more generalized Chapter 5 analysis is paired with the more detailed analysis of Chapter 6 to present the full range of issues and analyses that provide the basis for the conclusions needed in both federal and state decisions.

The affected environment and environmental consequences are analyzed in Chapter 5 and Chapter 6 for each resource within a given spatial bounds, or region of influence (ROI). The ROI for each resource is the geographic area within which the proposed Project may exert some influence; it is used in this EIS as the basis for assessing the potential impacts to each resource from the proposed Project. The spatial area for each resource's ROI may be different and each is described within its own section in Chapter 5 and Chapter 6. Information presented on each resource in Chapter 5 and Chapter 6 is generally relevant to the ROI of each resource. Additional data is provided in Appendix E through Appendix G, as described in Section 1.1.

5.2 General Impacts Common to All Routes

Resources described within Section 5.2 are those that do not vary by geographic section and would have similar expected general impacts from the proposed Project for all proposed routes or variations considered. The proposed routes and variations constitute the alternatives considered within this Environmental Impact Statement (EIS). Since the resource impacts do not provide a means

68 Council on Environmental Quality's (CEQ) National Environmental Policy Act (NEPA) implementing regulations at 40 Code of Federal Regulations (CFR) §1508.27 addresses the concept of significance (or "significantly") as used in NEPA, indicating that determining potential significance of impacts from a proposed action requires consideration of both context (of the project) and intensity (severity of impact) by agency decision makers. 40 CFR §1508.27(b) sets out a need for agency decision makers to consider a variety of factors in evaluating intensity, including but not limited to, whether or not the impact would be beneficial or adverse, duration of the impact, unique characteristics of the environmental context (e.g. presence of endangered species).

69 Minnesota Rules, part 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 as described in Chapter 1. The information gathered during the environmental review process is applied to these factors. Chapter 5 and Chapter 6 discuss the route alternatives reviewed in this EIS and their merits relative to the routing factors of Minnesota Rules, part 7850.4100.

to distinguish or compare the impacts for the proposed routes or variations, the resource is not discussed further in Chapter 6 of this EIS.

Maps referenced in this chapter either provide information for the entire proposed Project area or information specific to the geographic sections. Information for the entire proposed Project area is included on Map 5-1, Map 5-2, and Map 5-3. Information and details for the West Section are on Map 5-4 through Map 5-10; for the Central Section are on Map 5-11 through Map 5-17; and for the East Section are on Map 5-18 through Map 5-24.

5.2.1 Human Settlement

Transmission lines have the potential to impact human settlement through a variety of means. The proposed Project could potentially result in displacement, noise, air quality, property values, electronic interference, and transportation and public service impacts. Further discussion of each of these resources and the potential impacts that could result from the proposed Project are discussed below.

5.2.1.1 Displacement

This section describes the potential for displacement impacts in the West, Central, and East sections (described in Chapter 4) from the proposed Project.

For electrical safety code and maintenance reasons, utilities generally do not allow residences or other buildings within the right-of-way (ROW) of a transmission line. Any residences or other buildings located within a proposed ROW are generally removed, or "displaced." Displacements are relatively rare and are more likely to occur in densely populated areas where avoiding all residences and businesses is not always feasible.

The ROI for this analysis of displacement is the anticipated 200-foot ROW of the transmission line as structures within the ROW would need to be removed for construction and operation of the proposed Project.

Displacement in the West, Central, and East Sections

There are no residences, churches, schools, daycares, or nursing homes within the ROI that would be displaced as a result of the anticipated alignment of the proposed Project (Map 5-4, Map 5-11, 5-18). There are 11 non-residential structures (e.g., farm structures and animal sheds) within the ROW of the different routes and variations (Appendix E):

- Cedar Bend WMA Variation in the Cedar Bend Variation Area (two buildings; Appendix S - Part I, Maps 29 and 30);
- Beltrami North Variation 2 in the Beltrami North Variation Area (two buildings; Appendix S - Part I, Map 10);
- Beltrami North Central Variation 4 (three buildings) and Beltrami North Central Variation 5 (three buildings) in the Beltrami North Central Variation Area (Appendix S - Part I, Map 32); and
- Proposed Blue Route in the Pine Island Variation Area (one building; Appendix S - Part II, Map 36).

General Impacts

Displacement would not occur for any residences or businesses as a result of the proposed Project because there are no residences or businesses within the ROI, which is the 200-foot ROW. A limited number (less than three for each proposed route or variation) of non-residential structures are identified within the anticipated ROW and could potentially be affected by the proposed Project (see Section 2.9). The Applicant would need to coordinate with each affected landowner to address the potential impact from the proposed Project. Since there is no residential or business displacement expected from construction and operation of the proposed Project for any proposed route or variation considered, displacement is not discussed further in Chapter 6 of this EIS.

Construction Impacts

Operation, maintenance, and emergency repair impacts to residences, churches, schools, daycares, or nursing homes would be avoided since none of these structures are located within the ROW of the proposed Project. A limited number (less than three for each route or variation) of non-residential structures are located within the ROW. However, as the proposed routes and variations cross relatively sparsely populated areas, adequate space is generally available to allow the alignment of the transmission line to be adjusted so that no buildings would ultimately be located within the ROW of the proposed Project. Therefore, no displacement of residences are anticipated and no significant impacts are expected as a result of operation, maintenance, or emergency repair of the proposed Project, regardless of the route or variation considered.

Operation, Maintenance, and Emergency Repair Impacts

Operation, maintenance, and emergency repair impacts to residences, churches, schools, daycares, or nursing homes are not expected as none of these structures are located within the anticipated 200-foot ROW. Therefore, no displacement of residences are anticipated. A limited number of non-residential structures (less than three for each proposed route or variation) are located within the ROW, however as the proposed routes and variations cross relatively sparsely populated areas, adequate space is generally available to allow the alignment of the transmission line to be adjusted so that no buildings would ultimately be located within the ROW.

5.2.1.2 Noise

This section describes the potential for noise impacts from the proposed Project to residences and sensitive receptors within the proposed Project area.

Sound is an alteration of pressure through air thereby producing an auditory sensation is humans. Noise is generally defined as unwanted sound. Noise is commonly measured in units of decibel (dB) on a logarithmic scale. This scale is used to quantify sound intensity and to compress the scale to a more manageable range. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted decibel scale (dBA) scale is used to emphasize the range of sound frequencies that are most audible to the human ear (Minnesota Pollution Control Agency (MPCA) 2008, reference (10)). The human range of hearing extends from approximately 3 dBA to 140 dBA, and the human ear can usually detect the difference when a sound changes by 3 dBA, while a 5 dBA change in sound is clearly noticeable to the human ear (MPCA 2008, reference (10)).

Table 5-1 shows a range of typical noise levels from common noise sources. Further discussion of noise impacts is provided in Appendix H.

Environmental noise is often expressed as a continuous sound occurring over a period of time, typically 1 hour. The average sound level is called the equivalent continuous noise level (Leq) and is variable. This metric is used as a baseline by which to compare project-related noise levels (i.e., noise modeling results, which are also expressed as an hourly Leq) and to assess the potential project-related noise increase over existing (or ambient) conditions.

Table 5-1 Noise Levels from Common Sources

Sound Pressure Level (dBA)	Typical Sources
140	Jet engine at roughly 80 feet (25 meters)
130	Jet aircraft at roughly 400 feet (100 meters)
120	Rock Concert
110	Pneumatic chipper
100	Jackhammer at roughly 3 feet (1 meter)
90	Chain saw or gas lawn mower at 3 feet (1 meter)
80	Heavy truck traffic, typical city street corner
70	Business office, vacuum cleaner
60	Conversational speech or typical television volume
50	Library
40	Bedroom
30	Secluded woods

Source(s): MPCA 2008, reference (10)

Noise Regulations

The MPCA enforces the state of Minnesota noise rules (Minnesota Rules, chapter 7030). Minnesota's noise limits for daytime (7:00 a.m.–10:00 p.m.) and nighttime (10:00 p.m.–7:00 a.m.) hours are set by "noise area classifications" based on the land use activity at the location of the receiver (e.g., residential, commercial, or industrial land uses). These noise standards are expressed as a range of permissible noise levels (dBA) within a one hour period; L50 is the noise level (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 one hour. Table 5-2 describes Minnesota's applicable noise standards.

The ROI for this analysis of noise includes receptors within a 1,500-foot radius from the anticipated alignment of the transmission line, proposed **Iron Range** 500 kilovolt (kV) Substation site, the 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. Since construction areas and access roads may be located anywhere within the ROW and not necessarily only at the anticipated alignment, a conservative radius of 1,500 feet from the proposed project noise sources has been selected to assess the potential impacts of noise from the project on existing sensitive receptors. The attenuation of noise with distance results in a decrease in noise with distance. Typically, a radius

Table 5-2 Minnesota Noise Standards

Noise Area Classification	Daytime (dBA)		Nighttime (dBA)	
	L10[4]	L50[5]	L10[4]	L50[5]
Residential and other sensitive uses[1]	65	60	55	50
Non-Residential uses[2]	70	65	70	65
Non-Residential uses[3]	80	75	80	75

Source(s): MPCA 2008, reference (10)

(1) Includes residential, educational, medical, cultural, and designated recreational areas.

(2) Includes commercial, transportation facilities, and governmental services.

(3) Includes industrial areas, utilities, highways and streets, transportation, and communications centers.

(4) L10 – Noise level (dBA) that may be exceeded 10 percent of the time within one hour

(5) L50 – Noise level (dBA) that may be exceeded 50 percent of the time within an hour

of 0.25 miles to 1,500 feet is used while evaluating potential community noise impacts.

Noise in the ROI

Ambient noise in the ROI currently consists of noise from agricultural and farming equipment and vehicle traffic. Noise from the existing Blackberry Substation contributes to ambient noise in the ROI near the proposed **Iron Range 500 kV Substation**.

General Impacts

Noise from construction and operation of the proposed Project would primarily affect rural residences located near the proposed Project. Potential noise associated with the proposed Project could result from machinery used for construction, operation of the transmission line, and operation of the proposed **Iron Range Substation**, 500 kV Series Compensation Station, or regeneration stations. Since noise impacts are a function of the transmission line and equipment, predicted noise levels would not vary by proposed route or variation. Temporary, localized, adverse noise impacts during construction could exceed the Minnesota noise standards and occur regardless of the final route. Since potential construction impacts would be short-term and potential impacts from operation of the proposed Project are expected to be below Minnesota noise standards, noise is not discussed further in Chapter 6 of this EIS. Route permits issued by the Minnesota Public Utilities Commission (MN PUC) require compliance with Minnesota's noise standards.

Construction noise at any proposed Project location would occur on a temporary, intermittent, and localized basis during daytime hours. In the event construction works occur in the immediate vicinity (within 50 feet) from sensitive receptors, the following noise control practices are recommended to minimize construction noise levels and comply with Minnesota standards:

- Limit heavy equipment activity (e.g., pile driving, drilling, and crane use) adjacent to residences or other sensitive receptors to the shortest possible period required to complete the work activity;
- Minimize construction equipment idling;
- Ensure that proper mufflers, intake silencers and other noise reduction equipment are in place and in good working condition;
- Maintain construction equipment according to manufacturer's recommendations;
- Use portable noise barriers to enclose noisier stationary equipment; and
- Where practical, locate stationary equipment such as compressors, generators, and welding machines away from sensitive receptors or behind barriers.

Construction Impacts

Construction of a 500 kV transmission line would require cranes, augers, compressors, air tampers, generators, trucks, and other equipment. Helicopters would be used in some areas to transport construction materials, place structures, and to string conductors. During construction of the proposed Project, short-term, localized noise from heavy equipment and increased vehicle traffic would be expected to occur along the ROW during daytime hours. Construction activity and crews would be present at a particular location during daytime hours for a few days at a time, but on multiple occasions throughout the period between initial ROW clearing and final restoration. Typical noise levels from heavy duty construction equipment commonly used for construction of transmission lines and associated facilities (at 50 feet from the source) are summarized in Table 5-3 and in Appendix H. Construction noise could temporarily affect residences within the ROI when temporary construction sites or access roads are located in the immediate vicinity of receptors; however, as explained above, the proposed routes and variations cross relatively sparsely populated areas and only a few sensitive receptors (schools, daycares, and nursing homes) could be impacted.

Construction noise would occur during daytime hours, so only daytime standards would apply.

Table 5-3 Typical Noise Levels of Construction Equipment

Equipment Type	Maximum Noise Level (Lmax, dBA)	Utilization Factor	Estimated Noise Level (dBA) at 50 feet
Pickup Truck	55	0.4	51
Crew Cab	55	0.4	51
Compressor Trailer	80	0.4	76
Crane	85	**0.2**	77
Backhoe/Front-end loader	80	0.4	76
Auger Truck	85	0.2	78
Water Truck	84	0.4	80
Dump Truck	84	0.4	80
Concrete Truck	85	0.4	81
Fork Lift	86	0.4	82
Vibratory Pile Driver	95	0.2	88
Estimated Transmission Line Construction Noise Level (at 50 feet)			91

Source(s): FHWA 2006, reference (11)

Note(s): Noise emission levels and utilization factors are based on FHWA guidelines.

Because construction noise would be intermittent and levels decrease by 6 dBA with a doubling of distance from a point source, noise levels at residences within the ROI are generally not expected to exceed Minnesota's daytime noise standards (MPCA 2008, reference (10)). Limited construction could occur outside of daytime hours or on weekends if the Applicant is required to work around customer schedules, line outages, or other impediments to daytime construction.

Operation, Maintenance, and Emergency Repair Impacts

Noise levels related to activities during the operation, maintenance, and emergency repair of transmission lines are expected to be below state standards. Noise from transmission lines is primarily associated with the "corona effect," due to small electrical discharges which ionize surrounding air molecules around the line, causing a crackling or hissing noise that may be audible from a position located directly below the transmission line, especially during damp conditions. The Applicant has modeled audible noise from the proposed 500 kV transmission lines under rainy conditions (worst case scenario for noise generated from corona effect), considering two configurations: standalone 500 kV transmission line and collocation of the proposed Project with existing transmission lines. The Applicant's calculations for the audible noise results are provided in Table 5-4. Detailed results for the different cases modeled by the Applicant are presented in Appendix I.

Noise from operation of the proposed Project does not solely emanate from the transmission line; it also includes noise from the proposed **Iron Range Substation 500 kV** and 500 kV Series Compensation Station. Sources of audible noise at the proposed substation include transformers, **transmission-level reactors**, capacitors, and coolers McDonald 2007, reference (14)). Major noise sources from a 500 kV Series Compensation Station include capacitor bank, damping circuits, by-pass switches, and protective devices.

Transformer noise is generally the dominant noise source at substations. Operating noise at the proposed **Iron Range** 500 kV Substation would result from vibrations associated with magnetic forces inside substation transformers and from cooling fans and pumps that control transformer temperature. **A substation noise analysis conducted by the Applicant anticipated that the predominant noise emitters from the proposed Iron Range 500 kV Substation would include a single 1,200 MVA 500/230 kV transformer bank (consisting of four transformers) and two 150 MVAr 500 kV shunt reactors (Appendix H, Minnesota Power 2015, reference (198)).** Most of the other electrical equipment at substations is either silent or generates minimal noise in comparison to transformers. It is anticipated that the transformers to be installed at the proposed **Iron Range** 500 kV Substation would not exceed the values specified by the National Electrical Manufacturers Association (NEMA) Standards. The NEMA Standards maximum sound levels applicable to the proposed Project oil-immersed transformers are 91 dB at a 1 foot distance (NEMA 2000, reference (15)).

Table 5-4 Predicted Audible Noise Levels from the Proposed Project Transmission Line in Rainy Weather Conditions

Proposed Transmission Line Configuration	Maximum Audible Noise Level (dBA)		
	Within ROW	At edge of ROW	At 300 feet from Anticipated Alignment
500 kV Transmission Line (Stand-alone, not paralleling existing lines)	51	48	43
500 kV Transmission Line paralleling existing 500 kV Transmission Line(1)	**52**	**52**	**51**
500 kV Transmission Line paralleling existing 230 kV Transmission Line(2)	51	50	46
500 kv Transmission Line paralleling existing 115 kV Transmission Line(3)	51	48	43
500 kV paralleling two existing 115 kV Transmission Lines(4)	**51**	**48**	**43**
500 kV paralleling existing 115 kV and 230 kV Transmission Lines(5)	51	**49**	**45**

Source(s): Power Engineer 2013, reference (12); Power Engineer 2014, reference (13)

(1) Existing 500 kV D602F transmission line (self-supporting tower structures). For this analysis, the Applicant calculated audible noise up to 400 feet from the anticipated alignment. Results are reported at 300 feet for comparison purposes.
(2) Existing 230 kV 83L transmission line (H-Frame structures).
(3) Existing 115 kV 28L tap (H-Frame structures).
(4) Existing 115 kV 62L and 63L transmission lines (H-Frame structures).
(5) Existing 115 kV **20L** and 230 kV 83L transmission lines (H-Frame structures).

Table 5-5 Predicted Audible Noise Levels from Operation of the Proposed 500 kV Blackberry Substation

Proposed Substation Operational Noise Source	Predicted Noise Level (dBA)		
	At Source(1)	Northern Receptor(2)	Northeastern Receptor(3)
Transformers (Low/High)	82/92	30	27
Shunt Reactors	90	44	45
Overall Noise Level	N/A	44–46	45

Source(s): NEMA 2000, reference (14), Minnesota Power, 2015 (198)

(1) For transformers, noise at source is measured at 3 feet. For reactors, noise is measured at 6 feet from the reactor bank. Final layout and site plan of the proposed 500 kV Iron Range Substation is not available at the publication of this EIS. Based on a preliminary site plan, the Applicant assumed a potential transformer bank location in the midpoint of the substation site and a potential reactor bank location on the northern fence line.
(2) For the purposes of this analysis, the sensitive receptor identified north of the substation site is located 1,120 feet from the midpoint of the substation site.
(3) For the purposes of this analysis, the sensitive receptor identified northeast of the substation site is located 1,700 feet from the midpoint of the substation site.

The Applicant's substation noise model was based on an estimated transformer bank position approximately at the midpoint of the proposed Iron Range 500 kV substation site, and two reactors in the northern fence line of the substation. The presence of firewalls between transformers and possibly between reactors within the proposed Iron Range 500 kV Substation would provide noise attenuation between these noise sources and sensitive receptors in the vicinity of this facility. The two nearest receptors identified as part of the Applicant's analysis are two residences located north and northeast of the proposed Iron Range 500 kV Substation. DOE reviewed and verified the assumptions and calculations provided in the Applicant's analysis. Calculated noise levels from transformers and shunt reactors are estimated to be between 44 and 46 dBA at the receptor located north of the substation, while the estimated operational noise level at the northeastern receptor would be 45 dBA (Appendix H, Minnesota Power 2015, reference (198)). Therefore, operation of the proposed **Iron Range 500 kV** Substation is not expected to exceed Minnesota noise standards. The operation of the proposed 500 kV Series Compensation Station would generate noise from capacitor banks and other electrical equipment that would be lower than noise levels associated with substation transformers **and shunt reactors**. As such, operation of the proposed 500 kV Series Compensation Station is not expected to exceed Minnesota noise standards.

Noise levels resulting from operation of the proposed Project are expected to be below Minnesota noise standards. The predicted transmission line operation values encompass the

range of voltages and structure types proposed for the proposed Project. Substation operation values shown in Table 5-5 represents the range of values that result from modeling substation noise associated with transformer equipment compliant with NEMA standards at the proposed **Iron Range** 500 kV Substation. Operational noise levels from the proposed 500 kV Series Compensation Station would be less than noise levels from the proposed **Iron Range** 500 kV Substation.

Although operational noise impacts are estimated to fall within acceptable state noise standards, the proposed Project would introduce a new permanent noise source that, in certain situations (e.g., a calm evening) may be heard by residents in the ROI. The primary means of mitigating this noise impact is prudent routing to avoid areas where residents in the project area live, work, and congregate. Noise impacts from the proposed substation operation could be mitigated by using additional natural or built sound barriers, e.g., berms, plantings. Since noise impacts are a function of the transmission line and equipment, predicted noise levels would not vary by proposed route or variation considered in this EIS. Noise levels resulting from operation of the proposed Project are also expected to be below Minnesota noise standards. Route permits issued by the MN PUC require compliance with Minnesota's noise standards.

5.2.1.3 Air Quality, Greenhouse Gas Emissions, and Climate Change

This section describes the potential for change in air emissions, namely criteria pollutants and greenhouse gases (GHGs), from the proposed Project to impact air quality and climate change.

Air pollution comes from many different sources:

- Stationary sources such as factories, power plants, and smelters and smaller sources such as dry cleaners and de-greasing operations;
- Mobile sources such as cars, trucks, and construction equipment;
- Naturally occurring sources such as windblown dust and volcanic eruptions; and
- Removal of forest vegetation.

All of these sources contribute to air pollution. Air quality and the climate can be affected in many ways by the pollution emitted from these sources (EPA 2015, reference (16)).

Air Quality Regulations

Frameworks are in place at the federal and state level to protect air quality and human health. The relevant frameworks discussed below include regulations applicable to criteria pollutants and guidance and proposed rulemaking related to climate change and greenhouse gas emissions.

Criteria Pollutants

The Clean Air Act (CAA) of 1970, 42 U.S.C. 7401 et seq., amended in 1977 and 1990, is the primary federal statute governing ambient air pollution. The CAA designates standards for the following criteria pollutants that have been determined to affect human health and the environment: particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), lead (Pb), and ozone (O_3). Volatile Organic Compounds (VOC) and NO_2 are precursors to O_3, which is not an emitted source but is formed by these pollutants in the atmosphere (40 Code of Federal Regulations (CFR) Part 50). The EPA has developed National Ambient Air Quality Standards (NAAQS) for these criteria pollutants to protect public health and welfare (Table 5-6; EPA 2014, reference (17)). Minnesota has also established state standards (Minnesota Ambient Air Quality Standards; MAAQS) for hydrogen sulfide (H_2S) and particulate matter (PM) (Minnesota Rules, part 7009.0080). The MPCA is responsible for compliance with state and federal standards for air quality in Minnesota.

Areas that do not meet the NAAQS are designated as "nonattainment" for that criteria pollutant. Areas that were previously designated "nonattainment", but are now in attainment, are designated as "maintenance." The CAA requires preparation of a State Implementation Plan (SIP), which is a compilation of laws, regulations, strategies, programs, and guidelines to improve and maintain air quality within the state. The General Conformity Rule applies to all Federal actions in nonattainment and maintenance areas (42 U.S.C. 7506(c)). The CAA, through the General Conformity Rule, prohibits federal agencies from engaging in, supporting, providing financial assistance for licensing, permitting, or approving any activity that does not conform to an applicable SIP.

The Regional Haze Rule of the CAA established protection of visibility within Class I areas, which are national parks or wilderness areas where visibility is important to the value of the area and/or threatened by air pollution (40 CFR Part 51).

Table 5-6 National Ambient Air Quality Standards

Pollutant [final rule citation]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO) [76 FR 54294, Aug 31, 2011]		Primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb) [73 FR 66964, Nov 12, 2008]		Primary and Secondary	Rolling 3-month average	0.15 µg/m3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2) [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]		Primary	1 hour	100 ppb	98th percentile, averaged over 3 years
		Primary and Secondary	Annual	53 ppb(2)	Annual mean
Ozone (O_3) [73 FR 16436, Mar 27, 2008]		Primary and Secondary	8 hours	0.075 ppm(3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution [78 FR 3086, January 15, 2013](5)	$PM_{2.5}$	Primary	Annual	12 µg/m3	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m3	Annual mean, averaged over 3 years
		Primary and Secondary	24 hours	35 µg/m3	98th percentile, averaged over 3 years
	PM_{10}	Primary and Secondary	24 hours	150 µg/m3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2) [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sept 14, 1973]		Primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Source(s): EPA 2014, reference (17)

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(2) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) **was revoked as of April 6, 2015 (40 FR 12264, 2015).** In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year). Some areas have continued obligations under **previous standards** ("anti-backsliding").

(4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

(5) The EPA revised the annual primary $PM_{2.5}$ standard by lowering the level to 12.0 µg/m3 and maintaining the 15.0 µg/m3 $PM_{2.5}$ standard as a secondary standard. The final rule was effective on March 18, 2013.

Climate Change and Greenhouse Gas Emissions

Climate change refers to any significant change in measures of climate lasting for an extended period of time. GHGs are gaseous emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. The most common GHGs emitted from human activities include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) (EPA 2015, reference (18)). On December 18, 2014, the Council on Environmental Quality (CEQ) issued revised draft guidance "to provide Federal agencies direction on when and how to consider the effects of GHG emissions and climate change in their evaluation of all proposed federal actions in accordance with the National Environmental Policy Act (NEPA) and CEQ Regulations implementing NEPA" (CEQ 2014, reference (19)). This revised draft guidance is intended to describe controlling requirements under the terms of NEPA and the CEQ regulations, and indicates that NEPA requires the documentation of the proposed Project's impacts on GHG emissions and climate change (CEQ 2014, reference (19)). CEQ's revised draft guidance indicates that NEPA requires not only the documentation of the proposed Project's potential impacts on GHG emissions, but also the need to assess how climate change would affect the proposed Project (CEQ 2014, reference (19)). Climate-related impacts are

occurring across regions of the country and across many sectors of our economy. Many state and local governments are already preparing for the impacts of climate change through "adaptation," which is planning for the changes that are expected to occur (EPA 2015, reference (20)).

On a Federal level, EPA and other agencies have implemented various programs to encourage the reduction of GHG emissions to address climate change.[70] On June 2, 2014, EPA proposed draft rules under Section 111(d) of the CAA to cut carbon emissions from existing fossil fuel-fired power plants. The draft rules are commonly referred to as "the Clean Power Plan." The Clean Power Plan would establish goals for carbon reduction, but the states would determine the means of achieving the standards: "EPA's guidelines provide flexibility and encourage states to look across their whole electric system to identify strategies to include in their plans that reduce carbon pollution from fossil fuel fired power plants." (EPA 2015, reference (21)).

Minnesota has implemented various programs and legislation to reduce GHG emissions. Since the 1990s, the state has provided tax exemptions for renewable and alternative energy sources (Minnesota Statutes, sections 272.02 and 297A.68). The Next Generation Energy Act of 2007 established state GHG reduction goals of 15 percent by 2015, 30 percent by 2025, and 80 percent by 2050. In May 2013, the omnibus energy bill was passed, increasing Minnesota's Renewable Portfolio Standard (RPS) to 26.5 percent by 2025 by including 1.5 percent to be achieved through energy efficiency (Minnesota Statutes, section 216B.1691, subdivision 2).

As discussed in Chapter 2, the Applicant has implemented the "EnergyForward" plan to increase the percentage of renewable energy it provides to its customers while reducing air emissions (Minnesota Power 2015, reference (22)).

Air Quality in the ROI

The ROI for this analysis of air quality includes the counties of Roseau, Lake of the Woods, Beltrami, Koochiching, and Itasca. Air quality conditions relative to NAAQS in the State of Minnesota are assessed at the county level.

EPA designates all of the counties in the ROI to be in attainment or unclassifiable (to be considered in attainment) for all NAAQS (EPA 2015, reference (2)). Therefore, DOE's proposed action is exempt from applicability of the General Conformity Rule requirements of the CAA.

The state of Minnesota contains two Class I areas, Voyageurs National Park (in Koochiching and St. Louis counties) and the Boundary Waters Canoe Area (in St. Louis, Lake, and Cook counties) (EPA 2012, reference (23)). Neither the proposed routes nor the variations pass through a Class I area. Voyageurs National Park is approximately 25 miles northeast of the Central Section, and the Boundary Waters Canoe Area is over 50 miles to the east and northeast of the Central and East sections, respectively. Further, this proposed Project would not result in any major stationary emission sources, therefore prevention of significant deterioration requirements established to protect Class I Wilderness Areas are not applicable to the proposed Project.

According to the EPA's Air Quality Index (AQI) report statistics for Minnesota, all monitoring in the state indicates AQI ratings of good to moderate, and the state did not experience any days above the air quality standards in 2013 or 2014 (EPA 2015, reference (24)). Implementation of the state and federal air control programs have resulted in notable improvements in air quality throughout the state.

70 In October 2009, Executive Order (EO) 13514, titled Federal Leadership in Environmental, Energy, and Economic Performance, was signed and requires Federal agencies to set goals for reducing GHG emissions. One requirement within Executive Order 13514 is the development and implementation of an agency Strategic Sustainability Performance Plan (SSPP) that prioritizes agency actions based on life cycle return on investment. Each SSPP is required to identify, among other things, "agency activities, policies, plans, procedures, and practices" and "specific agency goals, a schedule, milestones, and approaches for achieving results, and quantifiable metrics" relevant to the implementation of Executive Order 13514.

On September 20, 2010, the Department of Energy (DOE) publicly released its SSPP. This implementation plan describes specific actions the DOE will take to achieve its individual GHG reduction targets, reduce long-term costs, and meet the full range of goals of the Executive Order. The proposed Project, as an activity that requires a Presidential permit from DOE, would fall under the Scope 3 GHG emissions requirements. However, the Scope 3 GHG goals in the DOE SSPP do not include emissions generated by prime contractors not directly associated with DOE site operations.

On March 19, 2015, President Obama released the Executive Order 13693, Planning for Federal Sustainability in the Next Decade. This Executive Order revokes and replaces previous Executive Orders and presidential memorandums, including Executive Order 13514, and provides new, specific goals and requirements for energy, water, vehicle fleet, buildings and acquisition management. Each of the agencies will need to provide plans in 2015 to meet these new goals. The SSPP would be expected to be updated in the future as GHG reduction policy and implementation guidance become further developed. Future SSPP goals could include Scope 3 goals for these types of prime contractors, but that is uncertain at this time.

General Impacts

The construction and operation of the proposed Project would result in direct and indirect emissions of criteria air pollutants and GHG emissions. These emissions would be adverse, short-term, and localized. In addition, the proposed Project would result in reductions of indirect criteria pollutant and GHG emissions, as the proposed Project could allow the reduction of coal-fired electricity generation in Minnesota. The loss of forest carbon sink and forest carbon sequestration (see discussion of these terms below) from the clearing of forest in the transmission line ROW is not expected to result in significant changes to GHG emissions.

The Applicant is strongly urged to implement best management practices (BMPs) **during construction,** which could be included as MN PUC Route Permit conditions (Section 1.3.1; Appendix B). These BMPs, incorporated as MN PUC Route Permit conditions, could include:

- Minimizing idling of construction vehicles;
- Utilizing existing power sources (e.g., grid-supplied power) or clean fuel generators **and vehicles** rather than diesel-powered generators **and vehicles, where practical**;
- Ensuring that construction equipment is properly tuned and maintained prior to and during on-site operation;
- Developing a project-specific dust control plan, which could include the following additional BMPs:
  - Using traffic controls to restrict traffic to predetermined routes
  - Maintaining as much natural vegetation as practicable
  - Phasing of construction to reduce the area of land disturbed at any one time
  - Using temporary mulching, or temporary vegetative (sod) cover, to reduce the need for dust control
  - Using mechanical sweepers on paved surfaces where necessary to prevent dirt buildup, which can create dust
  - Periodically moistening exposed soil surfaces with adequate water to control dust

Changes in emissions and carbon sink and sequestration resulting from the proposed Project would be similar for all proposed routes and variations. The scale of the ROI is at the region and county level and the location of the proposed routes and variations do not differ substantially enough to result in different impacts for the proposed routes and variations considered, therefore air quality, GHG emissions, and climate change are not discussed further in Chapter 6 of this EIS.

Construction Impacts

Criteria Pollutants

Construction activities associated with the proposed Project, for all proposed routes and variations, would result in short-term increases in air emissions as a result of the combustion of fossil fuels in construction equipment and vehicles, and from the fugitive dust emissions associated with site ground disturbance. The Applicant would use large equipment to clear trees and other vegetation and to level construction areas. Large cranes and flatbed trucks would be used to place transmission lines and substation components. Helicopters may be used to place lines and structures. Temporary concrete batch plants may be utilized to supply concrete for foundations. Equipment and material deliveries, the removal of waste, and worker activities and commuting would produce indirect emissions on paved and unpaved roads within the ROI. Construction of the proposed Project would take about four years, but activities are assumed not to occur at a single construction location for more than a year.

Construction of the proposed Project is expected to occur between October 2017 and June 2020. Because specific scheduling and construction documentation have not been developed yet, annual emissions of criteria pollutants from construction of the proposed Project have been estimated using an average emissions per mile for typical construction based on a hypothetical project site. Average emissions per acre have also been estimated for forest clearing activities, and this estimate was added to the route variations where appropriate. Substation average emissions were also estimated. Criteria pollutant and GHG emission factors are based on the size and type of equipment developed using the EPA's MOVES2014 modeling program for on-road and non-road equipment (MOVES 2015, reference (199)). Total project emissions have been calculated for the West, Central, and East Sections using the total mileage and forest removal areas for the Proposed Blue Route and Proposed Orange Route, although the total sum of routes in each of the three

sections is greater than the totals for the Proposed Blue Route and Proposed Orange Route because routes overlap within the sections. Details of the methodology and results of these estimates can be found in Appendix W.

The results of these estimates show that potential impacts related to air quality from construction of the proposed Project would be adverse, but localized and short-term and would not affect the attainment status in the region. Construction emissions would be short term and dispersed over the ROI during the construction duration; therefore, the total emissions would not result in a direct impact to any one location. Project construction emissions do not vary significantly by proposed route or variation considered. Construction procedures and techniques would be similar in all locations and impacts would be comparable.

The Applicant has proposed a number of avoidance, minimization, and mitigation measures that would reduce construction emissions; these are outlined in Table 2-2.

Climate Change and GHG Emissions

Construction activities for all proposed routes and variations would result in similar short-term increases in GHG air emissions, from the combustion of fossil fuels in equipment and vehicle use as described above. CO_2, CH_4, and N_2O would be emitted from the combustion of fossil fuels, **although CH_4 and N_2O would be minimal. CO_2 emissions from construction operations have been estimated (Appendix W). Potential impacts of GHG emissions from** construction would be adverse, localized, and short-term.

During construction, the clearing of the ROW would require clearing of forest lands. Deforestation is another source of CO_2 to the atmosphere, as trees and forest land act as a carbon sink, absorbing CO_2 from the atmosphere and storing it. Removing forests releases most of the stored carbon stock, either through burning or decay. Some forest material from ROW clearing would be used as lumber, paper, or other wood products, which would retain some of the carbon in finished products or in a landfill. In addition, deforestation eliminates future CO_2 capture.

The relative magnitude of the impacts associated with clearing of forested ROW can be assessed by quantifying these potential losses in sequestered carbon and comparing them to total carbon stock along the proposed routes and variations. The loss of future CO_2 capture can be estimated on an annual basis.

The amount of forest removal for the proposed routes and variations is discussed further in **Section 5.3, 5.4, and 5.5 (Land Use)** of this EIS. For the purposes of the GHG impact analysis, the resulting loss of carbon stock, or carbon sink has been estimated for the Proposed Orange Route and Proposed Blue Route as those are the only two complete routes and provide the best indication of the scale of the loss of carbon sink for the proposed Project. Loss of carbon sink for all other variations would be proportionally less or more, based on the total area of forest cover being removed by the Proposed Orange Route or Proposed Blue Route section. The loss of carbon sink that results from the removed forest has been estimated using *Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States* (Smith et al. 2006, reference (25)). The calculations assume the removal of "Northern Lake States Spruce-balsam Pine" forests that are an average of 55 years old. Carbon sink is defined and reported as the total amount of carbon, in metric tons, and in the equivalent amount of CO_2 in metric tons, calculated using the atomic weight ratio of 12 for Carbon to 44 for CO_2.

The proposed Project will require the removal of all forested areas within the anticipated 200-foot ROW. The Proposed Blue Route would require the removal of approximately 4,829 acres of forest in the anticipated 200-foot ROW. The loss of carbon sink is estimated at 218,731 metric tons carbon, which is the equivalent of 802,013 metric tons of CO_2. The Proposed Orange Route would require the removal of approximately 4,883 acres of forest in the anticipated 200-foot ROW. The loss of carbon sink is estimated at 221,219 metric tons carbon, which is the equivalent of 811,136 metric tons of CO_2. **Detailed calculations are provided in Appendix W.** It should be noted that this loss is appropriately not considered as a single year of emissions but is attributed to the proposed Project separately as a decrease of carbon sink, lost **over the 3- to 4-year construction period**. The estimate is also overly conservative (higher) as it does not account for the amount of carbon that may remain sequestered as a portion of the cleared timber may be used in wood products (e.g., lumber).

This loss of carbon sink in the anticipated 200-foot ROW can be compared to the total carbon sink along the proposed routes. For the Proposed Blue Route, there are 71,399 acres of forest within 1,500 feet of the anticipated alignment, representing over 3.23 million metric tons of carbon sink, or the equivalent of 11.87 million metric tons of CO_2. For the

Proposed Orange Route, there are 72,229 acres of forest within 1,500 feet of the anticipated alignment, representing over 3.27 million metric tons of carbon sink, or the equivalent of 12.01 million metric tons of CO_2. The loss of carbon sink associated with either the Proposed Blue Route or the Proposed Orange Route represents less than 7 percent of the total forest carbon sink within 1,500 feet of the anticipated alignment, and therefore a much smaller percentage of carbon sink in the region.

In addition to the loss of existing carbon sink, removal of forested land eliminates the CO_2 sink that would be provided by continued growth of trees in the forest. Using data from Smith et al. 2006 (reference 25, the annual carbon uptake of live trees in "Northern Lakes State Spruce-balsam Pine" forest are estimated at 0.65 metric tons C/acre-year. This would result in the equivalent loss of approximately 11,500 metric tons CO_2 uptake per year for either the Proposed Blue Route or the Proposed Orange Route. This adverse impact would be long-term.

Operation, Maintenance, and Emergency Repair Impacts

Criteria Pollutants

On-site transmission line operational activities that would result in direct or indirect air emissions, regardless of the proposed route or variation selected, would be limited. Operational emissions would occur from vehicle usage to and from the ROW or site for regular maintenance and landscaping activities, as well as emergency maintenance. Operational activities would be considerably less on an annual basis than the construction activities discussed above. Ionization of air molecules surrounding the conductor ("corona effect") may also produce a small amount of ozone and nitrous oxide (NO_x). These potential operational emissions are expected to be small and would result in limited impacts to air quality and would not affect the attainment status in the region.

The implementation of the proposed Project would allow the Applicant to fulfill obligations under its power purchase agreements (PPA) with Manitoba Hydro. The Applicant is party to a 250 MW PPA, as well as an additional 133 MW Renewable Optimization Agreement with Manitoba Hydro. According to the Applicant, the ability to purchase 383 MW of energy generated at Manitoba Hydro hydroelectric facilities for distribution in Minnesota would allow the Applicant to meet its goals of reducing coal powered electricity generation at its facilities (Minnesota Power 2013, reference (26)). The Applicant has also determined that a new 500 kV transmission tie line with the Manitoba hydroelectric system would not only provide them with additional hydroelectric capacity, but it would also provide an opportunity to optimize and use what would otherwise be excess wind energy from its North Dakota wind facilities. The resulting increase in the use of wind and hydropower and decrease in coal supplied power would greatly reduce criteria pollutant emissions such as SO_2, NO_x, and mercury from the Applicant's energy generation portfolio facilities. It is difficult to quantify the impact of this reduction in criteria pollutant emissions because other factors such as emission control improvements and changes in electricity demand would also have an impact on emission reductions. However, the Applicant's Resource Plan states their goal is to reduce GHG and criteria pollutant emissions through the reduction in the use of coal and the increase in the use of renewable energy. The Applicant has stated that this proposed Project is part of that plan, for that purpose. Therefore, it is reasonable to assume that the Applicant's distribution of low-emission, renewable energy in Minnesota would be a beneficial long-term impact to air quality in the region.

Climate Change and GHG Emissions

Operational GHG emissions would occur for all proposed routes and variations from vehicle usage to and from the site for regular maintenance and landscaping activities as well as emergency maintenance. Operational activities would be considerably less on an annual basis than the construction activities evaluated.

Sulfur hexafluoride (SF_6) may be used in small quantities in substation transformers and other electrical equipment. As a GHG, it has a global warming potential 22,800 times that of CO_2 (EPA 2015, reference (24). SF_6 is only released as a fugitive emission, if equipment is malfunctioning or during maintenance and repair, and most new equipment requires less SF_6 or none at all (EPA 2015, reference (27)) The Applicant would minimize SF_6 emissions through the BMPs and maintenance, which could be included as MN PUC Route Permit conditions (Section 1.3.1; Appendix B). The EPA has established the SF_6 Emission Reduction Partnership for Electric Power Systems (EPA 2015, reference (28)) to identify and continuously improve the BMPs for SF_6 emission reductions.

The implementation of the proposed Project would allow the Applicant to fulfill obligations under its PPA with Manitoba Hydro. This would allow the Applicant to meet its goals of reducing coal powered electricity generation at its facilities,

thereby reducing GHG emissions. It is difficult to quantify the impact this reduction, but it is reasonable to assume that this impact would be a beneficial impact to air quality in the region, and would help Minnesota meet the current GHG reduction goals. While there are no current federal requirements to reduce GHG emissions, it is likely that the final Clean Power Plan legislation would call for some reduction of GHG emissions from large fossil fuel power plants. Once it has been finalized, appropriate actions will be taken to comply.

Climate Change Adaptation

In the Midwest, communities must prepare for increases in precipitation events, droughts, and heat waves. Heavy precipitation events have doubled in the last century, and heat waves are becoming more frequent, as average summer temperatures may increase by 3°F by 2050 and by 10°F by 2100. Increased temperatures would affect agriculture, fisheries, and ecosystems, with impacts on industries from milk production to winter recreation (EPA 2014, reference (20)). The Minnesota Department of Health (MDH) completed the *Minnesota Climate Change Vulnerability Assessment* in 2014 (MDH 2014, reference (29)), identifying the vulnerability of Minnesota residents to the anticipated climate change effects of extreme heat events, air pollution, vector-borne diseases, flooding and flash flooding, and drought. The report concluded that "these climate hazards present major challenges to the health and quality of life of Minnesotans" (MDH 2014, page 81, reference (29)).

In a 2013, the Minnesota Interagency Climate Adaptation Team published a report titled *Adapting to Climate Change in Minnesota* (Minnesota Interagency Climate Adaptation Team, 2013). This report defines specific actions each of the cooperating agencies will take to adapt to climate change, and establishes seven priority areas:

- Building resilience to extreme precipitation;
- Implementing best practices that achieve multiple benefits;
- Protecting human health;
- Strengthening existing ecosystems by addressing ongoing challenges and risks;
- Building partnerships with local governments;
- Quantifying climate impacts; and
- Conducting public and community outreach, education, and training (Minnesota Interagency Climate Adaptation Team 2013, reference (30)).

Increased flooding, storm, and heat wave events could increase risks to transmission lines and substations, and require adequate planning and preparation to handle unexpected repairs and contingencies. Heat waves pose a change to electrical transmission and generation systems, as more indoor space is equipped with cooling systems and the systems require more power during heat events. The improved capabilities of the transmission network would reduce the threats of peak overloads. The proposed Project would be designed to adequately withstand expected weather challenges, and proper maintenance and repair plans would also consider future climate changes, as committed to by the Applicant in their proposed measures to minimize environmental impacts in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

5.2.1.4 Property Values

This section describes the potential for impacts to individual property values from the proposed Project.

The placement of high voltage transmission lines and associated facilities near human settlements could potentially affect property values. In general, three main factors related to a proposed high voltage transmission line could affect property values:

- The presence of high voltage transmission lines in the viewshed could adversely affect the aesthetics of a property, thereby deterring certain buyers. Potential aesthetic impacts are discussed in Section 5.3.1.1.
- The real or perceived risks associated with EMF may discourage certain buyers. Potential health impacts of EMF are discussed in Section 5.2.2.1.
- High voltage transmission lines structures, when placed in an agricultural field, displace very little farmland. However, they have the potential to interfere with farming operations. Impacts on crop yields and crop choices could affect property values. Potential interference with farming operations is discussed in Section 5.3.2.1.
- In addition to the three main factors that could affect property values, noise emissions from operation of high voltage transmission lines due to the "corona effect" can also affect nearby residences, as discussed in Section

5.2.1.2. The noise impacts from operation of high voltage transmission lines could deter certain buyers.

The ROI for this analysis of property values is 1,500 feet on either side of the anticipated alignment of the transmission line and within 1,500 feet the permanent footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations and permanent access roads). This is the same ROI used in the analysis of the factors (Aesthetics, EMFs, and Agriculture) that could influence property value impacts.

5.2.1.5 Property Values in the ROI

Proximity to high voltage transmission lines is only one of many interconnected factors that influence property values, so the magnitude of this variable is difficult to isolate. Property values are influenced by the complex interaction of factors specific to each individual piece of real estate as well as local and national market conditions. The relationship between property values and proximity to high voltage transmission lines has been researched over decades, using a variety of methodologies to try to isolate the factor of distance to transmission lines (Appendix J). The Wisconsin Public Service Commission (PSC) (Wisconsin PSC 2000, reference (31) pp. 212-215)) analyzed the findings of approximately 30 papers, articles, and court cases, and reported six observations in its final EIS on the Arrowhead-Weston Electric Transmission Line Project that are generally applicable to properties near transmission lines, including:

- Proximity to a transmission line does not always cause property values to go down. When property values do go down, the potential reduction in value from proximity to a transmission line is in the range of 1 to 14 percent.
- Property value impacts decrease with distance from a line, and impacts are usually greater on smaller properties than on larger ones where distance from the residence to the line is generally less.
- Adverse impacts to property values diminish over time.
- Other amenities, such as proximity to schools or jobs, lot size, square footage of the home and neighborhood characteristics, tend to have a much greater effect on sale price than the presence of a high voltage transmission line.
- The value of agricultural property is likely to decrease if transmission line support structures interfere with farming operations (such as aerial spraying or field irrigation systems). Potential interference with farming operations is discussed in Section 5.3.2.1.
- Impacts on sale price are more frequently observed for properties crossed by or immediately adjacent to a high voltage transmission line, but impacts have been observed for properties farther away.

Weber and Jensen (1978, reference (3)) and Jensen and Weber (1982, reference (4)) investigated property value effects of transmission lines on agricultural land in west-central Minnesota. In the 1978 study, they found no effects on the purchase prices of agricultural land. In the 1982 study, they observed transmission line effects ranging from no effects to a 20 percent reduction in sales price, depending on the level of disruption to farm operations.

Jackson and Pitts (2010, reference (5)) performed a literature review of 17 studies conducted between 1954 and 2009, which investigated effects of transmission lines on property values. The studies employed a variety of techniques, including survey-based studies, multivariate analyses of sales price, and sales price comparisons utilizing techniques other than multivariate analysis. Among the 17 studies reviewed, Jackson and Pitts (2010, reference (5)) observed that the studies generally found no effect or small effects on property values caused by transmission lines. In the few studies that detected decreases in sales price, those effects ranged from two to nine percent, and in a few cases, the sales price actually increased.

Additional detail about research on the relationship between transmission lines and property values is provided in Appendix J.

General Impacts

The Applicant conducted routing studies and public meetings to identify residences and public concerns regarding the proposed Project in order to reduce the potential for impacts on residences (Section 2.3). Further, the Applicant-proposed measures to minimize environmental impacts listed in Table 2-2, reflect the mitigation recommendations discussed above and further reduce any potential impact to property values from construction and operation of the proposed Project.

Potential impacts to property values could be mitigated by reducing aesthetic impacts and

agricultural impacts. Choosing routes and alignments that maximize use of existing ROWs or placing the transmission line away from residences and out of agricultural fields could address these concerns, thereby minimizing or avoiding impacts to property values. As described in Section 2.9.2, Land Acquisition, impacts could also be mitigated by utilizing Minnesota Statute, section 216E.12, subdivision 4 (commonly known as the "Buy the Farm" statute), where available, to move residents away from potential property value impacts. Utilizing the "Buy the Farm" statute, landowners with property designated as a "agricultural or nonagricultural homestead, nonhomestead agricultural land, rental residential property, and both commercial and noncommercial seasonal residential recreational property", have the option to require the utility to purchase the contiguous property crossed by a high voltage transmission line greater than 200 kV at fair market value. Additional discussion of relevant mitigation measures are provided in Section 5.2.2.1, Section 5.3.1.1, and Section 5.3.2.1.

Because potential reductions in property values are expected to range from zero to at most 20 percent as a result of operation of the proposed Project, and because potential property value reductions do not vary for proposed routes and variations considered, property values are not discussed further in Chapter 6 of this EIS.

Construction Impacts

Potential impacts to property values resulting from construction of the proposed Project are not expected because of its short-term and localized nature.

Operation, Maintenance, and Emergency Repair Impacts

Potential impacts to property values, if any, resulting from operation, maintenance, and emergency repairs of the proposed Project would be long-term due to aesthetics, EMF, and agricultural impacts. The impacts to property values would be expected to range from no effect to at most a 20 percent reduction,based on conclusions derived from the literature review of relevant studies presented in Appendix J.

5.2.1.5 Electronic Interference

This section describes the potential for electronic interference to occur as a result of the proposed Project.

Electronic interference during operation of the proposed Project could result from gap discharges, corona discharges, shadowing effects, reflection effects, and blocking line-of-sight communications.

Gap discharges are caused by spaces between loose hardware and wires. Electrical noise or interference occurs when there is a discharge across the gap. These gap discharges most commonly occur on low voltage distribution lines. Corona on transmission-line conductors can also generate electromagnetic noise at similar frequency bands that are utilized for radio and television signals, which can result in radio and television interference. Corona interference with electromagnetic signals is generally associated with high voltage transmission lines. Shadowing and reflection effects are the result of structures (typically tall buildings) reflecting, scattering, or obstructing the signal. Interference can also result from transmission line structures which block the line-of-sight that is necessary for microwaves to transmit between antennas.

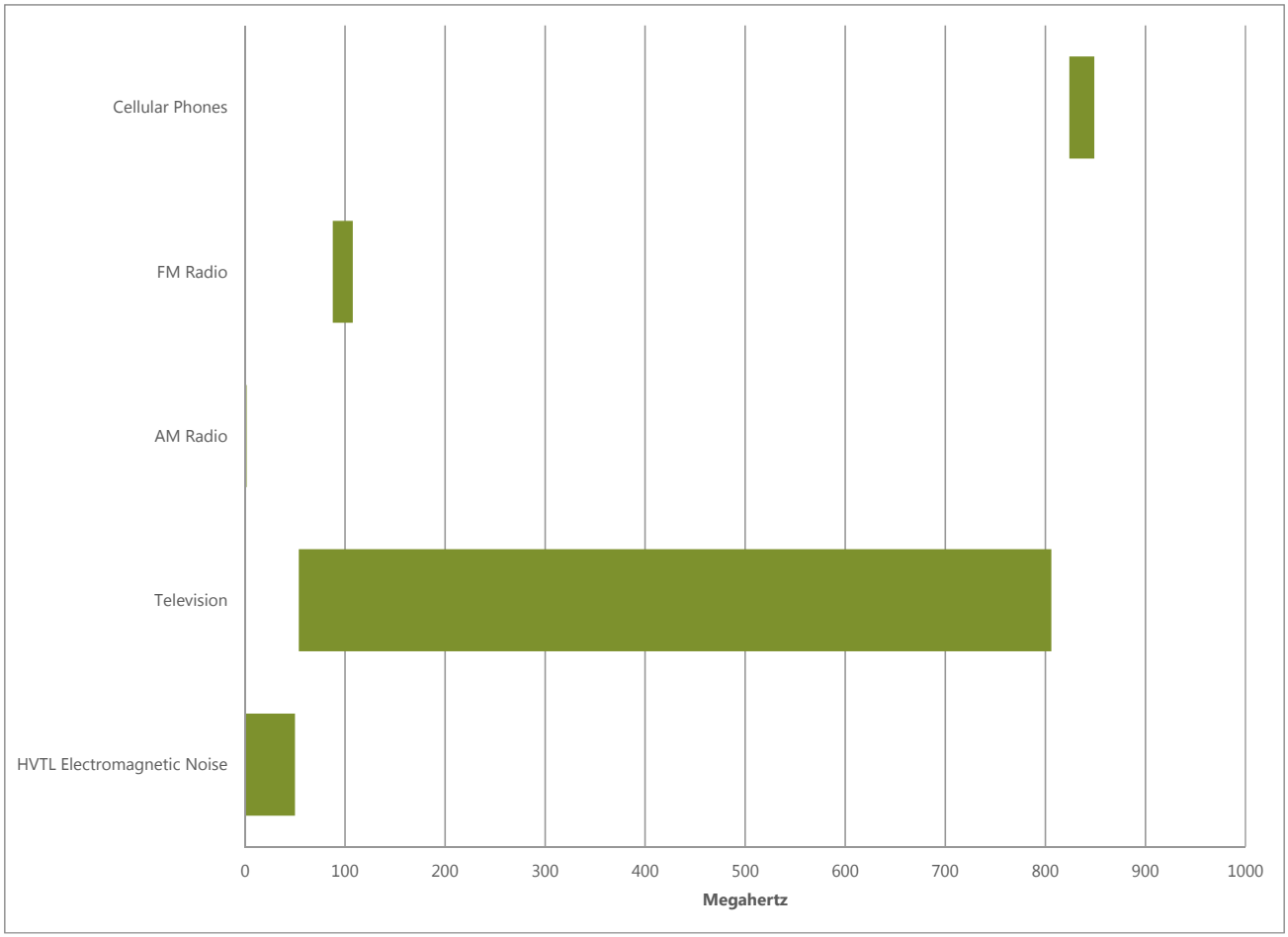
Corona interference from transmission lines causes the greatest disturbance in a relatively narrow frequency spectrum, in the range of about 0.1 to 50 megahertz (MHz) (Arora and Mosch 2011, reference (32)). Because many communication and media signals are transmitted at higher frequencies, impacts to communication signals would be limited. Figure 5-1 compares the spectrum of transmission frequencies for several communication and media signals to the peak intensity disturbance associated with electromagnetic "noise" from high voltage transmission lines. Additional discussion is provided below for each major type of media or communication signal.

The ROI for this analysis of electronic interference is 1,500 feet on either side of the anticipated alignment of the transmission line. This ROI was selected because high voltage transmission line impacts to radio and television interference are generally limited to areas within 100 to 600 feet of a transmission line (Bonneville Power Administration 2011, Appendix E of reference (33)). A conservative approach was taken for this analysis and the ROI was extended to 1,500 feet to assess potential impacts from the proposed Project.

Communication Towers in the ROI

There are no communication towers identified within the ROW and only a limited number (less than three for any proposed route or variation within a variation area) exist within 1,500 feet of the anticipated alignment of the proposed routes and variations for the West Section (Map 5-4), the

Figure 5-1 Frequencies of Electronic Communications Compared with Frequencies of Electromagnetic Noise Created by Transmission Line



Source(s): Arora and Mosch 2011, reference (32)

Central Section (Map 5-11), and the East Section (Map 5-18). Communication towers are identified within 1,500 feet of the anticipated alignment in the West Section for two variation areas (Map 5-4): Roseau Lake WMA Variation Area-Proposed Blue/ Orange Route, Roseau Lake WMA Variation 1, and Roseau Lake WMA Variation 2 (two towers identified for each); and Cedar Bend WMA Variation Area - Proposed Blue/Orange Route (two towers) and Cedar Bend WMA Variation (three towers). Within the Central Section, one communication tower is located within 1,500 feet of the anticipated alignment of the C2 Segment Option Variation in the C2 Segment Option Variation Area and the J2 Segment Option Variation in the J2 Segment Option Variation Area (Map 5-11). In the East Section, one communication tower is within 1,500 feet of the anticipated alignment for the Proposed Blue Route and Proposed Orange Route in the Blackberry Variation Area (Map 5-18).

General Impacts

Potential electronic interference impacts are expected to be limited for the proposed Project and would be similar for all proposed routes and variations since there are less than three communication towers within the ROI, and none were identified within the ROW, for the proposed routes and variations within the variation areas. The Applicant has identified mitigation measures that would be implemented (see Section 2.13) if impacts result from operation of the proposed Project. These Applicant proposed measures could be included as MN PUC Route Permit conditions. Since electronic interference impacts resulting from the proposed Project or variations are expected to be limited and do not vary by proposed route or variation considered, electronic interference is not discussed further in Chapter 6 of this EIS.

Construction Impacts

Electronic interference is primarily affected by operation of the transmission line and substations and the location of the individual transmission

structures. Therefore, potential impacts resulting from construction of the proposed Project are not expected regardless of the route or variation considered.

Operation, Maintenance, and Emergency Repair Impacts

As shown in Figure 5-1, television broadcast frequencies, which occur in the 54 to 806 MHz range, are high enough that they are relatively immune to corona-generated 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. Satellite television is transmitted in the Ku band of radio frequencies (12,000 to 18,000 MHz) and is likewise immune to corona-generated noise. Both digital and satellite television reception could be affected by multipath reflections (shadowing) generated by nearby towers. An outdoor antenna might be necessary to resolve issues with multipath reflections. Satellite television is susceptible to line-of-sight interference due to transmission line structures. However, reception could usually be restored by moving the affected satellite antenna to a slightly different location. Cable television is a redistributed form of satellite broadcast and is generally not susceptible to interference due to the use of shielded coaxial cable. Cable broadcasts could suffer interference if the satellite broadcast suffers interference (e.g., line-of-sight obstruction).

Another line-of-sight potential impact would be related to Global Positioning System (GPS) navigation on precision agricultural equipment. If the GPS unit satellite signal on agricultural equipment were blocked by a tower, it could disrupt the signal and affect the accuracy of the unit. This effect, however, would be extremely limited for two reasons: 1) GPS satellite signals come from multiple satellites, often up to six or seven satellites, so the obstruction of one signal would not block the others; and 2) the GPS unit would be on a mobile piece of farm equipment that would move beyond the location of the blocked signal to an area that is unobstructed.

Wireless internet and cellular phones use frequencies in the 900 MHz ultra-high frequency range—a range for which impacts from corona-generated noise are not anticipated. If internet service at a residence or business is provided by a satellite antenna, this service could be impacted by a line-of-sight obstruction. As with other satellite reception, any interference due to an obstruction could be resolved by moving the satellite antenna to a slightly different location.

Electromagnetic "noise" from transmission lines is not an issue for microwave communications. However, microwave communication can be physically blocked by taller transmission structures. Microwave pathways can extend as close as 150 feet to the ground, and the transmission line structures for this proposed Project are 100 feet to 150 feet tall; therefore, interference with microwave communications is possible. This potential impact could be avoided during detailed project design on any proposed route or variation by identifying the microwave pathways in the proposed Project area and siting the transmission line structures at locations where they would not interfere with any identified pathways.

Incorporating the Applicant's proposed measures to minimize and mitigate any impacts to television, radio, and communication towers (Section 2.13) are anticipated to avoid electronic interference impacts. It is recommended that once the Applicant finalizes the route and determines the locations of transmission line structures, that they conduct a communication tower study to ensure that impacts are avoided by the proposed Project. These Applicant proposed measures are potential MN PUC Route Permit conditions.

5.2.1.6 Transportation and Public Services

This section describes the potential for transportation and public services impacts in the West, Central, and East sections from the proposed Project.

The ROI for the roadways and railways, public utilities, emergency services, and airports and airstrips is provided in the following sections along with the rationale for the ROI.

Roadways and Railways

This section describes the existing roadway and railway systems in the West, Central, and East sections and the potential impacts on those resources from the proposed Project. This section focuses on federal and state roads that are most likely to be affected by construction and operation of the proposed Project. Transportation systems were identified based on a review of aerial photographs and data from the Minnesota Department of Transportation (MnDOT).

The ROI for the analysis of impacts to roadways and railways includes roadways and railways that exist in the West, Central, and East sections that could be traversed by personnel as a result of construction,

operation, maintenance, and emergency repair of the proposed Project. The proposed Project is not expected to have the potential to impact roadways and railways outside these sections.

Roadways and Railways in the ROI

The ROI is primarily rural with scattered pockets of development. The road network largely follows a grid-like pattern in the West Section (Map 5-4). Portions of the Central and East sections have a similar grid pattern of roadways, but much of the road network in these sections follow the natural geography of the area which is primarily defined by the presence of peatlands and lakes in the region (Map 5-11, Map 5-18). Major roadways located in the ROI are summarized in Table 5-7 using information obtained from MnDOT (reference (34)). In general, traffic volumes in the ROI are low. The population density near the community of Grand Rapids is higher than most areas within the ROI and; therefore have higher average numbers of cars per day using the major roadways in the East Section near Grand Rapids.

There is no passenger rail service in the ROI, however, several freight lines are located near the proposed Project (Maps 5-4, 5-11, and 5-18). The Minnesota Northern line is a private freight line that parallels Minnesota State Highway 11 in the West Section and would be crossed by Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area located west of the city of Roseau; the line is abandoned between Roseau and Warroad (Map 5-4) and would be crossed by the Proposed Blue Route, Proposed Orange Route, and Roseau Lake WMA Variation 2 in the abandoned portion of the line. The Canadian National rail line and the private Minnesota, Dakota & Western rail lines pass through the West and Central sections, but are not crossed by any proposed routes or variations (Map 5-4 and Map 5-11). An abandoned freight line that largely parallels U.S. Route 71 is crossed by the Proposed Blue Route and Proposed Orange Route in the Central Section (Map 5-12; freight line follows current location of the Blue Ox Trail). The Burlington Northern Santa Fe Railway and Northern Lines would be crossed by the Proposed Blue/Orange Route in the East Section between Bovey and Marble (Map 5-18; MnDOT 2015, reference (35)).

General Impacts

Due to relatively low existing traffic volumes in the ROI, combined with the Applicant proposed measures specified in Section 2.13, impacts would be short-term and localized. Other mitigation measures the Applicant could implement to further reduce any impacts may include coordinating with local officials to develop a detailed construction

Table 5-7 Major Roadways in the Project Area

Roadway Name	No. of Lanes	Average No. of Cars/Day	General Direction	Major Towns Crossed	Sections Crossed
Minnesota State Highway 1	2	5–205	W to E	Northome, Effie	Central, East
Minnesota State Highway 6	2	65–75	S to N	None	Central
Minnesota State Highway 11 (Scenic Byway)	2(1)	110–760	W to E	Roseau, Warroad	West, Central
Minnesota State Highway 38 (Scenic Byway)	2	25–500	S to N, W to E	Effie	Central, East
Minnesota State Highway 46	2	90–155	S to N	Northome	Central
Minnesota State Highway 65	2	5–315	S to N	Littlefork, Nashwauk	Central, East
Minnesota State Highway 72	2	100–205	S to N	N/A	Central
Minnesota State Highway 89	2	10–382	S to N	N/A	West
Minnesota State Highway 217	2	25–215	W to E	Littlefork	Central
Minnesota State Highway 308	2	5	S to N	N/A	West
Minnesota State Highway 310	2	35–315	S to N	Roseau	West
Minnesota State Highway 313	2	55–320	S to N	Warroad	West
U.S. Route 2	4(1)	550–1700	W to E	Grand Rapids	East
U.S. Route 71	2(1)	55–385	SW	Littlefork, Big Falls, Mizpah, Northome, Funkley	Central
U.S. Route 169	4	185–590	W to E, NW	Grand Rapids, Taconite, Pengilly	East

Source(s): MnDOT 2013, reference (40)

(1) Number of lanes may vary due to turning lanes

and mitigation plan where roadways would be temporarily closed; periodic halting of construction activity to allow queued vehicles to pass; and coordinating with rail line operators to avoid construction during periods when trains are scheduled to pass through the construction area. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Since potential impacts related to transportation and public services would be short- term and localized from construction and operation of the proposed Project and do not vary by proposed route or variation considered, transportation and public services are not discussed further in Chapter 6 of this EIS.

Construction Impacts

Impacts to transportation from the construction of the proposed Project consist of physical damage to roadways and infrastructure from the movement of construction related vehicles, temporary closure of roadways or rail lines, temporary limits on access to private land, and temporary traffic delays resulting from increases in construction vehicle trips.

Vehicles and equipment that would be used for construction of transmission lines (e.g., overhead line cranes, concrete trucks, construction equipment, and material delivery trucks) generally are heavier than lighter passenger vehicles and may cause more damage to road surfaces. Oversized/overweight load permits must be obtained from the MnDOT when size and/or weight limits would be exceeded. Therefore, potential impacts related to transportation from construction of the proposed Project are not expected since MnDOT would ensure that the roads traversed by the oversized/overweight trucks are capable of accommodating those trucks (Minnesota Office of the Revisor of Statutes 2014, https://www.revisor.mn.gov/statutes/?id=169.86). The Applicant would restore the anticipated ROW and all access roads affected by construction. Temporary access roads that would be needed for the proposed Project would be subject to review and approval by highway officials and traffic control measures would be implemented in accordance with the MnDOT Manual on Uniform Traffic Control Devices. The number and location of access roads has not yet been determined, but the typical width would be 16 feet.

Construction of proposed Project components that cross public roadways (i.e., overhead transmission lines) or that would share a corridor with a road (See Maps 5-10, 5-17, and 5-24) may require the access to one or more roadway lanes to be temporarily restricted. This may result in temporary delays in traffic and limiting of access to private roadways and land. Similarly, construction across the two active railways (Minnesota Northern line and Burlington Northern Santa Fe Railway) and one abandoned railroad (an abandoned freight line that largely parallels U.S. Route 71) may require rail traffic to temporarily reduce speed for short periods of time; these restrictions would be expected to last for a few hours to approximately one day. It would be expected that impacts on traffic would occur for a limited amount of time in any particular location.

Construction workers and construction related vehicles using public roadways to access the ROW are likely to have localized adverse impacts on traffic volumes. An average of 120 construction workers would be employed annually during construction from **2017** through 2020 (University of Minnesota-Duluth 2013, reference (36)). During the course of construction of the proposed Project construction workers would be employed and would be dispersed throughout the project area. Workers would not be concentrated in any one location at a single time and would be traveling to the construction site from different locations. Since trips from construction workers would be dispersed over a large geographic area, the increase in vehicle traffic would represent a small increase over existing traffic volumes at any given time, at a given location, and would be short-term and localized. This increased volume in vehicles could temporarily increase travel time for drivers during peak travel times. In developed areas, construction vehicles could temporarily block public access to streets and businesses.

Some limited short-term roadway impacts could occur, increase in traffic would represent a small increase, and lane restrictions would be temporary. The Applicant's proposed mitigation for potential impacts to roadways and railways are described in Section 2.13 and would include obtaining appropriate oversized/overweight permits and designing the proposed Project and associated road crossings to meet MnDOT guidelines, and obtaining a permit from MnDOT for the use of any state highway ROWs, including following MnDOT's Utility Accommodation requirements. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Operation, Maintenance, and Emergency Repair Impacts

Operation of the proposed Project where the anticipated alignment will cross public roadways or that would share a corridor with a road (see Maps 5-10, 5-17, and 5-24) would be strung overhead with sufficient clearance for cars and trucks. Operation of the proposed Project would

result in maintenance vehicles using public roads to access the ROW for maintenance activities. Potential impacts from operation, maintenance, and emergency repairs of the proposed Project would be intermittent (or as-needed), short-term, and localized. Transmission lines that parallel roads could affect future road expansions or realignments because structures placed along the road ROW may need to be moved to preserve a safe distance between structures and the edge of the expanded roadway. Costs associated with the relocation of permitted structures would be the responsibility of the utility owner (MnDOT 2015, reference (37)). Placement of transmission line structures would be coordinated with MnDOT and necessary permits obtained from MnDOT for the use of any state highway ROWs, including following MnDOT's Utility Accommodation requirements.

Severe weather, including high winds, ice and snow storms and tornados, could possibly create safety hazards on any roadways located within the designed fall distance of an overhead transmission line. The fall distance is equal to the height of the structure. Snow and ice accumulation and high winds could increase a structure's weight, making it more susceptible to failure or collapse. The Applicant has proposed Project design standards in Section 2.13 and other measures to minimize environmental impacts which would minimize roadway impacts from operation of the proposed Project. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Airports and Airstrips

This section describes the existing airports in the vicinity of the proposed Project in the West, Central, and East sections as well as applicable federal and state policies and potential impacts to airports from the proposed Project.

The Federal Aviation Administration (FAA) requires notification of construction or alterations that would result in a structure being greater than 200 feet from its base or exceeding the defined slope as established by 14 CFR 77.9 (U.S. Government Publishing Office 2015, reference (38)). Transmission structures for the proposed Project would range in height from approximately 100 feet to 170 feet.

The FAA and MnDOT have each established development guidelines on the proximity of tall structures near public use airports. The FAA has also developed guidelines for the proximity of structures to very high-frequency omni-directional range ground-based navigation systems. FAA Order 6820.10 specifies that overhead transmission lines should be more than 1,200 feet away from a navigational aid to avoid electronic interference. MnDOT has established separate zoning areas applying to land around public airports. The most restrictive safety zones are Safety Zone A and Safety Zone B. Safety Zone A extends from the end of the runway out to a distance equal to two-thirds of the runway length and does not allow any buildings or temporary structures, places of public assembly or transmission lines. Safety Zone B prevents places of public or semi-public assembly such as churches, hospitals or schools within the area that extends from Safety Zone A to an additional distance equal to one-third the runway length (Minnesota Rules, chapter 8800). Both federal and state regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. Private airports and personal use airports, including airstrips are not subject to FAA or MnDOT regulatory obstruction standards.

Airports in the ROI were identified based on a review of aerial photographs and data from the FAA. The ROI for this analysis of impacts to airports and airstrips includes FAA-registered airports within 20,000 feet of the proposed Project because, as noted above, FAA requires notification of construction or alterations that would exceed a defined slope that, depending on runway length, extends up to 20,000 feet from the nearest runway.

Airports and Airstrips in the ROI

There are several municipal airports and private airstrips located in the West, Central, and East sections. Table 5-8 lists the public and private airports (but not private airstrips) in the ROI along with the length of the longest runway at each airport. In addition to the airports listed in Table 5-8, there is one airstrip located within one mile of the Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area in the West Section, just east of the Roseau River and southeast of Roseau, MN (Map 5-4). The Proposed Orange Route in Pine Island Variation Area, C2 Segment Option Variation in the C2 Segment Option Variation Area, and the Proposed Orange Route in the J2 Segment Option Variation Area in the Central Section each have an airstrip within one mile of the anticipated alignment (Map 5-11). There are no airstrips located within one mile of the proposed routes or variations in the East Section (Map 5-18).

General Impacts

Of the FAA-airports in the ROI, all are located more than one mile from the proposed routes and variations, meaning they are not within MnDOT

Table 5-8 Federal Aviation Administration Airports in the ROI

Section	City	Airport Name	Public or Private Airport	Length of Longest Runway (feet)
West Section	Pinecreek	Piney Pinecreek Border Airport	Public	3,297
	Roseau	Roseau Municipal Airport	Public	4,401
	Warroad	Warroad International Memorial Airport	Public	5,400
	Roosevelt	Erickson Airport	Private	2,300
Central Section	Kelliher	Helblad Airport	Private	2,500
	Waskish	Waskish Municipal Airport	Public	3,700
	Bigfalls	Big Falls Municipal Airport	Public	2,850
	International Falls	Falls International Airport	Public	7,400
	Littlefork	Littlefork Municipal-Hanover Airport	Public	3,000
	Northome	Northome Municipal Airport	Public	3,199
	Bigfork	Bigform Municipal Airport	Public	3,998
East Section	Bigfork	Bigfork Municipal Airport	Public	3,998
	Bigfork	Bolduc Seaplane Base	Private	5,900
	Grand Rapids	Grand Rapids - Itasca County Airport	Public	5,747

Source(s): FAA 2015, reference (39)

Note(s): ROI for Airports includes 20,000 feet on either side of the proposed Project.

Safety Zone A. Given that the exact transmission structure locations are not currently known, and those locations are what would determine the impact on FAA-airports, a final determination on the impact of the proposed Project route on FAA-airports would be determined once a route is selected. Further, as specified in Section 2.13, the Applicant would work with the FAA and MnDOT to ensure that the proposed Project is compatible with all FAA and MnDOT requirements and the Applicant would notify the FAA as required and work with the FAA to meet applicable setback and height requirements. These Applicant proposed measures are potential MN PUC Route Permit conditions. No impacts to FAA-regulated airports are anticipated as a result of construction or operation of the proposed Project, regardless of the route or variation considered; therefore, airports and airstrips are not discussed further in Chapter 6 of this EIS.

Construction Impacts

During construction the Applicant could utilize cranes and helicopters to install proposed Project infrastructure which if close to airports could create additional hazards for aircraft utilizing the airport. There are several FAA-airports within the ROI and the Applicant would need to notify the FAA of any proposed structures that would exceed the FAA's defined slope and site structures so that construction of the proposed Project would not be expected to result in significant impacts to airports and air safety. The final structure height and location will be necessary to confirm that no adverse impacts to FAA-airports will occur as a result of the proposed Project.

Operation, Maintenance, and Emergency Repair

The Applicant would abide by FAA guidelines for public airports; therefore, no impacts on airports due to operation, maintenance, and emergency repair of the proposed Project are expected. Existing FAA airports are located within the ROI of the proposed Project and the Applicant would notify the FAA and MnDOT as required and work with the FAA to meet applicable setback and height requirements.

As discussed in Section 5.3.1.2, the presence of transmission structures could impact the ability of private aircraft employed by farmers to aerially apply pesticides to crops. **There are two airstrips** located within one mile of the Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area in the West Section; one **airstrip is within 1,500 feet of the anticipated alignment** (Map 5-4) and three airstrips are located within one mile of the Proposed Orange Route in Pine Island Variation Area, C2 Segment Option Variation in the C2 Segment Option Variation Area, and the Proposed Orange Route in the J2 Segment Option Variation Area in the Central Section (Map 5-11). As described above, some impacts on private airstrips could occur; however, mitigation could include working with owners of airstrips to site transmission structures and using shorter transmission structures near

airstrips to allow for safe takeoff and landing of aircraft. Alignment modifications have already been developed to address landowner concerns with private airstrips as reflected by the Airstrip Alignment Modification in the C2 Segment Option Variation Area.

Public Utilities

This section describes the existing public utilities, including electric, natural gas, and water services in the vicinity of the proposed Project.

Public utilities have been identified based on data from the MN PUC and municipal websites. The ROI for this analysis of impacts to public utilities includes all utilities identified in each geographic section. The proposed Project is not expected to have the potential to impact utilities outside these geographic sections.

Public Utilities in the ROI

A number of electric providers including private companies, cooperatives, and municipal utilities are identified as operating in the ROI, including:

- Roseau Electric Cooperative, Inc.—a cooperative electric utility providing service in much of Roseau County.
- Minnesota Power—providing service in southern and eastern Koochiching County and Itasca County.
- Northstar Electric Cooperative—providing service in eastern Roseau County, and northern Lake of the Woods and Koochiching counties.
- Lake Country Power—providing service in eastern Koochiching County and northern Itasca County.
- North Itasca Electric Cooperative—providing service in southern Koochiching County and northern Itasca County.
- Grand Rapids Public Utilities Commission—providing electric service within Grand Rapids and surrounding towns.

Minnesota Energy Resources provides natural gas to the cities of Roseau, Warroad, and International Falls. Propane delivery is used in many rural areas and is provided by a number of companies including Ferrellgas and Lakes Gas. Municipal public water systems are located in the following communities:

- Badger, Roseau and Warroad in Roseau County
- Williams in Lake of the Woods County
- Kelliher in Beltrami County
- Bigfalls, International Falls, Littlefork, and Northome in Koochiching County
- Bovey, Calumet, Cohasset, Coleraine, Grand Rapids, Marble, Nashwauk, and Taconite in Itasca County

The only location within the ROI where the proposed Project would cross a public water system is in the city of Taconite, which is served by the city of Taconite water district.

Existing 69 kV, 115 kV, 230 kV, and 500 kV distribution and transmission lines in the ROI are shown on Map 5-4, Map 5-11, and Map 5-18.

General Impacts

Public utilities could be impacted by the proposed Project if a gas or water pipeline or electrical lines were physically damaged during construction or if the proposed Project resulted in the disruption of existing services. Mitigation would include working with landowners and utility providers to avoid direct or indirect impacts to public utilities, and if necessary, relocating public utility facilities where appropriate and feasible. Since potential impacts to public utilities as a result of construction or operation of the proposed Project would only be short-term and localized and impacts to public utilities from the proposed Project are not anticipated and impacts to public utilities would be similar regardless of the proposed route or variation considered, potential impacts to this resource are discussed below but not carried through to Chapter 6 of this EIS.

Construction Impacts

Construction of the proposed Project is not expected to result in any long-term impacts to natural gas and water utilities. If a pipeline or other utility is encountered during excavation, an accident could occur and the public and/or workers could be put at risk. However, it is the Applicant's obligation to minimize this risk and they would be required, under state law (Minnesota Statues 2014, Chapter 216D), to call Gopher-State-One-Call 48 hours prior to starting construction to identify the location of buried public utilities and avoid those potential impacts.

The proposed Project could result in disruptions to service where it crosses over existing transmission lines, follows existing transmission line corridors, or crosses small power distribution lines; however, disruptions during construction would be

temporary, likely lasting only a few hours, and service would be restored as soon as possible.

Operation, Maintenance, and Emergency Repair Impacts

The proposed Project could result in disruptions to electricity service where it crosses over existing transmission lines, follows existing transmission line corridors, or crosses small power distribution lines should the proposed Project experience equipment failures. The Applicant would mitigate this potential impact by implementing the design measures and separation distances specified in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Emergency Services

This section describes the existing law enforcement, fire, and medical services in the vicinity of the proposed Project.

The ROI for this analysis of impacts to emergency services includes emergency services in each geographic section as emergency services across the region would likely be utilized should an emergency occur at or within the vicinity the proposed Project and construction of the proposed Project may disrupt the ability of emergency services to reach the general public.

Emergency Services in the ROI

Law enforcement in the ROI is provided by the Roseau County Sheriff's Department, Lake of the Woods County Sheriff's Department, Beltrami County Sheriff's Department, Koochiching County Sheriff's Office, Itasca County Sheriff's Office municipal police departments in nearby cites, and the Minnesota State Patrol. In addition, the Red Lake Police Department provides law enforcement on the Red Lake Reservation. Fire services are provided by municipal and volunteer fire departments. The Minnesota Department of Natural Resources (MnDNR) Division of Forestry provides additional fire prevention and protection in state forests (MnDNR n.d., reference (40)).

Emergency medical response services are provided by various ambulance districts in the ROI. Hospitals and medical services are generally concentrated in the incorporated cities in the ROI and include:

- LifeCare Medical Center in Roseau, Altru-Clinic in Warroad
- Littlefork Medical Center in Littlefork, Rainy Lake Medical Center in International Falls
- Grand Itasca Clinic and Hospital in Grand Rapids
- Fairview Mesaba Clinic in Nashwauk, Bigfork Valley Clinic in Bigfork
- Scenic River Health Services in Northome and Big Falls

Heliports are located at the LifeCare Medical Center, Rainy Lake Medical Center, Bigfork Valley Clinic, and Grand Itasca Clinic and Hospital. These heliports serve as landing locations for medical helicopters. In addition to those heliports, the Balsam Volunteer Fire Department noted during the scoping process that medical helicopters have also used their parking lot and recreation field for training exercises as well as emergency trauma patient loading. The Balsam Fire Department is located approximately 1,650 feet west of the Proposed Orange Route and 1,050 feet south of the Balsam Variation in the Balsam Variation Area. At this distance, impacts from the proposed Project to medical helicopter landing areas would not be anticipated.

General Impacts

The proposed Project is not expected to impact emergency services in the ROI due to the ability of existing services to handle the small number of construction workers that would be located in a given area. This does not vary by proposed route or variation considered due to the sharing of emergency resources in the counties and region, emergency services are not discussed further in Chapter 6 of this EIS.

Construction Impacts

Construction of the proposed Project may require temporary closure of roadways; however closures would be coordinated with local jurisdictions to provide for safe access of emergency vehicles. Fires could occur during construction or operations. During construction, fire hazards could result from workers welding, operating motorized construction equipment, smoking, refueling, and operating or parking vehicles in areas with dry vegetation. For incidents involving hazardous material spills, emergency medical issues, or fires that require assistance not provided on site, the local first responder would be the local fire department or district. Local emergency services would respond to any injuries or fires that might occur during construction and operation of the proposed Project. The proposed project would be expected to require an average of 120 construction workers that would be dispersed over a large geographic area. The existing emergency services would have sufficient

capacity to respond to any emergencies that could occur during construction of the proposed Project since there would not be a large concentration of workers in a single location in the proposed Project area that would impose a high demand for available emergency services. Implementation of safety procedures and speed limits near work sites would minimize the need for emergency services.

Operation, Maintenance, and Emergency Repair Impacts

Emergency services could be required during operation, maintenance, and emergency repair of the proposed Project as a result of fires, accidents, or injuries that could occur. Impacts would be similar to those described for construction.

5.2.1.7 Environmental Justice

This section describes the minority and low-income populations within the West, Central, and East sections and the potential for disproportionately high and adverse impacts to those populations from the proposed Project.

Executive Order 12898 and Associated Guidance

Environmental justice refers to a federal policy established by Executive Order 12898 (59 Federal Register 7629) under which federal agencies must identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations. The CEQ's "Environmental Justice: Guidance Under the National Environmental Policy Act" (1997), followed by the EPA's "Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses" (1998, reference (41)) were developed to provide EPA and other federal agencies, including DOE, a process for identifying environmental justice communities and addressing potential impacts to them. According to these guidance documents, the basic components of an environmental justice assessment should include:

- A demographic assessment of the affected community to identify minority and low-income populations that may be present.
- An integrated assessment to determine whether any adverse impacts would disproportionately affect minority and low-income populations.

U.S. Census data was used to identify low-income and minority populations. Low-income and minority populations are determined to be present in an area when the minority group or low-income percentage in an affected area exceeds 50 percent or is "meaningfully greater" than in the general population of the larger surrounding area. In this analysis, a difference of 10 percentage points or more was established as the threshold that distinguished whether a minority or low-income group percentage in an ROI census tract was "meaningfully greater" than that group's percentage in the ROI. The following groups are considered to be minorities: Black, not of Hispanic origin; American Indian or Alaskan Native; Asian or Pacific Islander; or Hispanic.

The ROI for this analysis of environmental justice includes the census tracts intersected by the ROWs of the proposed routes and variations (Map 5-3). Census tracts are relatively permanent statistical subdivisions of a county, created for the purpose of collecting statistical data and confirmed or updated every ten years. Populations in census tracts vary from 1,200 to 8,000 people, with an optimum size of 4,000 people, and the geographic size of each census tract can vary widely depending on its population density (U.S. Census Bureau 2012, reference (42)). The census tracts intersected by the ROWs of the proposed routes and variations are the best approximation of the geographic area within which potential disproportionate adverse impacts from the proposed Project could occur. The five counties that contain the census tracts in the ROI are considered representative of the general population in the area surrounding the proposed Project, against which census tract demographic and poverty data can be compared. In this analysis, this five-county region is referred to as the region of comparison (ROC), meaning the general population against which census tract data were compared. Map 5-3 depicts the location of the census tracts in the ROI, as well as the five counties that comprise the ROC, or general population, around the proposed Project.

Environmental Justice for the ROI

This section provides demographic information about the five-county ROC and census tracts in the ROI in the West, Central, and East sections. The demographic information is focused on minority and low-income populations, which have the potential to be environmental justice communities.

Table 5-9 Minority Population Composition of Five-County Region of Comparison (ROC) and State of Minnesota

Jurisdiction	Total Population (number of persons)	White %	Racial Minority Populations (%)						Ethnic Minority[2] (%)
			Black or African American	American Indian & Alaskan Native	Asian	Native Hawaiian & Other Pacific Islander	Some Other Race	Total Racial Minority	Hispanic or Latino Ethnicity
State of Minnesota	5,379,139	87.8	6.4	1.9	4.7	0.1	1.6	14.7	4.9
ROC[1]	122,701	89.4	1.0	10.6	1.1	0.2	0.3	13.2	1.1
Roseau County	15,665	95.9	0.5	1.9	2.8	0.0	0.4	5.6	0.8
Lake of the Woods County	4,039	97.0	1.5	1.6	1.4	0.0	0.0	4.5	0.0
Beltrami County	44,652	78.3	1.7	22.1	1.1	0.4	0.3	25.6	1.6
Koochiching Count	13,293	95.8	0.5	4.1	0.4	0.0	0.6	5.6	1.1
Itasca County	45,052	95.6	0.7	4.9	0.6	0.1	0.4	6.7	1.0

Source(s): U.S. Census Bureau 2012, reference (44)

Note(s): Persons may opt to identify with more than one racial minority, therefore, the sum of all racial categories in the table may equal more than 100%.

(1) Region of Comparison (ROC) for the environmental justice analysis includes the five counties traversed by the proposed routes and variations. ROC values are not a simple average of the five ROC counties. The ROC is calculated by dividing the total population for a minority in the five ROC counties by the total population of the ROC counties.

(2) The Hispanic or Latino ethnicity is not included in the total racial minority population percentage as it can be claimed by a person of any race. The Hispanic or Latino ethnicity is therefore included separately and reflects an ethnic minority.

Minority Populations

Table 5-9 identifies the minority population distribution for the combined population in the five-county ROC and in the individual counties that contribute to its composition. Statistics for the state of Minnesota are also included in for comparison. Data for all counties are derived from the U.S. Census five-year estimates from the 2008-2012 American Community Survey and data for the state are from the one-year estimate from the 2012 American Community Survey (U.S. Census Bureau 2012, reference (43), reference (42)).

As illustrated in Table 5-9, most minority groups in the ROC counties comprise less than three percent of the population, with the exception of the American Indian and Alaskan Native group percentage which range from 1.6 to 22.1 percent. Minnesota is home to several American Indian tribes and reservation lands, with some located in Beltrami, Koochiching, and Itasca counties. In the ROC, the American Indian and Alaskan Native population makes up 10.6 percent of the population, compared with 1.9 percent in Minnesota. It should be noted that the proposed routes and variations, including the Applicant's proposed routes, were designed to avoid directly impacting tribal reservation or trust lands. When all racial minority groups are combined, the five-county ROC racial minority population is slightly less than for Minnesota. The Hispanic or Latino ethnicity is not included in the total racial minority population percentage because it can be claimed by a person of any race. The Hispanic or Latino ethnicity is therefore included separately and reflects an ethnic minority. The Hispanic or Latino ethnic minority group in the five-county ROC consists of 1.1 percent of the population.

As stated, the ROI for this analysis of environmental justice includes the census tracts intersected by the ROWs of the proposed routes and variations. The ROI includes 13 census tracts in the five counties (Map 5-3). The minority percentages of the census tracts in the ROI were compared with the five-county ROC to determine if any census tract had meaningfully greater (i.e. ten percentage points or more) minority populations than in the general population. Table 5-10 lists the racial and ethnic demographic statistics of the census tracts, the five-county ROC, and Minnesota.

None of the minority populations for the ROI census tracts listed in Table 5-10 exceed the ROC minority percentage by 10 percentage points or more, which is the defined threshold of significance for potential

Table 5-10 Minority Population Composition in Census Tracts Traversed by the Proposed Project Routes and Variations, Region of Comparison (ROC), and State

Area	Census Tract	Total Population (number of persons)	White %	Racial Minority Populations (%)						Ethnic Minority[3] (%)
				Black or African American	American Indian & Alaskan Native	Asian	Native Hawaiian & Other Pacific Islander	Some Other Race	Total Racial Minority[1]	Hispanic or Latino Ethnicity
State of Minnesota	NA	5,379,139	87.8	6.4	1.9	4.7	0.1	1.6	14.7	4.9
ROC[2]	NA	122,647	89.4	1.0	10.6	1.1	0.2	0.3	13.2	1.1
Roseau County	9701	4,249	88.6	0.2	4.5	8.2	0.0	0.0	13.0	0.0
	9702	2,153	99.8	0.7	1.3	0.3	0.0	0.0	2.3	0.7
	9703	3,869	96.6	1.2	1.2	1.4	0.0	1.4	5.2	1.2
	9704	3,596	99.4	0.4	0.8	0.4	0.0	0.1	1.7	0.9
Lake of the Woods County	4603	1,628	95.3	1.8	3.3	1.7	0.0	0.0	6.9	0.0
	4604	2,411	98.2	1.3	0.4	1.2	0.0	0.0	2.9	0.0
Beltrami County	4505	1,714	98.8	0.1	1.2	0.0	0.0	0.4	1.6	0.0
Koochiching County	7903	3,070	96.9	0.3	2.9	0.6	0.0	0.0	3.8	0.0
	7905	2,356	95.9	0.3	4.6	0.0	0.0	0.3	5.2	0.8
Itasca County	4801	2,541	97.2	0.3	2.3	0.8	0.0	0.2	3.7	1.3
	4804	3,564	97.2	0.3	2.0	0.6	0.0	0.9	3.8	1.3
	4806	2,569	99.4	0.4	1.2	0.2	0.0	0.0	1.8	0.0
	4810	5,861	97.0	0.3	5.0	1.6	0.1	0.5	7.6	2.2

Source(s): U.S. Census Bureau 2012, reference (44); U.S. Census Bureau 2012, reference (42)

Note(s): Persons may opt to identify with more than one racial minority, therefore, the sum of all racial categories in the table may equal more than 100%.

(1) Due to rounding, % Total Racial Minority may not total the individual race percentages.

(2) ROC values are not a simple average of the five ROC counties. The ROC is calculated by dividing the total population for a minority in the five ROC counties by the total population of the ROC counties.

(3) The Hispanic or Latino ethnicity is not included in the total racial minority population percentage as it can be claimed by a person of any race. The Hispanic or Latino ethnicity is therefore included separately and reflects an ethnic minority.

environmental justice impacts from the proposed Project. The largest minority population in a single census tract is an Asian population that comprises 8.2 percent of Census Tract 9701 (Roseau County), compared with 1.1 percent in the ROC (Table 5-10). In all other instances in which a racial minority percentage in an ROI census tract exceeds the percentage in the ROC, the census tract percentage generally does not exceed the ROC by more than one percentage point. In addition to Census Tract 9701 in Roseau County which has the largest racial minority population, Roseau County Census Tract 9703, Lake of the Woods County Census Tracts 4603 and 4604, and Itasca County Census Tract 4810, have higher Asian percentages than the ROC, though the difference never exceeds more than 0.6 percentage points. In Lake of the Woods (Census Tracts 4603 and 4604) and Roseau (Census Tract 9703) counties, three census tracts have higher black or African American minority percentages than the ROC, although the difference is less than one percentage point. Four census tracts in Roseau (Census Tract 9703), Beltrami (Census Tract 4505), and Itasca (Census Tracts 4804 and 4810) counties have "some other race" percentages that exceed the ROC percentage by no more than 1.1 percentage points. None of the census tracts have a total racial minority population percentage that is larger than the total racial minority percentage in the ROC (Table 5-10). In addition, the percentage of American Indians in each of the census tracts that comprise the ROI is less than in the ROC.

In addition to certain racial groups, ethnic Hispanics or Latinos are considered minority groups for the purpose of environmental justice. Hispanics and Latinos can identify as any race and do not count toward the total racial minority percentage provided

Table 5-11 2008-2012 Poverty and Income Characteristics of Five-County Region of Comparison (ROC) and State of Minnesota

Jurisdiction	Total Population (number of persons)	Below Poverty Threshold (%)	Median Household Income (2102 dollars)
State of Minnesota	5,379,139	11.2	$59,126
ROC(1)	122,701	15.3	$45,178
Roseau County	15,665	10.4	$50,620
Lake of the Woods County	4,039	17.7	$41,979
Beltrami County	44,652	20.7	$44,038
Koochiching County	13,293	12.0	$40,167
Itasca County	45,052	12.5	$46,180

Source: U.S. Census Bureau 2012, reference (43)

(1) Region of Comparison (ROC) for the environmental justice analysis includes the five counties traversed by the proposed routes and variations. The ROC estimates are weighted averages calculated from the five counties.

in Table 5-10. The percentage of Hispanics or Latinos in the ROC is 1.1 percent, and none of the ROI census tracts have Hispanic or Latino percentages that are significant compared with the ROC. One census tract in Roseau County and three census tracts in Itasca County exceed the ROC Hispanic or Latino percentage composition by 1.1 percentage points or less, which is not enough difference to be considered significant (Table 5-10). Overall, the other racial and ethnic minority statistics did not reveal significant differences between the minority populations in the individual ROI census tracts and the ROC.

Low-Income Populations

Table 5-11 lists the percentage of individuals living below the poverty level and the household median income in the five-county ROC and the contributing five counties. Following federal guidance documents, the percentage of low-income residents in a community can be estimated from the percentage of individuals living below the poverty level, reported by the U.S. Census Bureau (CEQ 1997, reference (45), EPA 1998, reference (41)). Statistics for the state of Minnesota are also included in for comparison.

According to the data in Table 5-11, the percentage of individuals living in poverty ranges from 10.4 to 20.7 percent in the five counties, and all but Roseau County have higher poverty percentages than the state average. The estimated poverty percentage in the five-county ROC is 15.3 percent. The median household incomes of the ROC and the constituent five counties are lower than in Minnesota.[71] The median household income in the ROC is approximately $45,178.

71 A county with a higher median income than another county may also have a higher poverty percentage; the two statistics measure slightly different economic conditions.

The low-income populations in the ROI census tracts, represented by the percentage living in poverty, were compared with the ROC to determine if any were greater (i.e., 10 percentage points or more) than low-income population percentages in the ROC. Table 5-12 lists the percentage of individuals living below the poverty line and the median household income in the census tracts, ROC, and Minnesota.

None of the poverty percentages for the ROI census tracts listed in Table 5-12 exceed the ROC poverty percentage by 10 percentage points or more, which is the defined threshold of significance for potential environmental justice impacts from the proposed Project.

The largest low-income population in a single census tract is 22.8 percent in Census Tract 4604 (Lake of the Woods County), compared with a 15.3 percent low-income population in the ROC (Table 5-12). The only other census tract with a low-income population percentage that exceeds the ROC percentage is Census Tract 4505 (Beltrami County), with 18.2 percent of individuals living below the poverty line. The low-income percentages in the remainder of the ROI census tracts range from 7.1 to 15.2 percent.

Median household income is provided in Table 5-12 with additional detail about the economic conditions in the ROI census tracts and the ROC. The two census tracts (4604 and 4505) already noted for having larger low-income population percentages than the ROC also have lower median household incomes than the ROC. Three other census tracts in Koochiching and Itasca counties have lower median household incomes than the ROC, though these same census tracts have smaller low-income population percentages. The lowest median household income among the ROI census tracts is Census Tract 7905 (Koochiching County),

Table 5-12 Percentage of Individuals Below the Poverty Line and Median Household Income in Census Tracts Traversed by the Proposed Project Routes and Variations, Region of Comparison (ROC), and State

Area	Census Tract	Below Poverty (%)	Median Household Income[2]
State of Minnesota	NA	11.2	$59,126
ROC[1]	NA	15.3	$45,178
Roseau County	9701	9.9	$50,444
	9702	7.1	$54,113
	9703	14.3	$47,585
	9704	10.5	$50,948
Lake of the Woods County	4603	10	$45,326
	4604	22.8	$41,387
Beltrami County	4505	18.2	$39,628
Koochiching County	7903	4.6	$61,512
	7905	13.9	$39,417
Itasca County	4801	15.2	$40,114
	4804	8.9	$52,052
	4806	8.5	$46,172
	4810	11.7	$42,422

Source(s): U.S. Census Bureau 2012, reference (43)

(1) ROC values are not a simple average of the five ROC counties. The ROC is calculated by dividing the total population for a minority in the five ROC counties by the total population of the ROC counties.

(2) Based on 2012 dollars

approximately 13 percent less than the ROC median household income. The largest median household income among the census tracts is also in Koochiching County; Census Tract 7903 has a median household income approximately 36 percent greater than the ROC median income.

Subsistence Activities

The proposed Project routes and variations do not directly traverse Red Lake Indian Reservation or any other reservation lands held by the Minnesota Chippewa Tribe (comprised by White Earth, Bois Forte, Leech Lake, Mille Lacs, Grand Portage, and Fond du Lac Bands of Chippewa) and located in the area of proposed Project. However, the proposed routes and variations do cross lands that may be utilized by Red Lake Nation or Minnesota Chippewa Tribe members for subsistence activities. These lands include ceded lands with treaty rights for tribal members and other off-reservation lands (see Section 5.3.1.3 for more information about ceded lands with treaty rights). Members of Red Lake Nation Band of Chippewa Indians and Minnesota Chippewa Tribe engage in subsistence activities on ceded lands with treaty rights in addition to regular commercial activities to provide their basic needs. Examples of subsistence activities include hunting and trapping, fishing, and gathering of nuts, berries, and vegetation. Subsistence activities not only have practical application but are also culturally and historically significant. Harvested natural resources are used primarily for food and raw materials, but also for medicinal or ceremonial purposes. They may also be used for trading or personal sale. Subsistence activities and the natural resources that support them help ensure that Red Lake Nation and Minnesota Chippewa Tribe members are able to sustain themselves and their families.

For example, within the Red Lake Nation reservation, approximately 30.6 percent of the civilian labor force was unemployed as of 2013, and 45.1 percent of individuals were living below the poverty threshold and the median household income was $31,422 (US Census Bureau 2013, reference (46)). In 2013, the population of the Bois Forte Reservation had an 11.8 percent unemployment rate, a 20.4 percent poverty rate, and a median household income of $36,786. The population of the Fond du Lac Reservation and Off-Reservation Trust Land had an 8.3 percent unemployment rate, a 26.4 percent poverty rate, and a median household income of $45,161. The population of the Grand Portage Reservation and Off-Reservation Trust Land and had an 8.3 percent unemployment rate, a 20.2 percent poverty rate, and a median household income of $40,938. The population of the Leech Lake Reservation and Off-Reservation Trust Land had a 5.4 percent unemployment rate, a 25.7 percent poverty rate, and a median household income of $38,739. The population of the Mille Lacs Reservation and Off-Reservation Trust Land had an 8.2 percent unemployment rate, a 25.4 percent poverty rate, and a median household income of $34,865. The population of the White Earth Reservation and Off-Reservation Trust Land had a 6.4 percent unemployment rate, a 25.8 percent poverty rate, and a median household income of $37,043 (U.S. Census Bureau 2013, reference (46)). As such, natural resource procurement is vital to the Red Lake Nation and Minnesota Chippewa Indian populations.

Some of the primary subsistence activities conducted by members of Red Lake Nation or the Minnesota Chippewa Indians are described below.

Hunting and Trapping

Red Lake Nation and Minnesota Chippewa Tribe members may engage in hunting and trapping throughout the ROI. The proposed Project

area comprises a variety of MnDNR state lands with varying degrees of hunting and trapping permissions, including WMAs, game refuges, forests, and state parks and recreation areas open to public hunting (MnDNR 2014, reference (47)). Federal lands where some hunting and trapping may be permitted include National WPAs, national forest land, and to a much lesser extent, National Wildlife Refuges. MnDNR publishes hunting and trapping regulations that govern hunting and trapping permissions by all persons, including the Red Lake Nation and Minnesota Chippewa Tribe members, except on the reservation lands and on ceded lands with treaties specific to the Red Lake Band of Chippewa and the Minnesota Chippewa Indians.

A variety of wildlife species are present throughout the project area and could be harvested through hunting and trapping activities including waterfowl (e.g. ducks and geese), non-migratory birds, small game species (e.g. cottontail rabbits, gray squirrels, etc.), Big game species are also hunted in the area but to a lesser extent and include white-tailed deer, moose, and bear. Trapping activities target fur-bearing animals like fox, badger, mink, and several others.

Fishing

The Red Lake Indian Reservation encompasses a portion of Upper Red Lake and all of Lower Red Lake, the largest lake fully within Minnesota borders. These lakes help sustain the Red Lake Nation Fishery commercial enterprise but are also used by members for subsistence fishing. The Red Lake Nation members fish in several water bodies and watercourses throughout the ROI, both onshore and in boats and may employ methods besides just rod and reel (e.g. spear fishing). A diverse number of fish are targeted in Minnesota lakes and rivers, but the walleye is the species most associated with Red Lake Nation because of its abundance in Upper and Lower Red Lakes. Other fish species commonly caught include yellow perch, trout, small and large-mouth bass, and bluegill (Red Lake DNR 2015, reference (48)).

Gathering

Gathering activities can refer to hand harvesting of plants, berries, and herbs, and to more labor-intensive activities like harvesting timber. Wild rice is one of the most recognizable wild plants harvested in the state, readily associated with rural Minnesota and local Native American tribes, including the Red Lake Band of Chippewa Indians and members of the Minnesota Chippewa Tribe (MnDNR 2015, reference (49)). Minnesota has the largest acreage of naturally occurring wild rice in the country, and it is largely present in the northern lakes of the state, including in the ROI. Wild rice beds also serve as nesting cover by birds and as staging grounds for hunters targeting waterfowl. Members of the Minnesota Chippewa Tribe are able to harvest wild rice on certain specified lakes with their tribal identification card, and not the state license required for all other harvesters (MnDNR 2008, reference (50)).

Wild rice grows best in water six inches to three feet deep, and production varies from year-to-year depending on local water conditions. Wild rice productivity can be threatened by changes in local hydrology, water quality, water-based recreation, and shore-based development (MnDNR 2008, reference (50)).

Members of the Red Lake Band of Chippewa Indians and the Minnesota Chippewa Tribe gather a variety of other plants and berries, potentially throughout the ROI and on lands traversed by the proposed Project routes and variations. Plants may be used for traditional and medicinal purposes, and also for building materials. Timber, tree bark, and sweet grass are all used for making traditional items like canoes and baskets. Gathered timber may also be used for home heating and for home construction.

General Impacts to Minority, Low-Income, and Subsistence Populations

None of the census tracts crossed by the proposed Project routes or variations have minority or low-income populations at levels indicating that minority or low-income populations in the designated ROI are significantly different from the general population, represented by the ROC. This indicates that minority or low-income groups would not be exposed to disproportionate impacts from construction, operation, maintenance, and emergency repair of the proposed Project. Furthermore, many of the impacts from construction, operation, and maintenance of the proposed Project on human populations would be short-term and localized.

The potential impacts resulting from the proposed Project on minority or low-income populations would not differ significantly among the proposed routes and variations considered, all of which fall within the ROI counties and the same census tracts. Therefore, environmental justice is not discussed further in Chapter 6 of this EIS.

Construction Impacts on Minority and Low-Income Populations

The majority of human health and environmental impacts from construction of the proposed Project would be localized and short-term, including the limited impacts on air quality, socioeconomics, transportation, and public service, described as part of Human Settlement in Section 5.2.1. None of the construction impacts would have disproportionately high and adverse impact minority or low-income populations in the ROI.

Operation, Maintenance, and Emergency Repair Impacts on Minority and Low-Income Populations

During operation, maintenance, and emergency repairs, human health effects would include impacts from EMFs, implantable medical devices, stray voltage, and induced voltage as described in Section 5.2.2. Minority and low-income populations would not be disproportionately affected by any of these human health or environmental impacts during construction or operation of the proposed Project because the populations living in the ROI do not have disproportionate percentages of minority or low-income residents.

The Applicant has developed avoidance and minimization measures as specified in Table 2-2 which would limit the impacts from construction and operation of the proposed Project on all populations in the general region. One of the primary mitigation measures to further environmental justice is public outreach to minority and low-income communities and tribes. The Applicant mitigation measures are potential MN PUC Route Permit conditions. The Applicant's public outreach efforts to date, while not specific to low-income or minority populations, are summarized in the Applicant's Route Permit Application and Presidential permit application (Minnesota Power 2014, reference (1).

General Impacts on Subsistence

Adverse impacts to subsistence-based economies may occur from the construction, operation, and maintenance, and emergency repair of the proposed Project in areas that traverse off-reservation or treaty lands where Red Lake Nation members engage in subsistence-based activities like hunting and trapping, fishing, and gathering. Adverse impacts may result from access to traditional hunting and gathering areas, a decrease in the acreage of areas available for subsistence activities, fragmentation of habitat, or introduction or spread of invasive species by disturbing the existing landscape and creating new corridors. Since potential impacts to subsistence activities resulting from construction, operation, maintenance, and emergency repair for any proposed route or variation considered do not vary, potential impacts to subsistence are not discussed further in Chapter 6 of the EIS.

Construction Impacts on Subsistence

During the construction period, subsistence activities may be temporarily affected in the construction areas due to access issues. The proposed Project will be able to span major watercourses for all proposed routes or variations, so construction is not expected to impact subsistence fishing or wild rice gathering except for potentially, temporarily, blocking access points for watercourses. Transmission line structures may be constructed in wetlands which could impact wild rice harvests if wild rice is present in those areas. Access for hunting, trapping, gathering, and harvesting of timber would likely be restricted for short periods of time along portions of the proposed Project while construction occurs but would then reopened for hunting and trapping and gathering activities when construction in that area is complete.

During construction, wildlife, including small and large game and waterfowl, may temporarily leave the construction area due to site disturbance activities, thereby reducing the productivity of hunting activities in these areas. Although this could potentially be offset by other wildlife species moving in to the area to take advantage of the habitat change. As discussed in more detail in Section 5.3.4.3, long-term impacts to wildlife species could occur as a result of the loss or conversion of forested or shrub habitat and the fragmentation of that habitat as it's converted to low-stature vegetation in the ROW. Wildlife species previously occupying forested communities in the ROW would be displaced in favor of species that prefer more open vegetation communities. Impacts would be expected to be wide-ranging in areas where new ROW would be created and more localized in situations where an existing ROW is expanded. The introduction and/or spreading of invasive species in locations where clearing occurs could result in long-term impacts to the vegetation composition of the ROW, and potentially influence wildlife activity in those areas affected in such a way that tribal members may be less successful in their hunting and trapping activities. The Applicant, as described in Section 2.11.1.5, will implement regular, frequent cleaning of construction mats on the ROW to avoid the introduction of and minimize the spread of invasive species.

Operation, Maintenance, and Emergency Repair on Subsistence

During operation, vegetation within the ROW would be maintained at a low stature and in some areas the vegetation in and around the ROW would return to a previous or similar state and would support many of the same species targeted by subsistence-based hunting, trapping, and gathering activities. Transmission line structures may be constructed in wetlands which could impact wild rice harvests if wild rice is present in those areas, although with a footprint of **1,936** square feet per structure, only a very small area of wild rice would potentially be displaced. In other areas, long-term adverse impacts may result from fragmentation of habitat caused by the construction, or from introduction or spread of invasive species by disturbing the existing landscape and creating new corridors. As a result, these areas may not support the same plant and animal species or the same abundance that was present prior to construction of the proposed Project and a long-term adverse impact could occur. However, there would still be a large amount of contiguous non-reservation lands and treaty lands would continue to be managed at the state and federal level to support hunting, fishing, and gathering activities, including subsistence activities by Native Americans like the Red Lake Band of Chippewa Indians and the Minnesota Chippewa Tribe so the changes from the proposed Project are expected to have a minimal impact on subsistence activities.

5.2.1.8 Socioeconomics

This section describes the socioeconomic resources within the West, Central, and East sections and the potential impacts from the proposed Project.

Socioeconomics is concerned with the relationship between economic attributes and the social characteristics of society. In this section, socioeconomic indicators are assessed and analyzed based on the potential construction and operation of the proposed Project. The major determinants of socioeconomic impacts for the proposed Project are the number and duration of workers in the region and the capital expenditures and ongoing revenues generated from the proposed Project.

The ROI for this analysis of socioeconomic impacts includes the counties intersected by the proposed routes and variations. From north to south, the ROI includes the counties of Roseau, Lake of the Woods, Beltrami, Koochiching, and Itasca as the majority of potential socioeconomic effects from the proposed Project would occur in these counties. The ROI counties would experience some economic benefit (for example, in the form of tax revenue), as well as increases in job opportunities from construction of the proposed Project. As a result, competition for construction labor and demand for temporary housing may also increase in these counties. Based on the existing labor force in the region, many workers required during construction of the proposed Project could be hired from ROI counties or other Minnesota jurisdictions nearby. An average of 120 construction workers would be employed annually during the estimated five years of construction. The remaining workers would be hired from other areas in or out of the state of Minnesota and would likely move temporarily near the proposed Project.

Potential impacts on population, employment, taxes and revenues, and housing are analyzed in the remainder of this section. All data are presented at the county and the state levels for comparison. Because the proposed Project is not expected to cause large population changes, further investigation of potential impacts on schools and public services (e.g., police and fire) was not conducted. Investigation of potential impacts on schools was not conducted because impacts on schools is largely determined by population changes (see "Population" heading in this section for more detail). The proposed Project's impacts on emergency services are discussed separately in Section 5.2.1.6.

Socioeconomics in the ROI

This section provides information on population and employment in the West, Central, and East sections.

Population

Table 5-13 provides a population summary for the individual counties in the ROI, the total ROI, and Minnesota. The 2012 population statistic reflects the current population, while the 2010 population and 2020 and 2030 projections illustrate the projected growth trends for the locations. The 2010, 2020, and 2030 populations are spaced in 10-year increments so that the predicted population percent change can be compared from one 10-year increment to the next. Population projections indicate how populations are expected to change in the vicinity of the proposed Project during the proposed Project's lifetime.

The counties in the ROI are largely rural with low overall population densities ranging from 3.1 to 17.8 persons per square mile (U.S. Census Bureau

Table 5-13 Population Trends in the ROI

Location	Population Trends					
	Number of Persons				Predicted Percent Change	
	2010	2012 Estimate	2020 Projection	2030 Projection	2010 to 2020	2020 to 2030
State of Minnesota	5,303,925	5,379,139	5,677,582	5,982,601	7.0%	5.4%
Roseau County	15,629	15,665	16,703	17,771	6.9%	6.4%
Lake of the Woods County	4,045	4,039	4,195	4,146	3.7%	-1.2%
Beltrami County	44,442	44,652	47,863	50,757	7.7%	6.0%
Koochiching County	13,311	13,293	13,738	13,758	3.2%	0.1%
Itasca County	45,058	45,052	48,339	48,865	7.3%	1.1%
Total ROI	122,485	122,701	130,838	135,297	6.8%	3.4%

Source(s): U.S. Census Bureau 2010, reference (54), U.S. Census Bureau 2012, reference (43), Minnesota State Demographic Center 2014, reference (55)

2010, reference (51), 2012, reference (43)).[72] By comparison, the state of Minnesota has a population density of 67.6 persons per square mile (U.S. Census Bureau 2010, reference (51), 2012, reference (43)). Roseau County, at the northwest end of the proposed Project, is the third most populated county in the proposed Project area with 15,665 residents (2012 estimate). Lake of the Woods is the least populated of the ROI counties, with a population of 4,039. Koochiching County is similarly rural and lightly populated, especially considering its geographic size is almost twice as large as Roseau County; its population is 13,293 (2012 estimate). Beltrami and Itasca have larger populations and encompass more cities and towns than the other counties. Beltrami County has a population of 44,652 and includes Bemidji, a city of approximately 13,485 people. Itasca County has a population of 45,052 and is home to Grand Rapids, a city of approximately 10,865 (U.S. Census Bureau 2012, reference (53)).

Compared with Minnesota's population projections, Roseau and Beltrami are the only two counties projected to maintain a consistent growth rate from 2010 through 2030 (Table 5-13). Growth rates in all of the ROI counties and the state are projected to slow between 2020 and 2030, compared with the growth rates from 2010 to 2020. Only Lake of the Woods County is projected to have a negative growth rate at any point, although the growth rate for Koochiching County is predicted to slow to almost zero between 2020 and 2030. Compared with Minnesota, the ROI's projected growth rate is similar in the first 10-year period (2010 to 2020) but comparatively low in the second 10-year period (2020 to 2030).

General Impacts on Population

No long-term population impacts are expected as a result of construction, operation, maintenance, or emergency repair of the proposed Project for any proposed route or variation considered. Therefore, population is not discussed further in Chapter 6 of this EIS.

Construction Impacts

The Applicant contracted with the Bureau of Business and Economic Research at the University of Minnesota–Duluth's Labovitz School of Business and Economics to study the potential economic impacts of the proposed Project, including indirect and induced job creation (University of Minnesota-Duluth 2013, reference (36)). During construction of the proposed Project, an average of 120 construction workers would be employed annually during construction from **2017** through 2020 (University of Minnesota-Duluth 2013, reference (36)). These workers would likely move from geographic section to section along the proposed Project route and would be divided into different crews performing different tasks along the corridor. In this scenario, smaller groups of workers would begin to spread out along the ROW, such that in any one year, the average workforce would not all be located in one county. Some workers would likely relocate temporarily to the ROI, but it is assumed that many could be hired locally given the large percentage of construction workers in the area and the number of unemployed (see "Employment" in this section). Because the final route for the proposed Project has not yet been determined by the MN PUC, the estimated percentage of workers

72 Population densities were calculated by dividing the 2012 estimated population of each jurisdiction by its land area in square miles, reported in the most recent decennial U.S. Census in 2010.

that would be hired locally for the construction effort has not been calculated.

In some localized areas of the counties where populations are small, short-term increases in population caused by workers moving temporarily to the region would be noticeable in terms of temporary housing occupancy rates and local spending. However, it is unlikely that construction workers would permanently relocate to the area, particularly because no permanent jobs are expected to be created during operation and maintenance of the proposed Project. Therefore, population levels within ROI are not expected to change over the long-term as a result of construction of the proposed Project.

Operation, Maintenance, and Emergency Repair Impacts

No full-time or part-time workers are expected to be hired during operation of the proposed Project. Maintenance and emergency repairs would be performed by existing contractors. Therefore, population levels within ROI are not expected to change as a result of operation, maintenance, or emergency repairs of the proposed Project.

Employment

Table 5-14 provides a summary of the size and employment status for the civilian labor force in the ROI counties, the total ROI, and Minnesota. Civilian labor force is defined as employed non-military persons 16 years old and over and non-military unemployed persons 16 years old and over who were actively looking for work during the previous four weeks (U.S. Census Bureau 2012, reference (43)). The size of the civilian labor force varies with the population size in each county.

In 2014, approximately 6.1 percent of the ROI labor force was estimated to be unemployed (Table 5-14). The unemployment rate varies across the individual counties, and only Roseau County had an unemployment rate lower than Minnesota in 2014. Among the ROI counties, Koochiching County had the highest unemployment rate in 2014, while Itasca County had the highest number of unemployed persons.

Figure 5-2 shows the unemployment rate trends over the last 10 years for the ROI counties and Minnesota. This figure demonstrates how the unemployment rate trends in the ROI counties have been generally consistent with the unemployment changes in Minnesota. One recent exception is the slight rise in unemployment in Koochiching County from 2012 to 2014, during a period when unemployment rates were falling in the other counties and in the state. In the early part of the 10-year period, from 2005 to 2008, unemployment changes in Roseau County moved in directions opposite from the general trends in the remaining counties. All ROI counties and Minnesota had peak unemployment rates in 2009, and unemployment in all jurisdictions has steadily declined since that time, with the exception of Koochiching County, as noted.

Table 5-15 provides the number and percent employed in industry categories established by the U.S. Census Bureau, estimated from the 2008-2012 American Community Survey 5-Year Estimates (U.S. Census Bureau 2012, reference (43)). The leading employing industries within the five ROI counties include manufacturing; retail trade; arts, entertainment, recreation, and accommodation and food services; and educational services and health care and social assistance (Table 5-15). Minnesota shares three of the four highest employing industries in the ROI counties including

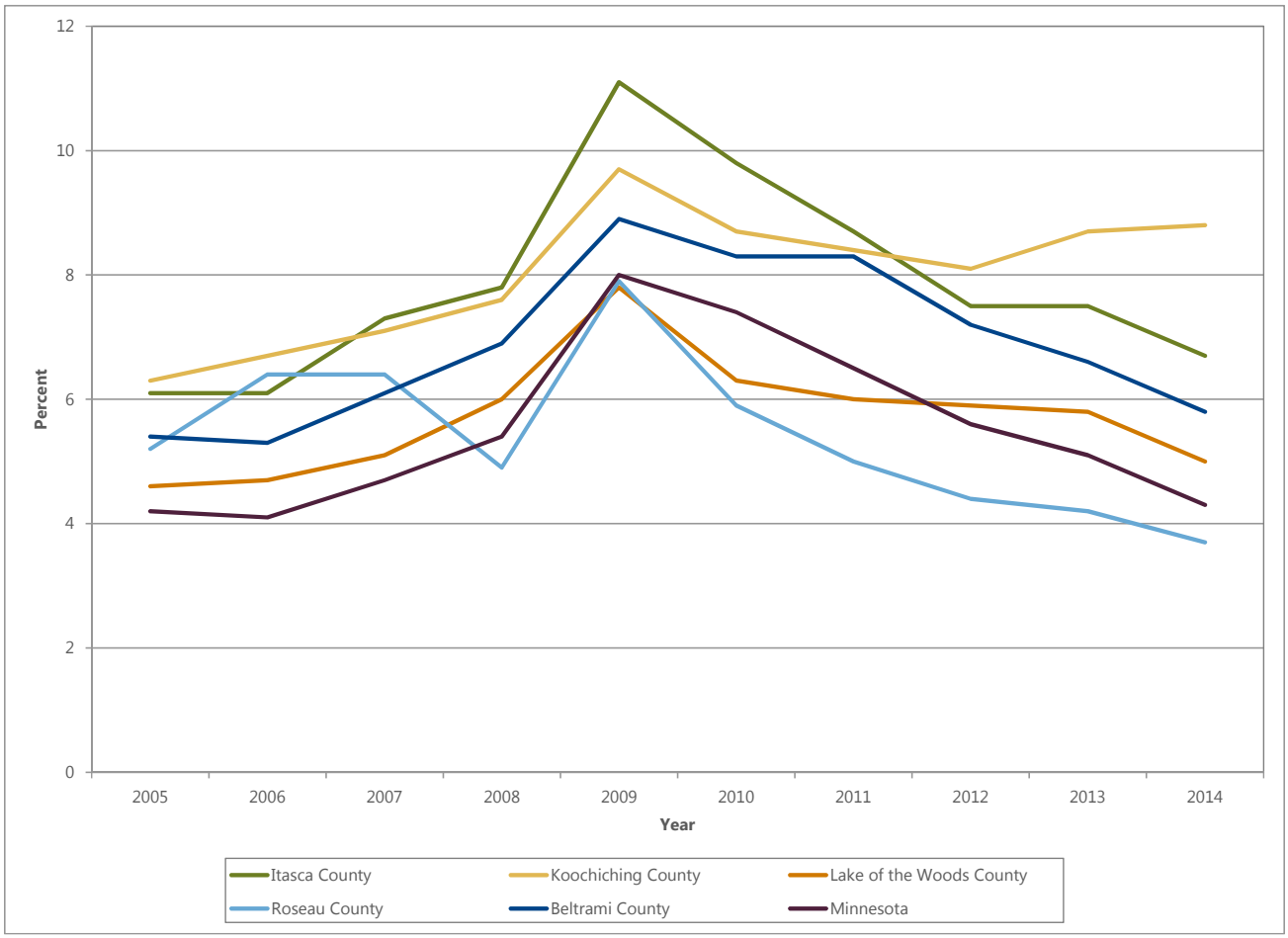
Table 5-14 Civilian Labor Force and Number Employed and Unemployed, 2014 Annual Average

Location	Civilian Labor Force[1]	Employed	Unemployed	Unemployment Rate
	Number of Persons (annual average)			%
State of Minnesota	2,992,649	2,863,378	129,271	4.3
Roseau County	9,167	8,832	336	3.7
Lake of the Woods County	2,373	2,255	118	5.0
Beltrami County	22,309	21,007	1,302	5.8
Koochiching County	6,517	5,946	571	8.8
Itasca County	22,586	21,083	1,503	6.7
Total ROI	62,952	59,123	3,830	6.1

Source(s): Minnesota Department of Employment and Economic Development 2014, reference (56)

(1) Civilian labor force is defined as employed non-military persons ("civilians") 16 years old and over and unemployed civilians 16 years old and over who were actively looking for work during the previous four weeks (U.S. Census Bureau 2012, reference (43)).

Figure 5-2 Annual Unemployment Rate, 2005–2014



Source(s): Minnesota Department of Employment and Economic Development, 2014, reference (56)

Note(s): Unemployment rates not seasonally adjusted.

manufacturing; retail trade; and educational services and health care and social assistance. The percent employment by the construction industry in three of the five ROI counties (Beltrami, Koochiching, and Itasca counties) is higher than for the state (Table 5-15). Employment in Roseau County is notable for its large percentage of workers employed in the manufacturing industry compared to the other ROI counties and the state. Beltrami, Koochiching, and Itasca counties are similar to the state in that the educational services and health care and social assistance combined industry employs the largest percentage of workers.

General Impacts on Employment

During construction, employment impacts in the ROI are expected to be minor and beneficial, both for the local construction workforce and for the service sectors that support construction. During operation, the proposed Project would not employ any new workers and would not impact local employment rates. This forecast would not change substantively among any combination of proposed routes or variations, because the distances between them are not great enough to result in different labor pools during the hiring of construction workers and related contractors. Since employment impacts resulting from the proposed Project are not expected to be long-term and do not vary by proposed route or variation considered, employment is not discussed further in Chapter 6 of this EIS.

Construction Impacts

During construction, an average of 120 construction workers would be employed annually during the construction period from **2017** through 2020. In the peak year of construction, the proposed Project would directly employ approximately 213 workers (University of Minnesota-Duluth 2013, reference (36)). Some skilled workers may need to be hired outside the ROI, while other construction jobs could be filled locally from existing labor pools. For example, in some of the most recent data estimates by the state and the U.S. Census Bureau, the ROI counties were estimated to have

Table 5-15 Percent Employment by Industry for ROI Counties based on the 2008–2012 American Community Survey 5–Year Estimates

Industry	Minnesota	Roseau County	Lake of the Woods County	Beltrami County	Koochiching County	Itasca County
	Percent					
Agriculture, forestry, fishing and hunting, and mining	2.4	4.4	8.8	2.8	3.9	4.4
Construction	5.6	4.2	3.7	7.1	7.0	8.8
Manufacturing	13.7	41.1	18.3	7.4	19.3	11.2
Wholesale trade	3.0	1.5	4.7	2.0	1.5	1.7
Retail trade	11.6	9.0	12.4	13.1	10.6	11.6
Transportation and warehousing, and utilities	4.6	3.1	2.5	4.7	6.3	5.4
Information	2.0	1.0	0.6	1.9	1.0	0.9
Finance and insurance, and real estate and rental and leasing	7.2	2.7	1.7	3.3	6.5	4.4
Professional, scientific, and management, and administrative and waste management services	9.5	2.4	1.3	5.3	4.9	6.6
Educational services, and health care and social assistance	24.4	17.3	11.7	32.1	21.2	27.0
Arts, entertainment, recreation, and accommodation and food services	8.1	7.1	22.4	11.1	8.8	10.0
Other services, except public administration	4.5	3.5	6.7	3.7	3.0	3.6
Public administration	3.4	2.7	5.2	5.4	5.9	4.4

Source(s): U.S. Census Bureau 2012, reference (43)

approximately 3,830 unemployed workers and 4,018 construction workers (Minnesota Department of Employment and Economic Development 2014; reference (56); U.S. Census Bureau 2012, reference (43)). Because the final route for the proposed Project has not yet been determined by the MN PUC, the estimated percentage of workers that would be hired locally for construction has not been calculated.

In addition to direct jobs, the proposed Project would create approximately 18 indirect jobs and 24 induced jobs, for a total of 42 additional jobs supported annually above construction jobs. In this case, indirect jobs are those created in related construction support industries as a result of spending by the proposed Project. Induced jobs result from additional household expenditures by workers directly or indirectly employed by the proposed Project. During the peak year of construction, a total of 73 indirect and induced jobs are anticipated to be added in industries serving the proposed Project construction or the workers, themselves. Some of the sectors expected to see higher employment rates include food services; architectural, engineering, and related services; and private hospitals (University of Minnesota-Duluth 2013, reference (36)).

The indirect and induced jobs would likely be spread across the ROI counties and could largely be filled by the local workforce because the majority of the indirectly supported jobs would be service-oriented and not highly specific (University of Minnesota-Duluth 2013, reference (36)). The variety of workers spread across employment industries in the ROI indicates there would be a sufficient workforce in the area (Table 5-15).

The employment impacts of the proposed Project during construction, while mainly short-term, are expected to be beneficial. Impacts would accrue locally because there is an existing labor supply in the ROI that can fill some of the direct, indirect, and induced jobs created by the proposed Project, and also regionally, as certain workers are hired from neighboring counties and the state. The new job opportunities in the ROI counties during the period of construction (five years) would be a beneficial impact, as would the potential increase in employment rates.

Operation, Maintenance, and Emergency Repair Impacts

No new full-time or part-time workers are expected to be hired to operate, maintain, or perform emergency repairs on the proposed Project. Maintenance and emergency repairs would be performed by existing firms and contractors. Therefore, operation, maintenance, and emergency repairs of the proposed Project are not expected to have an impact on employment in the ROI.

Taxes and Revenue

Property taxes in Minnesota are established and levied at the local level and primarily administered at the county level. Local property tax jurisdictions include cities, counties, townships, schools, and special taxing districts (Minnesota Revenue Department 2015, reference (57)). In Minnesota, local governments derive the majority of their funding from property taxes and state and federal grants (Association of Minnesota Counties 2010, reference (58)). According to preliminary property tax reports, counties collected approximately $2.75 billion in property taxes in 2014 (Minnesota Revenue Department 2015, reference (57)). As is the case for other local jurisdictions, property taxes are the largest source of revenue for most Minnesota counties, ranging from 30 to 50 percent of total revenue (Association of Minnesota Counties 2010, reference (58)).

In Minnesota, the corporate franchise tax applies to the profits of businesses taxed under subchapter C of the Internal Revenue Code. A business that transacts business or owns property in the state, regardless of its state of incorporation, is typically subject to the state's corporate franchise tax. In fiscal year 2014, Minnesota collected $1.3 billion in corporate franchise taxes (Minnesota Revenue Department 2015, reference (59)).

General Impacts on Taxes and Revenue

The proposed Project would be expected to have beneficial economic impacts in the ROI. The estimated tax and revenue impacts of the proposed Project would not differ according to the route or variation considered, because the values considered in this analysis are derived from estimated investment and spending on the proposed Project, regardless of its location. Taxes would be collected at the local, county, and state levels and tax rates would be set independently in each jurisdiction. Since the estimated tax and revenue impacts from the proposed Project would not vary according to proposed route or variation considered at this level of analysis, taxes and revenue are not discussed further in Chapter 6 of this EIS.

Construction Impacts

As previously stated, the Applicant contracted with the Bureau of Business and Economic Research at the University of Minnesota–Duluth's Labovitz School of Business and Economics to study the potential economic impacts of the proposed Project (University of Minnesota-Duluth 2013, reference (36)). At that time, the potential route options were more numerous and passed through nine counties, including the five ROI counties that contain the current proposed routes and route variations. Although the study considered the economic infrastructure and inter-industry relationships among nine counties rather than in five counties, the estimated dollar amounts are still indicative of the magnitude of spending triggered by implementation of the proposed Project, for any proposed route and variation that might be selected.

The study estimated tax revenues, gross output, and value-added spending (reported in 2013 dollars) resulting from development and construction of the proposed Project. During the five year construction phase, the proposed Project would generate approximately $26.5 million in state and local taxes through compensation, business, household, and corporation taxes (University of Minnesota-Duluth 2013, reference (36)). Combined with taxes paid at the state and local level during the development (pre-construction) phase, the total state and local taxes generated by the proposed Project during pre-construction and construction would be approximately $28 million (University of Minnesota-Duluth 2013, reference (36)).

Direct expenditures by the Project on goods and services required to sustain construction would total approximately $591.7 million. This direct spending would generate additional indirect and induced spending, resulting in total "output" spending of $839.0 million in the counties surrounding the proposed Project routes and variations.[73] Output spending represents the value of local production required to sustain implementation of a development. In addition, the proposed Project would serve as an economic stimulus, resulting in "value-added" spending. Value-added spending measures the enhanced spending on wages, rents, interest, and profits in the local community that is attributed to implementation of the proposed Project (University of Minnesota-Duluth 2013,

73 Indirect spending measures increased spending by industries supporting the proposed Project, and induced spending is a measure of increased consumer spending by workers.

reference (36)). Direct value-added spending by the proposed Project during construction would total approximately $246.4 million. Combined with indirect and induced value-added spending, the total effect of direct, indirect, and induced value-added spending is estimated to be $379.3 million (University of Minnesota-Duluth 2013, reference (36)).

During construction, spending impacts from the proposed Project would be short-term, beneficial, and regional, for all proposed routes and variations. These economic impacts would result from direct and indirect activities associated with the proposed Project, as described above. Tax revenue impacts would be short-term, beneficial, and regional, accruing at the state and local level. It is not known what portion of the estimated taxes, output, and value-added spending would accrue to each county in the ROI, but the increases in estimated dollar amounts in the region as a whole indicate that spending and tax revenues in the ROI would be expected to be beneficial.

Operation, Maintenance, and Emergency Repair Impacts

During the operation, maintenance, and emergency repair phase of the proposed Project, tax and other revenue impacts would be long-term, beneficial, and regional for the proposed routes and variations. The tax and revenues impact would generate revenue streams at the local, county, and state levels during the estimated lifespan of the proposed Project. For estimation purposes, it can be assumed that the proposed Project's estimated $591.7 million capital construction costs would be equivalent to the proposed Project's total value, against which property taxes would be levied in the local jurisdictions crossed by the proposed Project for the portion that falls within their boundaries. Other direct economic impacts would include hiring existing local or regional firms and contractors to periodically maintain or repair the transmission line. Some Minnesota Power customers would directly benefit from implementation of the proposed Project by having access to a new source of power, and the northern Minnesota region would benefit generally from the increased transmission capacity and enhanced power reliability.

Indirectly, the proposed Project's effect of increasing capacity and reliability of the regional utility service could support and potentially stimulate economic growth in the region. The increased power supply could benefit local businesses and public service providers and could permit expansion of the local economic base.

Housing

This section contains an inventory of temporary housing in the ROI counties that could potentially be available to (non-local) workers hired during construction of the proposed Project. The most likely housing types for temporary workers are hotels, motels, and RV campgrounds with "full" hookups, meaning hookups for water, electric, and sewer utilities. A list of all hotels, motels, and RV campgrounds were compiled from a web-based inventory maintained by Explore Minnesota Tourism Council, a publicly funded promotion entity (Explore Minnesota 2015, reference (60)). The inventory identifies accommodations in the state of Minnesota and within certain mile distances from any city in the state. The accommodations list can be filtered by category (e.g. hotel/motel or campground) and by amenities (e.g. campground electricity hookup).

Workers would seek accommodations near different geographic sections of the proposed Project, depending on where they were working at a given time during the construction period. The West, Central, and East sections were used for the housing analysis (Map 4-1). The temporary housing supply in each section was determined by inventorying temporary accommodations within a reasonable commuting distance of a centrally located town or towns within each section. A reasonable commuting distance was considered to be 50 miles or less, so that worker commutes would not generally exceed one hour. The towns and radial distances from each town were selected to avoid double counting of accommodations near each town. Table 5-16 provides a summary of the hotels/motels and RV campgrounds available in the West, Central, and East sections.

The temporary housing supply within the West Section was approximated by hotels/motels and campgrounds within 50 miles of Roseau and 10 miles of Baudette. Housing in the area encompassed by these two "circles" was considered reasonable commuting distance from the proposed routes and

Table 5-16 Temporary Housing Supply within Commuting Distance of Proposed Routes and Variations by Geographic Section of Proposed Project

Within commuting distance of	Hotels/ Motels (#)	RV campgrounds with full hookups (#)
West Section	12	20
Central Section	57	126
East Section	39	74
Total	108	220

Source(s): Explore Minnesota 2015, reference (60)

variations in the West Section. The area includes at least 12 hotels/motels and 20 RV campgrounds with full hookups (Table 5-16; Explore Minnesota 2015, reference (60)). The temporary housing supply within the Central Section was approximated by hotels/motels and campgrounds within 50 miles of International Falls and 50 miles of Bemidji. The area includes at least 57 hotels/motels and 126 RV campgrounds with full hookups (Table 5-16; Explore Minnesota 2015, reference (60)). The temporary housing supply within the East Section was approximated by hotels/motels and campgrounds within 50 miles of Grand Rapids, near the proposed terminus of the proposed Project. The area includes at least 39 hotels/motels and 74 RV campgrounds with full hookups (Table 5-16; Explore Minnesota 2015, reference (60)).

The inventory of the temporary housing supply would not vary with the different proposed routes or variations because they are not distant enough from each other to draw on geographically distinct housing supplies. All maintenance and emergency repairs would be conducted by locally and/or temporarily contracted service providers. An inventory of permanent housing in and near the ROI was not conducted because no permanent workers are expected to be hired during operation of the proposed Project; therefore, permanent housing demand in the ROI would not be expected to increase.

General Impacts on Housing

Given the available temporary housing supply in each geographic section of the proposed Project, the short-term construction period, and the short-term shifts at any one location as workers move across the route, impacts to temporary housing would not be expected. No new full-time or part-time workers are expected to be hired to operate, maintain, or perform emergency repairs on the proposed Project, so no workers are expected to require housing once operation commences. Since potential impacts related to housing are not expected from construction and operation of the proposed Project for any proposed route or variation considered, housing is not discussed further in Chapter 6 of this EIS.

Construction Impacts

In the West Section, the temporary housing supply is small, but could be sufficient to house skilled laborers and other non-local workers hired temporarily during construction. If all 213 workers employed during the peak construction period were hired from out of town and moved temporarily to the West Section simultaneously, they could feasibly be housed among the 12 hotels and motels and 20 RV campgrounds with full hookups that currently serve the region. More likely, some workers would be hired locally and would not need temporary housing, and not all workers employed during the peak would be stationed in the West Section concurrently. In the Central and East Sections, the temporary housing supply is larger than in the West Section and would be more than sufficient to house construction workers. As stated, the maximum number of workers that would move to any geographic section temporarily would be 213 workers. Because the average number of workers annually employed for construction of the proposed Project would be 120 workers and the workers would not typically all be working in one geographic section at the same time, the average number of workers moving to a geographic section would be expected to be much less. Some construction workers would be hired locally and would not require temporary housing (see "Employment" heading in this section for more detail). Even if all workers were hired from outside the region and required temporary housing near the proposed routes and variations in each geographic section, there would be sufficient housing capacity.

Short-term beneficial impacts would result in localized economic benefits to proprietors of the hotels, motels, and RV campgrounds rented by temporary workers. Adverse impacts during construction, if any, would be short-term high occupancy rates that prevent visitors to the region from staying in their preferred accommodations, though this is not likely given the available temporary housing supply.

Operation, Maintenance, and Emergency Repair Impacts

No new full-time or part-time workers are expected to be hired to operate, maintain, or perform emergency repairs on the proposed Project, so no workers are expected to require housing once operation commences.

Natural Resource-Based Economies

As described in Section 5.2.1.7, the proposed routes and variations do not cross Red Lake Indian Reservation or any other reservation lands held by the Minnesota Chippewa Tribe. However, the proposed routes and variations do cross lands that may be utilized by tribal members for subsistence and natural resource-based economic activities. These lands include ceded lands with treaty rights for Red Lake Nation and Minnesota Chippewa Tribe members and other off-reservation lands

(see Section 5.3.1.3 for more information about ceded lands with treaty rights). Members of Red Lake Nation tribe of Chippewa Indians engage in subsistence activities on ceded lands with treaty rights in addition to commercial activities to generate income.

Based on data from the five-year estimates calculated by the U.S. Census Bureau from the 2009-2013 American Community Survey, the estimated unemployment rate in Red Lake Nation was 30.6 percent compared with Beltrami county (where the greatest population of the Red Lake Nation is located; 11.8 percent) and the state (7.1 percent) (U.S. Census Bureau 2013, reference (46)). The estimate for median household income in the Red Lake Nation was approximately 36.1 percent less than Beltrami County's, and both were considerably less than the state of Minnesota's median earnings estimate. According to U.S. Census Bureau estimates for 2013, the median household income in the Red Lake Nation communities was $31,422, compared with $43,231 in Beltrami County and $59,836 in Minnesota. The per capita income in Red Lake Nation was approximately half the per capita income in Beltrami County and one-third the per capita income in the state. The percentage of the Red Lake Nation residents living below the poverty threshold was estimated to be 45.1 percent, compared with 21.9 percent in Beltrami County, and 11.5 percent in Minnesota. Subsistence activities, which are not captured in employment and earnings statistics, supplement Red Lake Nation members' needs to varying extents and are discussed in more detail in Section 5.2.1.7.

Some tribal member rely on subsistence activities to supplement earnings and income and help meet their basic needs. Red Lake Nation members engage in hunting, gathering, and harvesting of other natural resources on their reservation lands as well as on other lands, including state forest lands, federal forest land, and U.S. Fish and Wildlife Service (USFWS) Interest Lands. More information on the Red Lake Nation's treaty rights for hunting, gathering, and other activities on lands outside the reservation is discussed in Section 5.3.1.3. The natural resources on lands outside the reservation help supplement and sustain the subsistence-based and natural resource-based economic activity conducted by Red Lake Nation members. Some of these lands and water bodies are crossed or are adjacent to the proposed routes and variations, and thus potential impacts to these natural resource-based economies could occur.

Members of the Red Lake Band of Chippewa Indians have developed several commercial enterprises based on procuring and selling natural resources from the Reservation lands as well as treaty lands. These commercial-oriented activities include, but are not limited to, wild rice harvesting, plant and berry gathering, commercial fishing, and timber harvesting. Red Lake Nation has established several eponymous businesses that provide goods derived from natural resources:

- Red Lake Farms, Inc., (also known as Red Lake Nation Foods) produces and sells cultivated wild rice in addition to foods made from locally gathered resources. Additional food products include wild fruit jellies, jams, and syrups, batter mixes, popcorn, herbal tea, handmade birch bark baskets, and jewelry and gifts. The company sells its products both to retailers and directly to individuals through its websites (Red Lake Nation Foods 2015, reference (61)).
- Red Lake Nation Fishery, Inc., harvests and processes walleye and other freshwater fish caught wild by tribal members. The fish are sold online and in stores in several states around the U.S. Red Lake Nation Fishery first started operations in 1919, and by 1929, the Red Lake Walleye was known around the country (Red Lake Fishery 2015, reference (62)).
- Red Lake Forest Projects, Inc., sells products made from timber harvesting (Red Lake Nation 2015, reference (63)).

General Impacts on Natural Resource-Based Economies

Construction or operation of the proposed Project could potentially impact the economic activities of Red Lake Nation, chiefly by impacting the availability of natural resources used for natural resource-based economies. Potential direct and indirect impacts include the following:

- Removal of natural resources, e.g. timber, or of wildlife habitat
- Degradation of the quality of natural resources or habitat left in place
- Limitation of access to habitats or resources
- Indirect impacts on natural resources-based commercial enterprises or subsistence-based trade economies that result from change in quantity or quality of natural resources and habitats

Construction Impacts on Natural Resource-Based Economies

One of the primary socioeconomic activities affected by construction of the proposed Project would be timber harvesting. Currently, Red Lake Nation members harvest timber on forest land crossed by the proposed routes and variations. In the short-term, the initial timber removal from the ROW may create some positive impacts for members of Red Lake Nation participating in either timber harvesting or forest products enterprises by boosting activity in those industries. In the long-term, the permanent timber removal in the ROW may cause a localized adverse impacts by taking those areas out of timber production. The multiple routes and variations that constitute the alternatives of the proposed Project would result in different amounts of removed forestland. None of the alternatives, however, are expected, to remove forestland in amounts that would preclude ongoing timber harvesting in the area, given the amount of surrounding forest in the region (see discussion of forestry in Chapter 6).

As discussed in Chapter 6, the Project has been designed to avoid placement of transmission line structures within water bodies or other watercourses. Therefore, no direct impacts to lakes or streams where fishing occurs are anticipated. During construction of the proposed Project, access to certain water bodies areas could potentially be limited due to construction near water bodies. These impacts would be of localized and short-term, and would not cause impacts to the overall level of commercial fish harvesting by Red Lake Nation.

Transmission line structures may be constructed in wetlands which could impact wild rice harvests if wild rice is present in those areas. Similarly, structures may be placed in environments that support the growth of wild berries and other herbs collected by Red Lake Nation members for subsistence or commercial purposes. Construction activities may temporarily restrict access to these gathering areas. Because of the temporary nature of construction activities, and because no construction activities will take place on reservation lands where much of the land-based food products are hand harvested, construction of the proposed Project is not expected to cause long-term adverse impacts on the overall food harvest levels for subsistence or commercial activities.

Operation, Maintenance, and Emergency Repair Impacts on Natural Resource-Based Economies

Operation of the proposed Project could potentially cause minor, long-term impacts to timber harvesting by permanently converting existing forested areas to low-stature vegetated areas in the ROW of the proposed Project. Any previously forested area in the proposed Project's 200-foot ROW would not be viable areas for timber harvesting for the life of the proposed Project. The proposed Project's different routes and variations would result in differing amounts of cleared forest but none of which are expected to have an adverse impact on timber harvest levels given the amount of surrounding forest in the region (see discussion of forestry in Chapter 6).

The proposed Project would not adversely impact commercial fishing because the proposed Project has been designed to avoid placement of tower structures in any water bodies or watercourses. However, structures could be placed in wetlands, potentially impacting the availability of natural resources like wild rice although the with a footprint of **1,936** square feet per structure, only a very small area of wild rice would potentially be displaced.

Other potential impacts to the natural resources that support subsistence-based and natural resource-based economies include fragmentation of habitats or introduction or spread of invasive species by disturbing the existing landscape and creating new corridors. The spread of invasive plant species could out-compete vegetation that Red Lake Nation gathers for commercial sale. These impacts are expected to be adverse, localized, and potentially long-term.

5.2.1.9 Recreation and Tourism

This section describes the existing recreation and tourism resources in the vicinity of the proposed Project routes or variations.

Recreational uses have been identified by reviewing of aerial photographs and data from the Minnesota Department of Natural Resources (MnDNR). The ROI for this analysis of impacts to recreation includes county, state, and federal parks and forests, state Scientific and Natural Areas (SNAs), state trails, scenic byways, and snowmobile and water trails that are located within 1,500 feet of the anticipated alignment of the transmission line and within 1,500 feet of the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations,

permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. This ROI was identified because recreation features within these areas are most likely to experience direct or indirect impacts from the proposed Project.

Recreation and Tourism in the ROI

The region is primarily rural with recreation opportunities available in several state parks and state forests. Services such as restaurants and hotels, for tourists visiting the parks and forests, are concentrated in the nearby communities and population centers.

State forests in the ROI include the Lost River, Beltrami Island, Lake of the Woods, Pine Island, Smokey Bear, Red Lake, Big Fork, Koochiching, and George Washington (Map 5-5, Map 5-12, and Map 5-19). Recreational opportunities in these state forests include camping, hunting, bird watching, hiking, canoeing/kayaking, picnicking, horseback riding, snowmobiling, boating, and fishing. State forests are managed by the MnDNR Division of Forestry. The forests are open year round, however hunting is only allowed during appropriate seasons (MnDNR 2015, reference (64)).

State parks include the Hayes Lake and Zippel Bay, Big Bog State Recreation Area, Franz Jenve, Scenic State Park, McCarthy Beach, and Hill-Annex Mine (Map 5-5, Map 5-12, and Map 5-19). These parks offer opportunities for wildlife and bird watching, hiking, mountain biking, cross country skiing, snowmobiling, camping, fishing, and swimming. The state parks are managed by the MnDNR and are open year round (MnDNR 2015, reference (65)). Additionally, the Taconite State Trail is used for hiking, horseback riding, and mountain biking and would be crossed by the proposed Project route in the central part of the East Section (Map 5-19).

Scenic byways include Minnesota State Highway 11 (Waters of the Dancing Sky Scenic Byway), Minnesota State Highway 38 (Edge of the Wilderness Scenic Byway) near Effie, and Minnesota State Highway 46 (Avenue of the Pines Scenic Byway) near Northome. There are also several snowmobile trails located throughout the ROI that would be crossed by the proposed routes and variations. Recreational uses are shown on Map 5-5, Map 5-12, and Map 5-19. Many of the recreational activities are seasonally dependent, with snowmobiling and skiing occurring in the winter months, and boating, canoeing/kayaking, and swimming occurring in summer months.

General Impacts on Recreation and Tourism

Impacts to recreation and tourism due to construction of the proposed Project are expected to be short-term and localized in nature, lasting only for the duration of construction. Once constructed, the proposed Project components, such as the overhead transmission line, could have long-term direct and indirect aesthetic impacts in the ROI as a result of obstruction of scenic views or detracting from the setting of nearby recreational activities. Potential impacts from the proposed Project could result in long-term indirect impacts to recreation and tourism. While potential impacts to recreation and tourism could be long-term, they would not vary by proposed route or variation considered, as the proposed Project would be expected to cross state forests and have a similar impact wherever it is visible; therefore, recreation and tourism are not discussed further in Chapter 6 of this EIS.

Impacts from Construction

Direct impacts on recreation and tourism due to construction of the proposed Project are expected to be short-term and localized in nature, lasting only for the duration of construction. Impacts may include increased noise and dust in the proposed Project area, which could detract from nearby recreational activities, discourage tourism, and could affect the setting of non-motorized recreational activities as well as displace wildlife during hunting season. These effects would cease once construction was completed. Construction of proposed Project components across rivers or snowmobile trails could temporarily disrupt recreational users of these amenities. Overall, these impacts may result in a temporary reduction in the number of tourists visiting the ROI and money spent at local businesses. However, construction workers would be expected to visit state forests and parks and would likely stay at local hotels or campsites during construction, potentially off-setting the reduction in tourists. These effects would cease once construction was completed and tourists would be expected to return to the area.

Mitigation measures could include conducting the construction activities during off peak-seasons when fewer recreational users are present or providing alternative routes around the construction zone. Once construction has been completed, these areas would again be available for outdoor recreational uses. Therefore, construction of the proposed Project is not expected to result in ongoing or long-term impacts to recreation and tourism.

Impacts from Operation, Maintenance, and Emergency Repairs

Once constructed, proposed Project components, such as the overhead transmission line, could have long-term direct and indirect aesthetic impacts in the ROI that may obscure views of, or from, scenic vistas and detract from the setting of nearby recreational activities. Potential aesthetic impacts of the proposed Project are discussed in Section 5.3.1.1.

Most recreational activities (e.g., hiking, snowmobiling, mountain biking, bird watching, etc.) can be done safely in transmission line ROWs, but certain activities are not recommended and could result in public safety hazards. Activities to be avoided include flying kites or model planes near transmission lines and building fires under transmission lines (Bonneville Power Authority 2007, reference (66); Great River Energy n.d., reference (67)). In addition, hunting activities in close proximity to a transmission line increases the risk for **accidental shooting of** insulators or conductors which can break wires and cause an electrical discharge arc (Great River Energy n.d., reference (67)).

Implementation of proper signage and restricted access to the proposed Project transmission line routes and variations, substation, and compensation facilities would reduce the potential for public health and safety hazards from recreational activities.

5.2.2 Public Health and Safety

Transmission line projects have the potential to impact public health and safety during construction, operation, maintenance, and emergency repairs. Within this section, public health and safety includes EMF, implantable medical devices, stray voltage, induced voltage, intentional destructive acts, and environmental contamination.

Potential public health and safety impacts during construction of a transmission line include construction site accidents and encountering contaminated soils and groundwater. During operations, the potential health and safety impacts from a transmission line could potentially involve an increase in EMFs, stray voltage, induced voltage, intentional destructive acts, electrocution hazards, potential aircraft accidents during inspections or due to potential collisions with new transmission lines, and potential hazardous materials spills at the proposed **Iron Range 500 kV** Substation and 500 kV Series Compensation Station. Further discussion of each type of impact as it relates to the proposed Project is provided below.

5.2.2.1 Electric and Magnetic Fields

This section describes EMFs and potential impacts to public health and safety from the proposed Project.

EMFs are invisible areas of energy produced by the movement of electrons and are produced by power lines, wiring, and electrical appliances (National Cancer Institute 2014, reference (68)). Naturally occurring EMFs are caused by the earth's weather and geomagnetic field and mainly occur in the form of static fields, which can induce currents in moving and rotating objects (National Institute of Environmental Health Sciences (NIEHS) 2002, reference (69)). Human-made EMFs are caused by electrical devices and are characterized by their wavelength, amplitude (strength), and the frequencies at which they alternate, that is, the rate at which the fields change direction each second. All alternating current (AC) electrical lines in the United States have a frequency of 60 cycles per second or 60 Hertz (Hz). EMFs at this frequency level are known as extremely low frequency EMFs. Electric fields are produced by voltage and increase in strength as the voltage increases (NIEHS 2002, reference (69)). Electric field strength is measured in kilovolts per meter (kV/m), and 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 or buildings.

Magnetic fields result from the flow of electrical current (measured in amps) moving through wires or electrical devices. The strength of a magnetic field is proportional to the electrical current, and is typically measured in milliGauss (mG). As with electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases. Unlike electric fields, however, magnetic fields are not easily shielded or weakened by objects or materials (NIEHS 2002, reference (69)).

Overhead transmission and distribution lines produce both electric and magnetic fields. At a distance of 300 feet and at times of average electricity demand, the magnetic fields from electric transmission lines could be similar to typical background levels found in most residences. The distance at which the magnetic field from the transmission line becomes indistinguishable from typical background levels differs depending on the type of transmission line. At substations, in general, the strongest EMF results from the transmission lines entering and leaving the facility. The strength

of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels (NIEHS 2002, reference (69)).

A U.S. government study conducted by the EMF Research and Public Information Dissemination Program determined that most people in the United States are on average exposed daily to magnetic fields of two mG or less (NIEHS 2002, reference (69)). Typical magnetic field strengths near common office and home sources are shown in Table 5-17.

A concern related to EMF is the potential for adverse health effects due to EMF exposure. In the 1970s, epidemiological studies indicated a possible association between childhood leukemia and EMF levels. 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 (Appendix K). In general, these studies concur that:

- Based on epidemiological studies, there is an association between childhood leukemia and EMF exposure, **but this association is weak (NIEHS 2002, reference (69))**. There is no consistent association between EMF exposure and other diseases in children or adults[74].
- 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 has not been established, despite an association between childhood leukemia and EMF exposure, there is uncertainty as to the potential health effects of EMF and no methodology for estimating health effects based on EMF exposure.

74 After reviewing all data obtained in two decades of epidemiological studies, the U.S. National Institute of Environmental Health Sciences (NIEHS) concluded in 1999 that the evidence was weak, but that it was still sufficient to warrant limited concern. The NIEHS rationale was that no individual epidemiological study provided convincing evidence linking magnetic field exposure with childhood leukemia, but the overall pattern of results for some methods of measuring exposure suggested a weak association between increasing exposure to EMF and increasing risk of childhood leukemia.

Table 5-17 Typical Sources of Magnetic Fields

Source	Distance from Source:			
	0.5 foot	1 foot	2 feet	4 feet
	Typical Magnetic Fields (mG)			
Air Cleaners	180	20	3	-
Copy Machines	90	20	7	1
Florescent Lights	40	6	2	-
Computer Displays	14	5	2	-
Hair dryers	300	1	-	-
Baby Monitor	6	1	-	-
Microwave Ovens	200	4	10	2
Vacuum Cleaner	300	60	10	1
Color Televisions	N/A	7	2	-

Source(s): NIEHS 2002, reference (69)

Animal scientists have also investigated the potential effects of EMF exposure to livestock. Mammals share similar biochemical mechanisms and physiologies as humans, and the potential effects of EMF exposure have been discussed in animal science literature. Large four-legged animals such as cattle, bison, horses, swine, and sheep are exposed to EMFs in grazing or pasture lands with transmission lines, and in barns and pens. The areas of interest and economic importance that have been studied most intensively are dairy cow productivity (milk production), a sensitive indicator of overall health, reproductive success, morbidity and mortality, weight gain, and health indicators from veterinary treatment records. Lee (1996, reference (70)) provided a concise review of a number of studies with long-term exposures of livestock to 50- or 60-Hz transmission line EMF. Results from a number of controlled, long-term studies on milk production, animal health, reproductive success, behavior, growth, and immune system function were consistent in finding no effects for several species, with most studies showing no influence from the transmission line.

Appendix K provides further detailed background about EMF health impact research on humans and livestock.

EMF Standards

There are currently no federal regulations for allowable electric or magnetic fields produced by transmission lines. A number of states, including Minnesota, have developed state-specific regulations (Table 5-18), and a number of international organizations have adopted standards for EMFs (Table 5-19).

The MN PUC established a standard that limits the maximum electric field under transmission lines to 8 kV/m. All transmission lines in Minnesota must meet this electric field standard. Since no quantitative standard has been established for magnetic fields in Minnesota, the MN PUC has also adopted a prudent avoidance approach in routing transmission lines and, on a case-by-case basis, considers mitigation strategies for minimizing EMF exposure levels associated with transmission lines.

The ROI for the analysis of EMF includes a 600-foot buffer (300 feet from the anticipated alignment) along the proposed routes and variations within the West, Central, East sections, as well as the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations. When the proposed transmission line routes are collocated with existing transmission lines, the ROI has been expanded to a buffer of 800 feet wide (400 feet from the anticipated alignment of the proposed transmission line). The ROI was determined based on standard methodologies for EMF measuring and modeling that factors into account standard attenuation distances for these fields.

The Applicant modeled and calculated EMF with structure configurations that may be used for the proposed Project. They analyzed two transmission line configuration scenarios at the maximum operation voltage: stand-alone 500 kV transmission line (i.e., not paralleling an existing transmission line) and the 500 kV transmission line paralleling existing 500 kV, 230 kV, and 115 kV transmission lines. These two scenarios were evaluated under numerous cases involving different types of structures (self-supporting lattice, guyed delta, and guyed V-towers) operating at different currents. The results obtained under each scenario and the corresponding field plots are presented in Appendix I.

EMF in the ROI

As mentioned in Section 5.2.1, there are no residences, churches, schools, daycares, or nursing homes within the ROW of the proposed routes and variations within the West, Central, or East sections, but there are a limited number of residences within the ROI (four or fewer with the exception of the Cedar Bend WMA Variation which has up to 16 residences). There are also a limited number of non-residential structures (e.g., farm structures and animal sheds) that are within the ROI. Based on the model results in Table 5-20, Table 5-21, and Table 5-22, electric fields range from a low of 0.08 kV/m at 300 feet from the anticipated alignment to a high of 7 kV/m directly underneath the transmission line, all of which are below the 8 kV/m standard for Minnesota. Correspondingly, magnetic fields range from a low of 6 mG at 300 feet from the anticipated alignment to a high of 95 mG at the edge of the ROW, which are far below the guidelines listed in Table 5-18 and Table 5-19.

General Impacts Resulting from EMF

In all cases, predicted magnetic fields for the proposed Project are below regulatory guidelines for magnetic fields used in other states and internationally (Table 5-18 and Table 5-19). Predicted average magnetic field levels at the edge of the anticipated 200-foot ROW for all scenarios are less than 200 mG (Table 5-22). Therefore, potential public health and safety impacts associated with magnetic fields would not be expected, regardless of the proposed route or variation or structure type considered since residences and businesses are located outside of the ROW in all instances. Since EMF impacts resulting from the proposed Project are expected to be below regulatory thresholds and do not vary by proposed route or variation considered, EMF is not discussed further in Chapter 6 of this EIS.

Construction Impacts

There would be negligible EMF impacts during construction of the proposed Project because construction equipment typically generates low levels of EMF, which is only generated by the occasional use of electric and/or electronic devices. Potential EMF exposure effects from electric and electronic devices during construction would be infrequent and within the same range of typical magnetic levels described in Table 5-17.

Operation, Maintenance, and Emergency Repair Impacts

Table 5-20 and Table 5-21 summarize the predicted intensity of electric fields (kV/m) calculated under the following two main operational scenarios analyzed by the Applicant:

- **Scenario 1: Stand-alone 500 kV Transmission Line.** EMF from the proposed Project transmission line structures only. EMF was predicted for three types of structures: guyed Delta tower, guyed V-tower, and self-supporting tower at an operating current level of 2,000 amperes.
- **Scenario 2: 500 kV Transmission Line Paralleling Existing Transmission Lines.** EMF from the proposed 500 kV transmission line operating in parallel with the following existing 500 kV, 230 kV, and 115 kV transmission lines:

Table 5-18 Limits on Electric and Magnetic Fields Near High Voltage AC Transmission Lines for Various States

State	Area where limits applies	Field	Limit
Florida	Edge of ROW	Electric	2 kV/m (lines ≤ 500 kV)
		Magnetic	150 mG (lines ≤ 230 kV) 200 mG (>230 kV - ≤ 500) 250 mG (>500 kV)
	On ROW	Electric	8 kV/m (≤230 kV) 10 kV/m (>230 kV - ≤ 500) 15 kV/m (>500 kV)
Minnesota	On ROW	Electric	8 kV/m
Montana	Edge of ROW(1)	Electric	1 kV/m
	Road crossings	Electric	7 kV/m
New Jersey	Edge of ROW	Electric	3 kV/m
New York	Edge of ROW	Electric	1.6 kV/m
		Magnetic	200 mG
	Public road crossings	Electric	7 kV/m
	Private road crossings	Electric	11 kV/m
	On ROW	Electric	11.8 kV/m
Oregon	On ROW	Electric	9 kV/m

Source(s): National Institute of Environmental Health Sciences 2002, reference (69)

(1) May be waived by landowner.

Table 5-19 International Electric and Magnetic Field Guidelines

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	General Public	Occupational	General Public	Occupational
Institute of Electrical and Electronics Engineers	5	20	9,040	27,100
International Commission on Non-ionizing Radiation Protection	4.2	8.3	2,000	4,200
American Conference of Industrial Hygienists	-	25	-	10,000/1,000(1)
National Radiological Protection Board	4.2	-	830	4,200

Source(s): International Commission on Non-ionizing Radiation Protection 2010, reference (71)

(1) For persons with cardiac pacemakers or other medical electronic devices.

Table 5-20 Predicted Electric Field Strength at Maximum Operating Voltage for Scenario 1: Stand-Alone 500 kV Transmission Line

Proposed Project Structure Type	Maximum field within ROW (kV/m)	Maximum at edge of ROW (kV/m)	Maximum at 300 feet from Anticipated Alignment (kV/m)
500 kV Guyed Delta tower	6.41	1.33	0.08
500 kV Guyed V and Self-Supporting towers(1)	7.03	2.33	0.10

Source: Power Engineer 2013, reference (12), Power Engineer 2014, reference (13)

(1) The Applicant has assumed electric fields from self-supporting lattice structure as equivalent to electric fields from guyed V-structures.

- 500 kV D602F transmission line (guyed Delta, guyed V, and self-supporting structures),
- 230 kV 83L transmission line (H-Frame structures),
- 115 kV 28L tap (H-Frame structures),
- 115 kV 62L and 63L transmission lines (H-Frame structures), and
- 115 kV 28L and 230 kV 83L transmission lines (H-Frame structures).

As shown in Table 5-17 and Table 5-18, electric field levels for the proposed Project are anticipated to be less than the MN PUC's 8 kV/m standard.

Predicted magnetic field levels depend on anticipated currents (amps) on the transmission line, which in turn depend on the electric load served by the transmission line now and into the future. The larger the expected current flow, the higher the predicted magnetic field. **The Applicant has modeled magnetic field levels for two conditions: (1) the maximum continuous rating of the proposed Project which represents the maximum allowable power flow of the transmission line; and (2) the projected peak loading when the proposed Project is in service, derived from power system modeling of the proposed Project under peak loading conditions. For both conditions, predicted magnetic fields from a total of six corridor scenarios (stand-alone or where the proposed Project may parallel existing transmission lines) were calculated for each of the proposed structure types for the proposed Project. DOE reviewed and verified the assumptions and calculations provided in the Applicant's analysis.**

Table 5-21 Predicted Electric Field Strength at Maximum Operating Voltage for Scenario 2: Paralleling Existing Transmission Lines

Proposed Project Structure Type	Maximum field within ROW (kV/m)	Maximum at edge of ROW (kV/m)	Maximum at 300 feet from Anticipated Alignment (kV/m)(1)
Proposed 500 kV paralleling existing 500 kV Line(2)			
500 kV Guyed Delta	6.46	1.36	1.73
500 kV Guyed V- and Self-Supporting towers(3)	7.06	2.36	1.76
Proposed 500 kV paralleling existing 230 kV Line(4)			
500 kV Guyed Delta	6.43	1.34	0.19
500 kV Guyed V- and Self-Supporting towers(2)	**7.04**	2.33	0.22
Proposed 500 kV paralleling one existing 115 kV Line(5)			
500 kV Guyed Delta t	6.42	1.39	0.08
500 kV Guyed V- and Self-Supporting towers(2)	**7.04**	2.38	0.10
Proposed 500 kV paralleling two existing 115 kV Lines(6)			
500 kV Guyed Delta	**6.43**	1.65	0.08
500 kV Guyed V- and Self-Supporting tower (2)	7.05	2.58	0.10
Proposed 500 kV paralleling existing 115 kV and 230 kV Line(7)			
500 kV Guyed Delta	6.43	1.34	0.42
500 kV Guyed V- and Self-Supporting towers(2)	7.03	2.32	0.45

Source(s): Power Engineer 2013, reference (12); Power Engineer 2014, reference (13)

(1) 300-foot comparison distance is based on modeling analysis in Appendix I of the Presidential permit Application (Minnesota Power 2014).

(2) Existing 500 kV D602F transmission line (**guyed Delta and** self-supporting tower structures). For this analysis, the Applicant calculated electric field intensity up to 400 feet from the anticipated alignment. Results are reported at 300 feet for comparison purposes.

(3) The Applicant has assumed electric fields from Self-Supporting lattice tower as equivalent to electric fields from guyed-V structures.

(4) Existing 230 kV **907L** transmission line (H-Frame structures).

(5) Existing 115 kV 28L tap (H-Frame structures).

(6) Existing 115 kV 62L and 63L transmission lines (H-Frame structures).

(7) Existing 115 kV **20L** and 230 kV 83L transmission lines (H-Frame structures).

Table 5-22 Predicted Magnetic Field Strengths for the Proposed Project at Maximum Continuous Rating (200 amps)

Proposed Project Structure Type	Maximum within ROW, mG	Maximum at edge of ROW, mG	Maximum 300 feet from Anticipated Alignment, mG
Proposed 500 kV Transmission Line (stand-alone)			
500 kV Guyed Delta tower	258.11	52.94	6.31
500 kV Guyed V tower(1)	**293.67**	88.54	10.13
Proposed 500 kV Transmission Line paralleling existing 500 kV Transmission Line(2)			
500 kV Guyed Delta tower	**268.51**	85.62	72.94
500 kV Guyed V tower(1)	**284.12**	**103.86**	**76.59**
Proposed 500 kV Transmission Line paralleling existing 230 kV Transmission Line(3)			
500 kV Guyed Delta tower	**250.09**	**70.39**	**22.60**
500 kV Guyed V tower(1)	**288.35**	**94.18**	**26.46**
Proposed 500 kV Transmission Line paralleling one existing 115 kV Transmission Line(4)			
500 kV Guyed Delta tower	258.39	52.83	6.27
500 kV Guyed V tower(1)	294.02	88.45	10.08
Proposed 500 kV paralleling two existing 115 kV Lines(5)			
500 kV Guyed Delta tower	265.47	71.22	12.58
500 kV Guyed V tower(1)	303.11	105.83	9.13
Proposed 500 kV paralleling existing 115 kV and 230 kV Line(6)			
500 kV Guyed Delta tower	246.59	76.69	44.78
500 kV Guyed V tower(1)	286.56	93.26	48.30

Source(s): Power Engineer 2013, reference (12); Power Engineer 2014, reference (13)

(1) The Applicant has assumed **magnetic** fields from Self-Supporting lattice tower as equivalent to **magnetic** fields from guyed V-structures.

(2) Existing 500 kV D602F transmission line (**guyed Delta and** self-supporting tower structures). For this analysis the Applicant calculated electric field intensity up to 400 feet from the anticipated alignment. Results are reported at 300 feet for comparison purposes.

(3) Existing 230 kV **907L** transmission line (H-Frame structures).

(4) Existing 115 kV 28L tap (H-Frame structures).

(5) Existing 115 kV 62L and 63L transmission lines (H-Frame structures).

(6) Existing 115 kV **20L** and 230 kV 83L transmission lines (H-Frame structures).

The Applicant's modeled magnetic fields for the proposed Project's primary structure types are shown in Table 5-22. Detailed modeling results for the various structure types and transmission line scenarios are provided in Appendix I.

For the proposed Project's primary structure types, the maximum predicted magnetic field, modeled at one meter above ground, is calculated to be 303 mG at a distance of 18.8 feet from the anticipated alignment for the proposed Project when the 500 kV transmission line is paralleling two 115 kV lines (Table 5-22). Because magnetic field strength drops off exponentially with distance, predicted levels fall below 100 mG at the edge of the ROW, and below 50 mG by 300 feet from the anticipated alignment. As shown in the detailed data in Appendix I, predicted magnetic fields strength would vary depending on the configuration of the shared corridor when the proposed transmission line parallels existing lines.

The predicted electric field and magnetic field levels for the proposed Project scenarios would not exceed the MN PUC's 8 kV/m standard and other state and international standards on magnetic fields. EMF levels are predicted based on the proposed Project components rather than the surrounding environment; therefore, EMF levels within the ROW would remain below the Minnesota standard regardless of the proposed route or variation considered.

5.2.2.2 Implantable Medical Devices

This section describes the potential impacts to implantable medical devices from the proposed Project.

Electromechanical implantable medical devices, such as cardiac pacemakers, implantable cardioverter defibrillators (ICDs), neurostimulators, and insulin pumps may be subject to interference from EMFs, which could mistakenly trigger a device or inhibit

it from responding appropriately (Public Service Commission of Wisconsin 2009, reference (72)).

The ICD manufacturers' recommended threshold for modulated magnetic fields is 1 Gauss (G). Since 1 G is five to ten times greater than the magnetic field likely to be produced by a high voltage transmission line (Public Service Commission of Wisconsin 2009, reference (72)), research has focused on electric field impacts. A 2004 Electric Power Research Institute report states that sensitivity to electric fields was reported at levels ranging upwards from 1.5 kV/m, particularly for older (unipolar) pacemakers; some modern (bipolar) units are immune at 20 kV/m. Medtronic and Guidant, manufacturers of various implantable medical devices, have indicated that electric fields below 6.0 kV/m are unlikely to affect most of their devices (Electric Power Research Institute 2004, reference (7)).

Scholten (2005, reference (6)) conducted a theoretical study evaluated the risk for a patient with a unipolar cardiac pacemaker under worst-case and real-life conditions under a high voltage overhead power line. This study concluded that beneath high voltage overhead lines, a life-threatening situation for cardiac pacemaker patients is very unlikely; however, an interference between the implant and the electromagnetic fields cannot be excluded. Definitive conclusions about the real risk can be drawn only by conducting additional studies with pacemaker patients (Scholten 2005, reference (6)).

The ROI for this analysis of impacts to implantable medical devices is the same as the ROI for EMF, which includes a 600-foot buffer (300 feet from the anticipated alignment) along the proposed routes and variations within the West, Central, East sections, as well as the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations. When the proposed 500 kV transmission line route parallels existing transmission lines, the ROI is expanded to a buffer of 800 feet wide (400 feet from the anticipated alignment). The ROI was determined based on standard methodologies for EMF measuring and modeling and factors into account standard attenuation distances for these fields.

Implantable Medical Devices in the ROI

There are no residences, businesses, or sensitive receptors such as hospitals or nursing homes located within the ROI, therefore the regular presence of implantable medical devices within the ROI would not be expected.

General Impacts

Potential impacts related to implantable medical devices as result of EMF are not expected as a result of construction or operation of the proposed Project and do not vary by proposed route or variation considered. Since potential impacts related to EMFs are not expected from construction, operation, maintenance, and emergency repairs of the proposed Project (see discussion below) for any route or variation considered, implantable medical devices are not discussed further in Chapter 6 of this EIS.

Construction Impacts

There would be negligible impacts to implantable medical devices during construction of the proposed Project because construction equipment typically generates low levels of EMF, only generated by the occasional use of electric and/or electronic devices. Potential EMF exposure effects from electric and electronic devices during construction would be infrequent and within the same range of typical EMF levels described in Table 5-17.

Operation, Maintenance, and Emergency Repair Impacts

The maximum predicted electric field strength for the proposed Project is 7.06 kV/m within the anticipated 200-foot ROW (Appendix I). This electric field strength is above the 6.0 kV/m interaction level for modern and older pacemakers. Electric field strength levels decrease with distance, however, and maximum levels at the edge of the ROW are anticipated to be less than 2 kV/m, and, in most instances, less than 1 kV/m. In the event that a cardiac device is affected, the effect is typically a temporary asynchronous pacing (i.e., fixed rate pacing), and the device returns to its normal operation when the person moves away from the source of EMFs (Public Service Commission of Wisconsin 2009, reference (72)). Electric field levels are predicted based on the proposed Project components rather than the surrounding environment and electric field levels within the ROW would remain below the Minnesota standard regardless of the proposed route or variation considered. Accordingly, potential impacts to implantable medical devices and their users from operation, maintenance, and emergency repair of the proposed Project are not expected regardless of the proposed route or variation considered.

5.2.2.3 Stray Voltage

This section describes the potential for stray voltage impacts from the proposed Project.

Electrical systems that deliver power to end-users, and electrical systems within the end-user's business, residence, farm, or other buildings are grounded to the earth for safety and reliability reasons. The grounding of these electrical systems results in a small amount of current flow through the earth as a result of the neutral wiring network of a farm and/or the electric power delivery system (Reinemann 2008, reference (73)). Stray voltage can arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, or from faulty wiring or faulty grounding of conducting objects in a facility. Therefore, stray voltage could exist at any business, residence, or farm which uses electricity, independent of whether there is a transmission line nearby. Factors that could influence the intensity of stray voltage include wire size and length, the quality of connections, the number and resistance of ground rods and the current being grounded.

With respect to agriculture, stray voltage is defined by the U.S. Department of Agriculture (USDA) as a small voltage (less than 10 volts) measured between two points that can be contacted simultaneously by an animal (Wisconsin Public Service 2011, reference (74)). For example, this effect is experienced when livestock come into contact with two metal objects between which a voltage exists, such as feeders, water troughs, or stalls, thereby causing a small current to flow through the livestock. The direct effect of animal contact with electrical voltage can range from mild behavioral reactions indicative of sensation, to involuntary muscle contraction (or twitching), to intense behavioral responses indicative of pain (Reinemann 2008, reference (73)). The indirect effects of these behaviors can vary considerably depending on the specifics of the contact location, level of current flow, body pathway, frequency of occurrence, and other factors related to the daily activities of the animals. Common situations of concern in animal environments include the following (Reinemann 2008, reference (73)):

- Animals avoiding certain exposure locations that may result in reduced water or feed intake if painful exposure occurs while accessing watering or feeding devices or locations
- Difficulty of moving or handling animals in areas of annoying voltage/current exposure
- Release of stress hormones produced by contact with painful stimuli

Studies have been conducted to investigate the potential direct physiological effects that may be produced at stray voltage levels above those that produce behavioral changes. Research has also been conducted to describe the potential effects that may result from the animal's exposure to voltage/current below levels which may produce sensation and behavioral response. A detailed literature review and synthesis of research findings on the impact of stray voltage on farm operations is provided in Appendix L. These studies have found, through different controlled and field experiments, that sensitive dairy cows may experience mild behavioral modifications at current levels exceeding 2 milliamps and 1 to 2 volts. However, aversion and metabolic changes in livestock would require substantially higher voltage and current exposures than those predicted (Reinemann 2008, reference (73)).

Low levels of AC voltage on the grounded conductors of a farm wiring system are a normal and unavoidable result of operating electrical farm equipment. In other words, some levels of stray voltage will always be found on a farm using electricity. The issue of concern involves stray voltage that occurs at a level that negatively affects an animal's behavior, health, and more specifically, production. Field research shows that cow contact current is often dependent on both on- and off-farm electrical power systems. A common on-farm source of stray voltage is the inappropriate interconnection of equipment grounding conductors with the neutral conductors of the farm wiring system. Mitigation of stray voltage can be achieved through a variety of proven and acceptable methods, such as additional grounding or the installation of an equipotential plane (Public Service Commission of Wisconsin 2013, reference (72)).

Several state agencies have conducted scientific and technical reviews and held public hearings on stray voltage issues. These scientific and technical reviews have found that stray voltage can be caused by a combination of on-farm and off-farm sources. Therefore, state regulations have focused on compliance with the National Electric Safety Code (NESC) and the National Electrical Code, as well as with implementation of good management practices.

MN PUC assembled a team of Science Advisors to study farmers' claims that electric currents in the earth from electric distribution systems caused behavior, health, and production problems in cows in the state. In its Final Report, the Science Advisors reached three conclusions:

- There is no credible scientific evidence to verify the specific claim that currents in the earth or associated electrical parameters such as

voltages, magnetic fields, and electric currents are causes of poor health and milk production in dairy herds.

- At the present time, there is no basis for altering the MN PUC approved standards by which electric utilities distribute power onto or in the vicinity of individual dairy farms.
- There are many well-documented non-electrical factors that are known and accepted by the scientific community and by most farmers as well, to cause dairy cow health and production problems. Among the most noteworthy stressors is poor nutrition, poor cow comfort and hygiene, and low or no use of vaccinations and related preventive veterinary practices. Those who want to improve performance of dairy herds should always address these factors.

As mentioned above, stray voltage can be caused by a combination of on-farm and off-farm causes. One off-farm contributor to stray voltage is the operation of transmission lines in close proximity and parallel to a distribution line (Public Service Commission of Wisconsin 2013, reference (72)). To minimize the likelihood of stray voltage occurrences, utilities sometimes propose to relocate paralleling distribution lines further away from the transmission line. Additionally, some agencies require the utility to conduct pre-construction and post-construction testing of potentially impacted farms and lines (Public Service Commission of Wisconsin 2013, reference (72)).

The ROI for this analysis of stray voltage includes the anticipated 200-foot ROW for the proposed routes and variations within the West, Central, East sections, as well as the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations. This ROI is based on the location of the transmission line and proximity to existing parallel distribution lines is the potential source of impact.

Stray Voltage in the ROI

There are no residences or businesses within the ROI, however there are non-residences (e.g., farm structures and animal sheds) present within the ROI as described in Section 5.2.1.1.

General Impacts

Stray voltage impacts are not anticipated as a result of construction, operation, maintenance, and emergency repair of the proposed Project because the proposed Project would not parallel a new or existing distribution line. However if there is not proper grounding or wiring on any distribution system or at a nearby business, residence, or farm, these currents could result in potential stray voltage impacts. In those instances where transmission lines could induce currents on inadequately grounded distribution circuits, mitigation measures for stray voltage may be required by. These mitigation measures would involve the use of phase cancellation, increased transmission-to-distribution separation, neutral isolation (i.e., decoupling the distribution neutral system from the farm neutral system), and improved grounding.

Potential impacts related to stray voltage are not expected from construction, operation, maintenance, and emergency repair of the proposed Project for any proposed route or variation considered, therefore stray voltage is not discussed further in Chapter 6 of this EIS.

Construction Impacts

Potential impacts resulting from stray voltage are not expected to occur during construction as stray voltage only occurs during operation when the transmission line has been energized.

Operation, Maintenance, and Emergency Repair Impacts

There are no residences or businesses within the ROI but non-residences (e.g., farm structures and animal sheds) are present within the ROI. The proposed 500 kV transmission line would not directly connect to businesses, residences, or farms in the area, therefore no impacts due to stray voltage are anticipated from operation of the proposed Project. However, all proposed routes and variations would at some point parallel existing distribution lines, so in those locations additional currents could occur on the distribution line in the immediate area of the paralleling. These currents are not anticipated to cause stray voltage impacts in the proposed Project area where proper grounding exists on the current distribution system. However, if there is not proper grounding or wiring on the distribution system or at a nearby residence, business, or farm, these currents could result in potential stray voltage impacts. The location and extent of areas without proper grounding or wiring is not currently known. A thorough investigation and engineering analysis would provide a determination of whether a distribution line is operating according to its intended design and an estimate of the magnitude of neutral-to-earth voltage reduction from each of these measures.

5.2.2.4 Induced Voltage

This section describes the potential for induced voltage impacts from the proposed Project.

The electric field from a transmission line can couple with any object able to conduct electrical energy that is in close proximity to the transmission line, such as a vehicle or a metal fence. This conductive coupling can induce a voltage on the object, with the magnitude of this voltage depending on factors which include the weather, object shape, size, orientation, and location along the ROW. The alternating magnetic fields created by transmission lines could also induce currents on conductive objects.

If the objects upon which a voltage is induced 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 might be accompanied by a spark discharge and mild shock, similar to what could occur when a person walks across a carpet and touches a grounded object or another person.

The main concern with induced voltage is the current flow (amps) through a person to the ground. Most shocks from induced current are considered more of a nuisance than a danger, but to ensure the safety of persons in proximity to a transmission line, the NESC requires that any discharge be less than 5 mA. In addition, the MN PUC's electric field limit of 8 kV/m is designed to prevent serious hazard from shocks due to induced voltage under transmission lines.

The ROI for this analysis is the same as the ROI described for EMF which includes a 600-foot buffer (300 feet from the anticipated alignment) along the proposed routes and variations within the West, Central, East sections, as well as the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations. When the proposed transmission line routes are collocated with existing transmission lines, the ROI has been expanded to a buffer of 800 feet wide (400 feet from the anticipated alignment). The ROI was determined based on standard methodologies for EMF measuring and modeling the factors into account standard attenuation distances for these fields.

5.2.2.5 Induced Voltage in the ROI

There are existing high voltage transmission lines present within portions of the ROI that could cause induced voltage issues within the ROI. However there are no residences or businesses present within the ROI, so public safety issues from induced voltage in the ROI is likely minimal. In locations where there is no high voltage transmission lines present, induced voltage is not likely to occur at present.

General Impacts

Potential impacts from construction of the proposed Project related to induced voltage are not expected. Provided objects are effectively grounded, no impacts due to inducted voltage are anticipated from operation, maintenance, or emergency repair of the proposed Project. However, for metallic objects where effective grounding is more difficult to achieve, impacts such as mild shock could occur. This would be expected to occur in limited instances where a person is standing on the ground and touching ungrounded machinery, such as farming activities or conducting recreational activities (e.g. hunting, snowmobile use, ATVs), while directly under a transmission line. The primary means of minimizing this potential impact is to avoid exiting and entering machinery directly under a line and adhering to MN PUC and NESC standards related to electric field limit and line to ground clearances. As such, potential impacts from induced voltage are not expected to be significant. Since potential impacts from induced voltage are expected to be limited, and they do not vary by proposed route or variation considered, induced voltage is not discussed further in Chapter 6 of this EIS.

Construction Impacts

Potential impacts resulting from induced voltage are not expected to occur during construction as induced voltage impacts only occur during operation when the transmission line has been energized.

Operation, Maintenance, and Emergency Repair Impacts

For objects that the Applicant can ensure are effectively grounded (i.e., stationary objects), no impacts due to inducted voltage are anticipated from operation of the proposed Project. However, for metallic objects where effective grounding is more difficult to achieve (e.g., machinery that is movable and operated directly under a transmission line) impacts could occur, such as a mild shock. Such impacts could occur only if a person was standing on the ground and touching the machinery while directly under a transmission line. The primary means of minimizing this potential impact is to avoid exiting and entering machinery directly under a line. The Applicant would be required to ensure that the proposed Project is constructed and operated to meet NESC standards and the MN PUC's electric field limit; including meeting or exceeding the recommended NESC line to

ground clearances, which based on the Applicant's preliminary design criteria, minimum ground clearance for the conductors is estimated to be 40 feet. As a result of the MN PUC and NESC requirements, no impacts due to induced voltage from the proposed Project are anticipated regardless of the route or variation considered.

5.2.2.6 Intentional Destructive Acts

This section describes the potential for intentional destructive acts within the West, Central, and East sections of the proposed Project.

Physical damage to electricity infrastructure has previously occurred in the United States as criminal acts that would be defined as terrorist activity in the U.S. Code (18 U.S.C. 2331 and 2332). Especially in the aftermath of the terrorist attacks that occurred on September 11, 2001, terrorism has become a greater concern and increased security awareness has occurred throughout the electrical transmission industry and the nation. The North American Electrical Reliability Corporation (NERC) has identified vandalism and other malicious acts as one of the causes of outages and risks to the bulk power system in North America (NERC 2013, reference (75)). In the late 1970s, a series of attacks to electrical infrastructure caused $7 million of damage to power lines in Minnesota (Kemp 2014, reference (76)). More recently, three recent attacks to a high voltage transmission line were reported in Arkansas and are under investigation by the Federal Bureau of Investigation (Blinder 2013, reference (77)).

Energy transmission has become increasingly reliant on computer-based control systems that operate and monitor energy infrastructure allowing another method for intentionally destructive acts. The following points were extracted from a DOE-sponsored report through the Energy Sector Control Systems Working Group (Energy Sector Control Systems Working Group 2012, reference (78)) addressing cyber security threats to energy delivery systems:

- "Because the private sector owns and operates most of the energy sector's critical assets and infrastructure, and governments are responsible for national security, securing energy delivery systems against cyber threats is a shared responsibility of both the public and private sectors."
- "Smart technologies (e.g., smart meters, phasor measurement units), new infrastructure components, the increased use of mobile devices, and new applications are changing the way that energy information is communicated and controlled while introducing new vulnerabilities and creating new needs for the protection of consumer and energy market information."
- "Adversaries have pursued progressively innovative techniques to exploit flaws in system components, telecommunication methods, and common operating systems found in modern energy delivery systems with the intent to infiltrate and sabotage them."

In 2013, President Obama issued an Executive Order 13636 announcing, among other things, a public private partnership in preparing for cyber-security threats against critical infrastructure.

The ROI for this analysis of intentional destructive acts includes the anticipated 200-foot ROW for the proposed routes and variations within the West, Central, East sections, as well as the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations. This ROI is based on the location of the proposed Project infrastructure that could be affected by intentional destructive acts.

Intentional Destructive Acts in the ROI

There are not any specific sources of information regarding recent acts of terrorism specific to the proposed Project area or the ROI; however, incidents of intentional destructive acts, alleged to be sabotage, have occurred to high voltage transmission lines for a long period of time including in Minnesota.

General Impacts

While the likelihood for intentional destructive acts to the proposed Project is difficult to predict, it is unlikely that such acts would occur based on past experience along the thousands of miles of electrical transmission lines in the U.S. A more likely scenario would typically involve mischievous or criminal acts of theft or vandalism, which would generally pose lower safety risks. Although some theft or vandalism is considered possible, related health and safety impacts to workers or the public from the proposed Project are not expected and do not vary by proposed routes or variation considered, therefore intentional destructive acts are not discussed further in Chapter 6 of this EIS.

Since potential impacts as a result of intentional destructive acts for the proposed Project are not expected and do not vary by proposed route or

variation considered, intentional destructive acts are not discussed further in Chapter 6 of this EIS.

Construction Impacts

Equipment theft is a growing concern that can be very costly to construction projects. According to the National Insurance Crime Bureau, between $300 million to $1 billion a year is lost nationwide to the theft of construction equipment (National Insurance Crime Bureau 2012, reference (79)). A 2008 industry research study commissioned by LoJack Corporation and the National Insurance Crime Bureau showed that 71 percent of equipment owners have experienced the theft of equipment in the previous year (LoJack 2012, reference (80)). According to this study, the types of equipment most frequently stolen are light utility work trucks and trailers, loaders, skid steers, and generators/ air compressors/welders. Theft of tools, equipment, and construction materials is a relatively common occurrence at large sites, especially when spread across large geographic areas where security is more difficult to maintain. Impacts could result in schedule and cost delays to the construction effort.

Operation, Maintenance, and Emergency Repair Impacts

The transmission line, proposed **Iron Range** Substation, and 500 kV Series Compensation Station could be subject to physical attacks and cyber attacks. The proposed **Iron Range** Substation and the 500 kV Series Compensation Station would be fenced which would provide a level of protection against physical attacks; however the transmission line and structures are unfenced and therefore are more vulnerable to attacks. As a result of these attacks on the proposed Project, power outages could occur.

Although it is not possible to predict whether acts of terrorism or sabotage events would occur or the nature of such events if they did occur, the potential exists for events involving terrorism, sabotage, or criminal mischief that could result in health and safety impacts to workers and members of the public and power outages. In general, the proposed Project presents no greater target for intentional destructive acts than any other high voltage transmission lines or power plants in the U.S.

5.2.2.7 Environmental Contamination

This section describes the potential for environmental contamination impacts from the proposed Project.

Environmental contamination can be a concern during construction: (a) spills may cause contamination during construction, and (b) excavation may lead to discovery of existing contamination. If existing soil or groundwater contamination is encountered during construction, it could also create a safety and health concern as construction workers and the nearby public could be exposed to contaminated soils. If the spills or contamination are significant enough, they could be regulated under federal laws, such as the Resource Conservation and Recovery Act (42 U.S.C. 6901) or the Comprehensive Environmental Response, Compensation and Liability Act (42 U.S.C. 9601).

Hazardous materials and hazardous waste are defined by 49 CFR 171.8 and 42 U.S.C. Section 6903, respectively. Examples of hazardous materials include liquid fuels, solvents, oils, lubricants, and hydraulic fluids. Examples of hazardous wastes include spent hazardous materials and by-products from their use. Special hazards are regulated under 15 U.S.C. Chapter 53 and include asbestos-containing material, polychlorinated biphenyls (PCBs), and lead-based paint.

Improper management of hazardous materials and wastes can threaten the health and well-being of humans and wildlife species, botanical habitats, soil and sediment, and water resources. In the event of a release of hazardous materials or wastes, the extent of environmental contamination would vary based on the type and quantity of the contaminant and the type of soil or sediment, topography, and water resources. The Applicant is developing a Spill Prevention, Control, and Countermeasures (SPCC) Plan, which is required by the Oil Pollution Prevention regulation (3 U.S.C. 2702-2761; 40 CFR 112.3).

A SPCC plan is required to prevent discharge of oil into navigable waters of the United States, and is required if the above-ground storage capacity for the substance is greater than 1,320 gallons and there is a reasonable expectation of a discharge into navigable waters of the U.S. As described in Section 2.13, the Applicant would develop their SPCC plans for Project substations that meet the criteria per 40 CFR 112. These Applicant proposed measures are potential MN PUC Route Permit conditions.

If contamination is identified unexpectedly during construction activities, the construction would be discontinued in that location until further evaluation of the conditions is performed. The presence of contamination must be immediately reported to the property owner so the owner can make an evaluation as to whether the contamination must

be reported to the Minnesota Duty Officer per Minnesota Statute, section 115.061.[75]

The proposed Project would be located in predominately agricultural, wetland, and forested areas with a relatively dispersed population. Although mining is a regional economic activity in the proposed Project area, no active mining operations that could pose existing public health and safety hazards have been identified in the proposed Project footprint.

The ROI for this analysis of environmental contamination includes environmental contamination sites within 4,000 feet (2,000 feet on either side) of the anticipated alignment and proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations. Construction and maintenance of any transmission line involves the use of hazardous materials and the generation of waste. If handled improperly, the public and/or the surrounding environment could be adversely affected. For all the proposed routes and variations, soil would be disturbed and, as a result, any existing contaminated soil or groundwater could be mobilized. In this case, a 2,000-foot radius was used to be conservative and to gain a comprehensive view of the potential for contamination near the proposed routes and variations. The use of 2,000 feet provides a sufficient margin to identify potential existing contamination that exists where excavation could occur as part of the proposed Project.

Environmental Contamination in the ROI

Table 5-23 summarizes the list of registered potentially contaminated sites located within 2,000 feet from the proposed routes and variations, based on a review of MPCA's "What's in My Neighborhood" database. More detail about each of the sites listed in Table 5-23 is presented in Appendix M. The potentially contaminated sites for the West Section (Map 5-4), Central Section (Map 5-11), and East Section (Map 5-18) are labeled as "hazardous wastes," "investigation and cleanup," "tanks and leaks," or "multiple activities."

There are four active investigation and cleanup sites within approximately 2,000 feet from the proposed routes and variations (Table 5-23). These sites are former unpermitted dump sites currently under State Assessment (SA) status and are primarily located in the J2 Segment Option Variation Area in the Central Section (Map 5-11) and the Balsam Variation Area in the East Section (Map 5-18). In addition to these investigation and cleanup sites, three active hazardous waste sites have been identified within 2,000 feet; all these sites are registered small to minimal quantity generators located in the West and Central sections (Table 5-23).

The only environmental contamination site located within a proposed ROW is the Loman Dump found within the J2 Segment Option Variation in the J2 Segment Option Variation Area in the Central Section (Map 5-11). The MPCA database also registers seven inactive leak sites in the West, Central, and East sections of the proposed Project area; these sites were under investigation for fuel oil or gasoline releases with the potential for soil and groundwater contamination. Even though all of these leak sites have been closed and registered as inactive, five of the seven sites indicate remaining or unknown presence of soil or offsite contamination.

General Impacts

Only one contaminated site has been identified within a proposed ROW (J2 Segment Option Variation in the J2 Segment Option Variation Area). If the record provided information that the proposed Project would impact known contaminated sites, the MN PUC could require—as special condition to the Route Permit—that the Applicant conduct an investigation of potentially contaminated sites within the ROW and 250 feet from the final permitted route in order to ensure that construction of the proposed Project does not disturb contaminated soils or groundwater.

As part of its SPCC, the Applicant would develop procedures to maintain a clean substation facility and to prevent mishandling of materials should a spill of potentially hazardous materials occur. In addition, the SPCC would detail spill prevention and response procedures for construction. Implementation of this plan would reduce, but not eliminate, the potential that spills could occur. Spills of hazardous materials or fuels that occur during construction or operations would be limited due to the anticipated quantities and adherence to the SPCC plan.

Potential impacts related to environmental contamination from the proposed Project are limited and do not vary by proposed route or variation considered, therefore environmental contamination is not discussed further in Chapter 6 of this EIS.

75 Additional guidance is also provided in MPCA Cleanup fact sheet #1.01 – February 2009 at http://www.pca.state.mn.us/index.php/view-document.html?gid=2807.

Table 5-23 MPCA's "What's in my Neighborhood" Listed Sites in the Proposed Project Area

County	MPCA Site Name	Type	Status	Description	Nearest Project Route	Section	Approximate Distance to Anticipated Alignment (feet)
Roseau	U.S. Customs Building	Leak Site	Inactive	Fuel oil 1 and 2 release Site closure: June 2001 No offsite contamination	Border Crossing Hwy 310 Variation in Border Crossing Variation Area	West	400
	Mende Auto Body & Muffler	Hazardous Waste Site	Active	Small-to-minimal quantity generator	Proposed Blue/Orange Route in the Roseau Lake WMA Variation Area	West	1,735
	Ray Horner Farm	Feedlot	Active	Registered feedlot with 10 or more animal units (AU)	Proposed Blue/Orange Route in the Roseau Lake WMA Variation Area	West	1,720
	Knudson Brothers Farm Inc.	Tank Site	Inactive	Tank data not available	Cedar Bend WMA Variation in the Cedar Bend Variation Area	West	660
	Quentin Grittner Farm	Feedlot	Active	Registered feedlot with 10 or more animal units (AU)	Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area	West	1,285
	Skoglund Farm	Feedlot	Active	Registered feedlot with 10 or more animal units (AU)	Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area	West	476
	Nelson Residence	Leak Site	Inactive	Petroleum tank release. Site closure: May 2013	Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area	West	1,900
	Harvey Johnson Farm	Feedlot	Active	Registered feedlot with 10 or more animal units (AU)	Border Crossing 500 kV Variation in the Border Crossing Variation Area	West	2,094
Lake of the Woods	Williams Dump Site	Investigation and Cleanup	Inactive	State assessment site Unpermitted dump site closure: June 1978	Beltrami North Central Variation 4 in the Beltrami North Central Variation Area	West	116
	Calvin Carson Farm	Feedlot	Active	Registered feedlot with 10 or more animal units (AU)	Beltrami North Central Variation 4 in the Beltrami North Central Variation Area	West	1,226
	Northstar Electric Cooperative	Hazardous Waste Site	Active	Small-to-minimal quantity generator	Proposed Blue Route in the Pine Island Variation Area	Central	812
	MNDOT Truck Station	Leak Site (1504)	Inactive	Gasoline release. Groundwater cont. Closure date: 09/26/1995 Remaining soil contamination Offsite contamination unknown	Proposed Blue Route in the Pine Island Variation Area	Central	812
	Petal Pushers	Leak Site	Inactive	Diesel; Gasoline leaded release Closure date: 02/23/2001 Remaining soil contamination Offsite contamination unknown	Proposed Blue Route in the Pine Island Variation Area	Central	812
Koochiching	Northome Modified Sanitary Landfill	Investigation and Cleanup	Active	State assessment site SA 7935 (Active) Unpermitted dump site REM04735 (Inactive)	J2 Segment Option Variation in the J2 Variation Area	Central	680
	Northome Modified Sanitary Landfill	Solid Waste	Inactive	Landfill closed (SW-225) Owned by MPCA Groundwater monitoring data	J2 Segment Option Variation in the J2 Variation Area	Central	680
	Northome Modified Sanitary Landfill	Industrial Stormwater Permit	Inactive	Industrial SW Permit Termination: 03/17/2000	J2 Segment Option Variation in the J2 Variation Area	Central	680
	Northome Modified Sanitary Landfill	Industrial Stormwater Permit	Active	ISW No exposure exclusion. Effective Start: 12/15/2010	J2 Segment Option Variation in the J2 Variation Area	Central	680

County	MPCA Site Name	Type	Status	Description	Nearest Project Route	Section	Approximate Distance to Anticipated Alignment (feet)
Itasca	Loman Dump	Investigation and Cleanup	Active	State Assessment Site SA 7925 (Active) Unpermitted Dump Site REM04478 (Inactive)	J2 Segment Option Variation in the J2 Variation Area	Central	62
	Balsam Lake II Dump	Investigation and Cleanup	Active	State Assessment Site SA 7858 (Active) Unpermitted Dump Site REM03558 (Inactive)	Proposed Orange Route in the Balsam Variation Area	East	530
	Balsam Store	Tank Site	Inactive	Last site inspection: 05/05/2014 Field Citation MPCA - Closure date: 07/15/14	Proposed Orange Route in the Balsam Variation Area	East	1,710
	Former Balsam Store	Leak Site	Inactive	Diesel; Gasoline, Unleaded release Site Closure: 09/12/2014 Contaminated Soils Remaining Offsite Contamination	Proposed Orange Route in the Balsam Variation Area	East	2,012
	Former Balsam Store	Tank Site	Inactive	Last tank removal: 11/16/1998 Last site inspection: 04/08/1999	Proposed Orange Route in the Balsam Variation Area	East	2,012
	Rhunde Media	Leak Site	Inactive	Fuel Oil 1 & 2; Gasoline release. Site closure: 12/31/1997 Unknown soil and offsite contamination	Proposed Blue/Orange Route near Taconite	East	2,078
	Bray Lake Outlying Canister	Solid Waste	Active	Permit-by-Rule landfill. Facility permit: 10/24/2010 Inspection: 09/24/2010	Proposed Blue Route in the Balsam Variation Area	East	1,312
	Bray Lake Demolition & Disposal	Solid Waste	Active	Open Landfill. Facility permit: 08/06/2008 Last routine inspection: 07/17/12	Proposed Blue Route in the Balsam Variation Area	East	1,600
	MNDOT District 1b Deer Lake	Hazardous Waste Site	Active	Small to Minimal Quantity Generator	Proposed Blue Route in the Pine Island Variation Area	Central	775
	Wamp Lake Dump	Investigation and Cleanup	Inactive	State Assessment Site SA 7862 (Inactive) Unpermitted Dump Site REM05349 (Inactive)	Effie Variation in the Effie Variation Area	East	1,834
	Reckinger Solid Waste Site	Solid Waste	Inactive	Permit-by-Rule landfill.	East Bear Lake Variation in the East Bear Lake Variation Area	East	1,710
	Balsam Elementary School	Leak Site	Inactive	Fuel Oil 1 & 2 release. Site closure: 01/02/2004 Contaminated Soils Remaining	Balsam Variation in the Balsam Variation Area	East	610
	Iron Range Sanitary Landfill	Investigation and Cleanup	Active	State Assessment Site SA 7864 (Active) Unpermitted Dump Site REM04283 (Inactive)	Balsam Variation in the Balsam Variation Area	East	2,074
	Iron Range Sanitary Landfill	Solid Waste	Inactive	Landfill Closed. Owned by MPCA. Groundwater Monitoring Data (EDA - 2764).	Balsam Variation in the Balsam Variation Area	East	2,074
	Iron Range Sanitary Landfill	Industrial Stormwater Permit	Active	ISW No Exposure Exclusion. Effective Start: 12/15/2010	Balsam Variation in the Balsam Variation Area	East	2,074

Source: MPCA 2015, reference (81)

Construction Impacts

Construction of the proposed Project would involve soil disturbance as part of excavation activities. If existing soil or groundwater contamination is encountered during construction, it could create a safety and health concern as construction workers and the nearby public could be exposed to contaminated soils. The greatest potential for disturbing contaminated soils would result from constructing structures and foundations for the proposed **Iron Range** Substation, 500 kV Series Compensation Station, and regeneration locations.

Health and safety risks could be minimized with the implementation of a plan for training construction workers about the protocols appropriate to undertake when contamination is unearthed and identified. If any contaminated soils or groundwater are encountered during construction of the proposed Project, the contaminated material would need to be managed in accordance with state and federal regulations. If these measures are taken the potential adverse impact would be short-term and localized.

In addition, accidental spills of oils or lubricants from construction equipment during construction activities have the potential occur. The Applicant would implement a SPCC plan, including industry-specific BMPs related to environmental contamination in order to avoid potential impacts on public health and safety and the environment as described in Section 2.12 and 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Operation, Maintenance, and Emergency Repair Impacts

During operations, spills of oil immersed transformers at the proposed **Iron Range 500 kV** Substation could occur as well as diesel gas spills at the 500 kV Conversion Station if a back-up generator is needed. Implementation of the SPCC and spill prevention and control BMPs as specified in Section 2.13 would avoid and minimize impacts resulting from operation of the proposed Project. These Applicant proposed measures are potential MN PUC Route Permit conditions.

5.2.2.8 Worker Health and Safety Considerations

This section describes the potential for worker health and safety impacts from the proposed Project.

The most recently available data for fatalities and injuries in the industries that would be involved in the proposed Project was published by the Bureau of Labor Statistics of the U.S. Department of Labor. The industries include the construction of transmission and communication lines and related structures. These data show that these industries have the highest rate of incidents; comprising approximately 45 percent of the reported cases for fatalities and occupational injuries (Bureau of Labor Statistics 2014, reference (82); 2014, reference (83); 2014, reference (84); 2014, reference (85)).

Regulations

The proposed Project would be required to comply with the Occupational Safety and Health Administration (OSHA) standards (29 CFR Parts 1910 and 1926), which (1) provide regulations for safety in the workplace, (2) regulate construction safety, and (3) require a Hazard Communication Plan to identify and inventory all hazardous materials for which material safety data sheets would be maintained. OSHA's standards also require employee training in safe handling of said materials.

The construction contractor would develop various plans, including activity-specific Health and Safety Plan (HASPs) and an Emergency Contingency Plan, to ensure construction activities for the proposed Project are conducted in a safe manner. The HASPs would include such things as the following:

- Requirements for minimum construction distances from residences or businesses and requirements for temporary fencing around staging, excavation, and laydown areas during construction
- Requirements for minimum construction buffers (temporary aquatic exclusion areas) for recreational uses on the lake, such as boating
- Provisions for worker protection as required under the NESC and OSHA 29 CFR Part 1926, Safety and Health Regulations for Construction
- Provisions for railroad safety training and for general worker protection, as required under the NESC and OSHA 29 CFR Part 1926, Safety and Health Regulations for Construction

The ROI for worker health and safety is 1,500 feet from the anticipated alignment and includes the anticipated 200-foot ROW, proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations as these are the locations where workers would be present for Construction, operation, maintenance, and emergency repairs.

Worker and General Public Health and Safety Considerations in the ROI

The presence of workers within the ROI would depend on the anticipated schedule for construction and future operations, maintenance, and repair of the proposed Project components.

General Impacts

Impacts to worker **and general public** health and safety resulting from the proposed Project would be anticipated to be similar across the proposed Project's routes and variations, and substation and compensation locations as construction activities would be similar in all locations. Since potential impacts related to worker health and safety from the proposed Project do not vary by proposed route or variation considered, worker health and safety is not discussed further in Chapter 6 of this EIS. The Applicant would comply with federal, state, and local regulatory requirements regarding **public and** occupational health and safety and implement BMPs to safeguard the workers and the public from transmission line construction and operational hazards.

Construction Impacts to Worker Health and Safety

Accidents that could occur at the proposed Project construction sites would include heavy equipment and commuting vehicle accidents, electrocution, personal accidents (e.g., slips, trips, and falls), hazardous materials spills, construction-induced fires, and accidents due to the use of watercraft, aircraft, or driving equipment across the ice in winter. Specific health and safety risks for large-scale construction projects involving electrical components, working at height, and operating heavy machinery could include the following:

- Falls from working at height
- Crush injuries in excavation work
- Slips and trips
- Cuts and scrapes from sharp tools or construction materials or debris
- Receiving injuries from hand tools and/or rotating machinery
- Electrocution
- Being struck by falling objects
- Manually lifting heavy loads
- Bad working positions, possibly in confined spaces
- Being struck or crushed by a workplace vehicle
- Inhalation of dust
- Handling of rough materials
- Exposure to dangerous substances (chemical and biological)
- Working near, in, or over water
- Hearing damage from loud noises
- Sustaining injuries as a result of an on-road or off-road accident involving a motor vehicle or construction equipment

In order to minimize these potential impacts, the Applicant would comply with all applicable OSHA requirements. The Applicant would implement standard construction, mitigation, and operation and maintenance practices developed from experience with past projects as well as industry-specific BMPs, as specified in Section 2.13. These practices would be based on the specific construction design, prohibitions, maintenance guidance, inspection procedures, and other activities involved in construction of the proposed transmission line, substation, and conversion station facilities as specified in the Route Permit. Compliance with OSHA's standards for occupational health and safety along with implementation of BMPs would avoid and minimize impacts on workers' health and safety resulting from the construction and operation of the proposed Project, regardless of the route or variation considered since construction and operation procedures would be similar for the entire proposed Project.

Operation, Maintenance, and Emergency Repair Impacts

Under normal operating conditions, public safety hazards associated with the proposed Project include electrical shocks. These can occur from working and recreating under or near transmission lines. Electrical shocks can occur from touching transmission structures or other metallic objects near power lines. These result from voltage induced from the power line into nearby metal objects. The severity of the shock would reflect the voltage of the power line, the distance from the conductor, the size and length of the object, its orientation to the line, and how well the object is grounded (Bonneville Power Authority n.d., reference (66)).

Another potential worker safety hazard associated with the proposed Project could be arc flashes. Arc flashes occur when electricity from a high voltage line travels between conductors through the air and is commonly defined as "a luminous bridge formed in a gap between two electrodes". These can be initiated through accidental contact, equipment which is underrated for normal operational conditions, contamination or tracking over insulated surfaces, deterioration or corrosion of equipment and, or parts, as well as other causes (General Electric, n.d., reference (86)). These occur in normal conditions but also can be caused by smoke from fires (Bonneville Power Authority n.d., reference (66); and Great River Energy n.d., reference (67)). Arc flashes can produce intense heat and light. If individuals get too close to energized power lines without touching them an arc of electricity can form between the power line and the person and result in serious burns (Great River Energy n.d., reference (67)). While rare, the potential for impacts due to arc flashes from the proposed Project would be further minimized by restricting or controlling access to the transmission line.

Although there are no means of preventing lightning strikes, safety measures, including shield wires, are incorporated into transmission line design to prevent flashovers or power surges due to lightning strikes. A shield wire is a conductor connected directly to the top of a transmission structure to protect conductors from a direct lightning strike, minimizing the possibility of power outages. These measures would decrease the likelihood of the adverse effects of lightning strikes.

5.3 Route Specific Impacts to West Section

The West Section contains 15 alternatives as follows: the Proposed Blue Route, the Proposed Orange Route (which are combined in the West Section), four variations within the Border Crossing Variation Area, two variations in the Roseau Lake WMA Variation Area, one variation within the Cedar Bend WMA Variation Area, two variations within the Beltrami North Variation Area, and five variations in the Beltrami North Central Variation Area. Impacts that are unique to a specific alternative within the West Section are described in the following sections.

5.3.1 Human Settlement

5.3.1.1 Aesthetics

This section describes the aesthetic, or visual, resources within the West Section and the potential impacts from the proposed Project.

Aesthetic, or visual resources, are generally defined as the natural and built features of a landscape that may be viewed by the public and contribute to the visual quality and character of an area. Aesthetic resources form the overall impression that an observer has of an area or its landscape character. Distinctive landforms, water bodies, vegetation, and human-made features that contribute to an area's aesthetic qualities are elements that contribute to an area's visual character. Visual quality is generally defined as the visual significance or appeal of a landscape based on cultural values and the landscape's intrinsic physical elements (Smardon, R.C. et al 1988, reference (87)).

Visual sensitivity is a measure of viewer interest and concern for the visual quality of the landscape and potential changes to it. Visual sensitivity is determined based on a combination of viewer sensitivity and viewer exposure. Viewer sensitivity varies for individuals and groups depending on the activities viewers are engaged in, their values and expectations related to the appearance and character of the landscape, and their potential level of concern for changes to the landscape. High viewer sensitivity is typically assigned to viewer groups engaged in: recreational or leisure activities; traveling on scenic routes for pleasure or to or from recreational or scenic areas; experiencing or traveling to or from protected, natural, cultural, or historic areas; or experiencing views from resort areas or their residences. Low viewer sensitivity is typically assigned to viewer groups engaged in work activities or commuting to or from work U.S. Department of Transportation (USDOT) 1981, reference (88); U.S., Forest Service (USFS) 1974, reference (89)).

Viewer exposure varies for any particular view location or travel route depending on the number of viewers and the frequency and duration of their views. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. Other factors, such as viewing angle and viewer position relative to a feature or area, can also be contributing factors to viewer exposure.

The ROI for this analysis of impacts to aesthetics is 1,500 feet from the anticipated alignment of the

transmission line and within 1,500 feet from the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. Potential aesthetic resources included within the ROI are residences, historic architectural sites, state trails, county parks, state parks, state forests, state forest campgrounds, national forests, scenic byways, national parks, snowmobile trails, water access points, and state water trails.

The 1,500 foot ROI for aesthetic resources was identified because the proposed Project is most likely to be visible within this near-foreground distance zone and views of the proposed Project from aesthetic resources within this distance zone have the greatest potential to result in visual impacts for sensitive viewers (USFS 1974, reference (89); USFS 1995, reference (90); Bureau of Land Management 1986, reference (91); FHWA 1981, (88)).

Visual Character of West Section

The existing landscape character provides the context for assessing the effects of changes to the landscape. Major components of landscape character that define the appearance of the landscape include landform, water, vegetation, and human or cultural modifications. Descriptions of these elements are based on ecological subsections developed by the MnDNR and the USFS as part of an ecological classification system (ECS) (MnDNR 2015, reference (92)) in combination with observations of human or cultural modifications to the landscape. The ecological subsections for the West Section are shown on Map 5-2 and described in more detail in Section 5.3.4.2.

The West Section is comprised of two ecological subsections, the Aspen Parklands and the Agassiz Lowlands. The Aspen Parklands subsection is found in the western portion of the West Section and is considered a transitional landscape between prairies to the west and forest provinces to the east. The landform is generally flat with few areas of low topographic relief. Streams, wetlands, ponds, and small lakes are scattered throughout the area. Vegetation is a mosaic of prairie, brushland, woodland, and peatlands, and forests are common. The Agassiz Lowlands subsection occurs over most of the central and eastern portions of the West Section and is also generally flat with some low sand ridges. Streams, wetlands, ponds, and lakes are fairly common. Vegetation consists of extensive peatlands in low-lying areas and upland forests of aspen and birch or jack pine in the higher sand ridge areas. Peatlands consist of a mosaic of black spruce or tamarack forests, meadows, and fens.

The northern portion and much of the south-central and eastern areas of the West Section are forested. Several state forests, including the Lost River, Beltrami Island, and Lake of the Woods, are located within or adjacent to variation areas in the West Section (Map 5-5). Lake of the Woods State Forest occupies the northeast part of the West Section and the Roseau River, which runs south to north through the western portion of the West Section, is the primary stream in the area. Much of the western and central portions of the West Section consist of agricultural fields, mostly row crops, pastures, and hay fields, lined by drainage ditches laid out in rectilinear patterns. Human settlement is sparse throughout the section and consists of scattered rural residences, often with associated farm buildings, and a few small towns. Several transmission lines run through the West Section and several tall communication towers also are scattered through the area (Map 5-4). Views in agricultural areas of the section are expansive due to the flat landscape and open fields. Views in forested areas tend to be more enclosed and limited due to screening by the trees.

The number of residences within 500 feet and 1,000 feet of the anticipated alignment and the number of historic architectural sites within one mile of the anticipated alignment are provided in Section 6.2. No state trails, county parks, state parks, state forest campgrounds, national forests, national forest parks, water access points, or water trails were found within 1,500 feet of the proposed routes or variations in the West Section.

General Impacts

General impacts on existing aesthetic resources may be caused by construction and operation of the proposed Project and could include short-term and long-term impacts. Impacts on aesthetics are assessed based on the extent of changes to landscape character and scenic quality, the level of contrast introduced by the proposed Project, its proximity to viewers, and the visual sensitivity related to views of the proposed Project.

Impacts on aesthetic resources in the West Section due to construction or operation of the proposed Project would result from changes to existing views of the landscape by viewers with high visual sensitivity (i.e., people with high interest and concern for the visual quality of the landscape and

changes to it, such as residents from the vicinity of their homes or people engaging in recreation or leisure activities). Aesthetic impacts may include a substantial change to the landscape character (e.g., from rural, agricultural, or natural to more developed or industrial-appearing) or reduction in scenic quality (e.g., crossing through a scenic vista or other area considered to be of high scenic quality or value). Aesthetic impacts would be determined based largely on the level of increased contrast produced by the proposed Project as viewed by sensitive viewers. Aesthetic impacts are likely to be greatest for views of the proposed Project in the foreground distant zone (i.e., up to about 0.5 miles from the proposed Project), but impacts can also be substantial for views from greater distances. According to a recent study on the visibility of transmission lines in western landscapes by Sullivan et al. (2012, reference (93)), 500 kV lattice transmission structures were determined to be noticeable to casual observers at up to 10 miles and strongly attracted attention at up to 3 miles. To further characterize the potential impacts in the West Section, photographs were taken and simulations created for the location where the proposed Project crosses Waters of the Dancing Sky Scenic Byway (State Route 11) in the West Section (Viewpoint 04a in Appendix N). Further discussion of the potential aesthetic impacts of the proposed Project on that aesthetic resource is included in Section 6.2.2.1.

Construction Impacts

Short-term impacts on existing aesthetic resources may occur primarily during the construction phase. Short-term impacts could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations for transmission line construction. Some construction phase activities, such as access road construction and placement of temporary construction areas (e.g., construction yards, staging and laydown areas, pulling and tensioning sites) would involve grading and removal of vegetation which would later be restored following construction. Some access roads would be wider during construction to accommodate larger construction vehicles, thereby resulting in a greater impact during construction than operation. Likewise, some access roads would be temporary and fully restored at the end of construction. ROW clearing may also involve removal of vegetation in some areas that would later be restored. Short-term aesthetic impacts could result from contrast created by vegetation removal; grading that noticeably alters existing landforms; and materials, equipment, vehicles, structures, fences, and other elements that would be present during construction.

Vehicle and equipment operations may produce visible dust during land-clearing operations and from traveling on unpaved existing and new roadways. Overhead line cranes may be visible above the transmission line structures due to their height. Ground-level activities such as ROW clearing and site preparation require equipment such as bulldozers, excavators, loaders, and dump trucks. Foundation and structure construction activities require large delivery vehicles and concrete trucks. The local increase in general vehicle traffic could be a source of visual impact, depending upon the number of trips to a specific location. On-site parking could be noticeable during construction if certain sites require a larger number of workers and, consequently, their vehicles. Nighttime lighting for construction or safety and security in construction areas may also result in short-term aesthetic impacts. Although construction-related aesthetic impacts would be temporary, the severity of these impacts would depend not only on the contrast produced by the construction activities, but also on the visibility and proximity of these to viewers and the sensitivity of the viewers to changes in the landscape's character and quality.

Operation, Maintenance, and Emergency Repair Impacts

Long-term impacts on aesthetic resources may occur primarily during operation of the transmission line and would occur over the life of the proposed Project. For transmission lines, their vertical and geometric form and line and regular linear spacing often result in strong contrast with the mostly horizontal lines of flat terrain and the rounded, natural forms and lines of forested areas. Where present, these structures often are silhouetted against the sky above the horizon line, which draws viewer attention and increases their contrast in open landscapes. The presence of other structures of similar form nearby tends to somewhat reduce their level of contrast. However, increased numbers of structures, especially when they stand higher or have a different form or color, may add to the texture of structures and increase contrast. New transmission structures introduced into the landscape where other tall, vertical structures are not present would tend to be dominant and create strong contrast in the landscape. Where a new transmission line is adjacent to or very near an existing transmission line of similar type and height, or where other tall structures (e.g., communication towers) are common features, the new structures

are more likely to be co-dominant with the existing ones and produce less contrast.

In addition to their form, line, and texture, transmission lines may also produce strong contrast due to the reflectivity of conductors or color or finish of structures, especially if they have a shiny, metallic galvanized finish. Changes to landform and vegetation for access roads, pads, and ROW-clearing may be visible but generally would not be noticeable in mostly flat landscapes with sparse vegetation; however, there may be exceptions to this for foreground views where the transmission line traverses areas with dense vegetation and/or varied terrain. Aesthetic impacts could be substantial where a ROW is cleared or expanded through a forested area and creates a strong linear and/or rectilinear pattern that contrasts strongly with predominantly natural forms and lines of the characteristic landscape. Depending on their design and where they are sited, other elements of the proposed Project, such as the substation, **500 kV** Series Compensation Station, and regeneration stations, may also result in aesthetic impacts. In addition to contrast produced by their form, line, color, and texture, lighting associated with these proposed Project elements could potentially result in long-term aesthetic impacts due to introducing new sources of nighttime lighting where it did not previously exist or substantially increasing the amount or intensity of lighting in some areas. The transmission line itself is not likely to result in any long-term aesthetic impacts due to lighting because the structures would not exceed 200 feet in height and would therefore not be subject to FAA requirements for safety lighting and no other lighting for the transmission line is proposed. As with short-term aesthetic impacts, the severity of long-term aesthetic impacts would depend not only on the contrast produced by the transmission line, but also on its visibility and proximity to viewers and the sensitivity of the viewers to changes in the landscape's character and quality.

The potential impacts of the proposed routes and variations on aesthetic resources in the West Section are discussed in Section 6.2.2.1. Applicant proposed measures to avoid, minimize, or mitigate impacts on aesthetic resources are summarized in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

5.3.1.2 Land Use Compatibility

This section describes existing land uses within the West Section of the proposed Project and the potential impacts to that resource from the proposed Project.

There are large areas of state forest located throughout the entire project area and a patchwork of federal land interests (mostly USFWS interests) in the West and Central Sections. Applicable national, state, and local land use and zoning policies are described in this section. Other land use categories for areas outside of federal or state lands were identified based on a review of aerial photographs and data from the United States Geological Survey (USGS) National Landscape Conservation System (NLCS) Gap Analysis Program (GAP).

The ROI for this analysis of land use includes land within 1,500 feet on either side of the anticipated alignment of the transmission line and within 1,500 feet of the footprint of the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. This ROI includes the anticipated 200-foot ROW and adjacent lands that would be impacted by construction and operation of the proposed Project.

Land Use Compatibility in the West Section

The West Section is located in Roseau and Lake of the Woods counties in areas that are primarily rural with sparse development. The West Section encompasses the towns of Roseau and Warroad in Roseau County, and the towns of Roosevelt and Williams in Lake of the Woods County.

The predominant land uses in the West Section are state forest land, state fee lands, federal interest (USFWS) lands, and agriculture. **There are two parcels identified as North American Wetland Conservation Act federal aid parcels located within the Roseau Lake WMA (Map 5-5).** There is also a large number of Red Lake Reservation parcels located throughout the West Section. The various land uses along the proposed routes and variations are shown in Map 5-5.

As shown in Map 5-5, there is a patchwork of USFWS Interest Lands located throughout the West Section, including some that are leased to the State of Minnesota. The West Section also contains the Lost River State Forest, Beltrami Island State Forest, and Lake of the Woods State Forest. In 2013, the USFWS and the MnDNR released a joint comprehensive land use management plan for the Beltrami Island Land Utilization Project, an area that is approximately the same as the Beltrami Island State Forest (MnDNR 2015, reference (94)).

The State forest land consists primarily of undeveloped forest and swampland and is concentrated in the northwest and southeast

areas of the West Section. A number of recreation opportunities are present in the state forests which are discussed in more detail in Section 5.2.1.9. The state forests are managed by the MnDNR Division of Forestry which also provides fire protection and promotes conservation and recreational use of the state's forests. State fee lands are managed by MnDNR and include Minnesota School Trust Lands that generate revenue from the sale of mineral leases, timber sales, surface leases, utility licenses, easements, the sale of land, and state forest campground fees, the revenues are then provided to Minnesota's public schools (MnDNR 2015, reference (95)). There are numerous types of state lands in the West Section, including Consolidated Conservation lands (con-con), Other - Acquired Tax Forfeit and Volstead, Trust Fund, and Federal - State Lease.

Developed and urban land uses make up small portions of the West Section and these uses are concentrated in the cities of Roseau and Warroad. Some scattered residences, airstrips, and airports are scattered throughout the West Section (Section 5.2.1.6).

The West Section is primarily composed of rural, unincorporated communities; therefore, no local township land use plan or ordinances were identified. Relevant elements of county comprehensive plans and ordinances are described below. A MN PUC Route Permit would supersede all local zoning, building, or land use regulations; including local, county, and regional regulations (Minnesota Statutes, section 216E.10, however, the Route Permit does not preempt other state or federal permits. Any route crossing state lands or waters would require a license to cross as required under Minnesota Statutes, section 84.415 and Minnesota Rules, chapter 6135. Regulations covering the granting of permits for rights-of-way across USFWS Interest Lands (including easements) are promulgated in 50 CFR 29.21 and 29.22.

The **Roseau County Floodplain Management Ordinance** allows for utility transmission lines as a conditional use for Floodway Districts and General Flood Plain Districts. Transmission lines would be considered a permitted use in the Flood Fringe District if allowed by local zoning or if they are not considered a public nuisance when no local zoning exists. Conditional uses may not cause an increase in the stage of a 100-year or regional flood or cause an increase in flood damages in the reaches affected (Roseau County 2001, reference (96)).

The **Lake of the Woods County Comprehensive Plan** does not include any direct policies regarding transmission lines. The plan identifies land uses along the proposed routes and variations to consist primarily of forest and wetlands and identifies some land near the proposed route and variations as appropriate for future rural development. Rural development is described as industrial, commercial, tourism, residential, or other uses appropriate to the site's characteristics and neighborhood character. The plan describes the future land uses as a guide for the county and would not preclude construction of transmission lines and associated facilities. The plan recognizes that land use patterns are likely to be modified by changes in land ownership, economic activity, and changes in state or local policy (Headwaters Regional Development Commission 2000, reference (97)).

The **Lake of the Woods County Zoning Ordinance** identifies utility transmission lines as allowable in all non-shoreland areas and shoreland areas with the exception of Natural Environment Lakes, which specifically includes Winter Road Lake in the West Section. The Natural Environment Lakes shoreland area includes land extending 1,000 feet from the ordinary high water level. The nearest route or variation would be Variation 2 within the Beltrami North Central Variation Area, located approximately 5,000 feet from the Winter Road Lake, therefore the Lake of the Woods County zoning ordinance would not preclude construction of the proposed Project (Lake of the Woods County 2011, reference (98)).

Minnesota Forest Resource Strategies is an action plan developed by the MnDNR that identifies threats, opportunities, and strategies for the state's forests. The plan does not address specific land uses and does not preclude construction of transmission lines within state forests, however, fragmentation of state forest lands as a result of a new transmission line ROW is identified as a threat (MnDNR 2010, reference (99)).

The **Beltrami Island Land Utilization Project Comprehensive Conservation Management Plan** is a joint plan between MnDNR and the USFWS providing guidance on management of the 86,000 acres of federally owned land. The plan indicates that new construction of pipeline or transmission lines are not likely to be approved in the area (MnDNR 2013, reference (94)).

General Impacts

Section 6.2 summarizes the potential impacts of the proposed routes and variations on land use in the West Section. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on land use. These Applicant

proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Construction of the transmission line and associated facilities would result in temporary disturbances to land uses within the ROW and surrounding area. Disturbances related to construction activities would include limiting property access due the presence of construction work areas and equipment. These disturbance impacts related to construction activities would be temporary during the duration of construction.

Operation, Maintenance, and Emergency Repair Impacts

Operation, maintenance, and emergency repairs of the proposed Project would result in long-term impacts on land use within the ROW and surrounding area. The proposed Project would limit future land uses within the ROW for the lifespan of the proposed Project. The Applicant would acquire easement rights for the ROW that would limit uses or activities that would interfere with operation or maintenance of the transmission line and would clear all woody vegetation and brush within the ROW, resulting in long-term change in land cover for forest or shrub land. This conversion from forest land in state fee areas where timber can no longer be harvested would result in a reduction of revenues to the School Trust Land program. Agricultural land uses would continue to be allowed in the ROW, but the presence of transmission structures may prevent some farm equipment from accessing land (Section 5.3.2.1). The presence of transmission structures would impact the ability of private aircraft, including those used for agricultural purposes to travel near the ROW. This might require aircraft to alter their travel patterns and require farmers to find alternate methods for application of pesticides to crops. **Access roads would allow the public to access areas that were previously inaccessible.**

5.3.1.3 Cultural Values

This section describes the cultural values within the West Section and the potential impacts to cultural values from the proposed Project.

Cultural values are shared beliefs or attitudes that define what is acceptable or unacceptable, important or unimportant, right or wrong, workable or unworkable and provide a framework for unity and sense of identity for a community, region, or people.

The ROI for this analysis of cultural values in the West Section includes Roseau and Lake of the Woods counties which are crossed by the proposed routes and variations. The proposed Project is not expected to have the potential to impact cultural values outside these areas.

Cultural values are assessed based on a review of the available literature (discussed below) and a review of the comments provided during Public Scoping Meetings in the proposed Project area.

Cultural History

The proposed Project is located in an area dominated by both Euro-American and American Indian residents, with differing cultural values. The Euro-American residents of this area of northern Minnesota are largely of Protestant German and Scandinavian descent, and these northern European based communities may still identify with those ethnic heritage. Many of these counties suffered particularly badly in the Great Depression. They are predominantly populated by older, primarily white, mostly conservative people with incomes generally lower than the national average.

In the book, *Our Patchwork Nation*, authors Dante Chinni and James Gimpel used U.S. Census data to analyze the entire United States county by county and provide a list of 12 distinct types of communities that comprise the nation (Chinni and Gimpel 2010, reference (100)). In Chinni and Gimpel's analysis, Roseau and Lake of the Woods counties are identified as "Emptying Nest" type communities. Emptying nest counties are generally not densely populated, and mostly consist of strings of small towns.

The Euro-American population in the project area has been described by journalist Colin Woodard as part of a large region he called "Yankeedom." (Woodard 2012, reference (101)). According to Woodard, the values of the region can be described as middle-class, comfortable with local government regulation, and with a general belief that government should be used for improving the lives of its citizens.

The West Section includes agricultural areas, particularly in Roseau County. The more agricultural communities of the West Section appear to have cultural values that relate to the economic activities of agriculture, tourism, and manufacturing. Common themes mentioned on the websites of regional cities and business communities stress hard work, optimism, and appreciation of the natural world. The major values within the region include pragmatism, appreciation, and use of natural resources, individualism, political and social conservatism, community pride, and economic well-being (Minnesota Power 2014, reference (1)).

Public comments provided during EIS scoping raised concerns related to avoiding impacts to agricultural land, an indication of the value placed on preservation of agricultural life. In addition, concerns were raised specifically relating to possible visual and environmental impacts, implying cultural values of visual aesthetics of the landscape and sustained environmental conditions. Another common concern of the public comments was possibly decreasing home or land values, something that would be an understandable concern for people living on fixed incomes. This would imply valuing a certain standard of living and quality of life (DOE and DOC-EERA 2014, reference (102)).

Before Euro-American settlement, the proposed Project area was long inhabited by numerous American Indian tribes. Presently, different bands of the Anishinabe (also known as Ojibwe or Chippewa), the most prominent tribe in the area, retain authority over seven reservations within northern Minnesota. Most of the Ojibwe or Chippewa people live on land their ancestors settled before the coming of Europeans. This traditional homeland (and its resources contained within it) was immense and continues to be regarded as a gift from the Great Spirit to the Anishinabe people; a gift that belongs to all tribal members.

In the early 1700s, this area was largely occupied by Dakota tribes. By the mid-1700s, however, Anishinabe hunting, trapping and trading forays evolved into migration and the eventual dispersion into the area. This shift, which spanned many generations, brought the Anishinabe—driven by opportunities in the west and Iroquois raids—from the region near Sault St. Marie, Michigan, and Lake Huron into northern Minnesota. The Anishinabe to the north and south of Lake Superior evolved somewhat different economies and cultures as a result of different environments and trade relations (Meyer 1992, reference (103)). By the late 1700s, Anishinabe bands replaced the Dakota villages on the lake and stream sites in northern Minnesota. The Dakota largely moved to the prairies of the Minnesota and Missouri rivers.

Ceded Territory Areas

Beginning in 1837, the U.S. government and the Anishinabe entered into a complex series of treaties and agreements with the federal government ceding territory to the U.S. (see inset in Map 5-6.) Four of these treaties include ceded territory potentially crossed by the proposed Project:

- **Treaty of 1855** (Mississippi, Pillager, Winnibigoshish Bands) - Ceding territory in north central Minnesota west of 1854 Treaty border.
- **Treaty of 1863** (Red Lake, Pembina Bands at Old Crossing) - Ceding territory on western Minnesota border along the Red River to the Canadian border and into Dakota Territory. This treaty was subsequently modified in 1864.
- **Treaty of 1866** (Mississippi Band) - Ceding territory at Canadian Border west of 1854 Treaty Border, near Lake Vermillion, establishing Bois Forte Reservation.
- **Nelson Act of 1889** (and subsequent agreements with the Red Lake Band) - Ceding territory between west 1855 Treaty boundary and east 1863 Treaty Boundary; and defined White Earth, Leech Lake, Nett Lake (Bois Forte), Grand Portage, Fond du Lac, and Mille Lacs Band members living on reservations as a single group of people.[76]

The first of these treaties, the 1855 Treaty, involved three Anishinabe Bands (the Mississippi, Pillager, and Lake Winnibigoshish). It covers an area in the Central and East sections of the proposed Project area. Eight years later, the Red Lake Band and Pembina Bands entered into the Treaty of 1863. This treaty is also known as the "Old Crossing Treaty." In that treaty, the Red Lake Band ceded 11 million acres of rich farm land along the Red River of the North in Minnesota and North Dakota to the U.S. The 1866 treaty ceded territory around Lake Vermillion established the Bois Forte Reservation at Nett Lake and Deer Creek (Itasca County). The Lake Vermilion sections of the Bois Forte lands were later defined in an 1881 Executive Order. Then, in 1889, in the treaty establishing the current Red Lake Reservation boundaries, the Red Lake Band ceded another 2.9 million acres referred to as the "Act for the Relief and Civilization of the Chippewa."

Finally, in addition to these four treaties and agreements with the U.S., the Red Lake Band ceded a western section of Red Lake Reservation in the Treaty of 1902. Under this treaty, the Red Lake Band ceded a 256,152 acre area to the U.S. known as the "Western Townships." This treaty area is located west of the proposed Project area, but it involved the Red Lake Band so it is also summarized here for purposes of completeness.

76 Two years following the passage of the Indian Reorganization Act of 1934 which provided for the incorporation of tribal governments, these Bands incorporated as the Minnesota Chippewa Tribe.

Indian Reservations within the Proposed Project Area

As a result of these treaties, there are two federally recognized Indian tribes with reservations in the proposed Project area: the Red Lake Band and the Bois Forte Band. The larger of these is the Red Lake Band of Chippewa, who hold more than 840,000 acres of land, most of which is located within two large contiguous areas around Upper and Lower Red Lake, but whose holdings also include hundreds of small parcels spread throughout the counties in the Central Section. Both of these reservations are shown in Map 5-13, which shows the Central Section of the proposed Project area. The total Red Lake reservation area is larger than the state of Rhode Island, and Red Lake itself is the largest fresh water lake in the country wholly contained within one state. Because the Red Lake Reservation is located in the Central Section of the proposed Project area, additional background on the Red Lake Band is provided in Section 5.4.1.3.

The Bois Forte Band has also lived in northern Minnesota for centuries. The Bois Forte Reservation consists of three parts. The largest sector is at Nett Lake in St. Louis and Koochiching counties, which is home to the majority of Bois Forte Band members and the Band's Tribal Government Offices. The smallest sector is the Vermilion Reservation, located near the city of Tower on Lake Vermilion in St. Louis County. The only part of the Bois Forte Reservation within the project area is the 23,000 acre Deer Creek sector in Itasca County. No tribal members currently live there. Because the Bois Forte community lies completely in the Central and East sections of the project area, it is discussed more fully in Section 5.4.1.3.

The complex history of the area's treaties and the parties involved in them is outside the scope of this EIS. In general, however, the history of these treaties involved plans for allotting reservation land to individual families so as to replace the concept of shared ownership of Anishinabe people with a new system of private property. Starting with the Treaty of 1855, the treaties were intended to help Anishinabe people to be farmers on individually-owned plots of land; however, the Red Lake Band never accepted allotment. An example of the difference in historical cultural values between the Red Lake Band and Euro-Americans is provided in Section 5.4.1.3.

The Anishinabe tribes' hunting, gathering, and fishing rights in these ceded areas is the subject of a complex, ongoing legal dispute. This analysis of cultural values and the impacts of the proposed Project do not address these ongoing legal issues, but acknowledges and discusses the tribes' on-going interest in these rights that they retained in sections of the project area that are located within the ceded territory but outside of reservation boundaries.

As noted in Section 1.2.4, the NHPA (54 U.S.C. 306108) and Executive Order 13175 requires federal agencies to consult on a government-to-government bases with Indian Tribes that may be affected by the proposed Project. DOE requested initiation of Section 106 Consultation under the NHPA for the proposed Project in a November 19, 2014 letter to the Minnesota SHPO. DOE initiated its government-to-government tribal consultation efforts in a June 27, 2014 letter to potentially affected tribes, and has held consultation meetings in the proposed Project area in northern Minnesota. DOE's on-going consultation aids in identifying cultural values that the Anishinabe tribes ascribe to the area, its resources, and what the possible effects would be to the held values from construction and operation of the proposed Project.

General Impacts

Impacts to cultural values can be minimized primarily through corridor sharing with existing transmission infrastructure. Where existing infrastructure is present, impacts to the values addressed in Section 5.3.1.3 are likely to be marginal.

Although some permanent impacts to cultural values may be felt on a local basis, particularly where transmission lines run close to communities whose values are at odds with the presence of new, large infrastructure projects, at a county-wide or regional level no conflict with cultural values is anticipated. Since communities within the West Section are fairly homogenous, the proposed routes and variations considered are anticipated to have similar impacts on cultural values. These impacts are limited and do not vary by proposed route or variation considered; therefore, cultural values are not discussed further in Chapter 6 of this EIS.

Pragmatism and Quality of Life

The people living in this area tend to value pragmatism as seen by their concern for maintaining a certain standard of living. The Applicant has indicated that data gathered through their public engagement efforts suggests that there is a general understanding of the need for the proposed Project but that the local benefits of the proposed Project, in the form of tax payments to county government, may not be perceived as a direct benefit (Minnesota Power 2014, reference (1)). If there is no perceived

direct benefit in terms of better, more reliable energy to the communities, or if area residents sense it would inhibit their economic life in relation to tourism, agriculture, or decreasing land values, and inadequate compensation for use of their land, there could be adverse effects on the cultural values of pragmatism and quality of life. Such impacts are more closely linked to the proposed Project as a whole, and are unlikely to vary with the particular route that is permitted.

Natural Resource Appreciation and Use

The proposed Project would have direct effects on a number of natural resources and visual aesthetics to varying degrees, depending on the final route selection. Potential impacts related to natural resources and aesthetic from the proposed Project are discussed further in Chapter 6 and Chapter 7 of this EIS. Impacts to natural resources and aesthetics may be a proxy for the potential impacts to the cultural or traditional values tied to natural resource appreciation and use. However, given the broad region over which these values are held and the difficulty in quantifying impacts to cultural values, measurable differences in impacts to cultural values at the community or regional scale are not expected across the various proposed routes and variations evaluated in this EIS.

Individualism and Community Pride

The values of individualism and community pride are tied to the overall quality of life experienced by the area's residents. The basic elements of the community that are sources of community pride include a shared sense of the natural beauty of the area, access to the natural environment, and tourism. The proposed Project would allow local residents to continue their overall individual economic and social activities, and access to the natural environment and tourism is not expected to be permanently negatively affected by the proposed Project. An impact on the sense of beauty of the natural environment could occur in areas where a proposed route or variation is closest to occupied areas. Potential impacts related to aesthetics from the proposed Project are discussed further in Chapter 6 of this EIS.

Economic Well-being, Quality of Life, and Standard of Living

As discussed above, the proposed Project would have a beneficial, short-term, direct impact on the local economy during construction. As discussed further in Chapter 6 of this EIS, there should be no lasting adverse impacts on economic activities related to hunting, fishing, hiking, snowmobiling, and other recreational activities where local businesses provide services to tourists for income. Therefore, no indirect effects on economic well-being, quality of life, and standard of living are anticipated.

Construction Impacts

General impacts to cultural values from the proposed project are discussed above. The construction phase of the proposed Project is not expected to result in impacts to cultural values cultural values held by Euro-Americans or American Indian tribes.

Operation, Maintenance, and Emergency Repair

General impacts to cultural values from the proposed project are discussed above. Operation, maintenance, and emergency repair are not expected to result in impacts to cultural values held by Euro-Americans or American Indian tribes.

5.3.2 Land-Based Economies

Constructing and operating the proposed Project could potentially affect land-based economies in the proposed Project area. Transmission lines and associated structures are a physical, long-term presence on the landscape, which could prevent or otherwise limit use of the land for other purposes. When placed in an agricultural field, transmission line structures have a relatively small footprint, yet they could potentially interfere with farming operations. In addition, tall trees are not allowed in transmission line ROWs, a restriction that could affect forestry operations along the ROW. **Finally, transmission line structures could affect access to mineral resources, and EMFs associated with transmission lines may mask or prevent geophysical detection of mineral resources.**

5.3.2.1 Agriculture in the West Section

This section describes the agricultural resources within the West Section and the potential impacts from the proposed Project.

Agriculture is defined as the cultivation of plants and animals for sustaining and enhancing human populations. For the purposes of this analysis, impacts to agriculture were assessed by evaluating impacts to four farmland types: prime farmland, prime farmland if drained, farmland not classified as prime farmland, and farmland of statewide importance.

Prime farmland is protected under the Farmland Protection Policy Act (FPPA) of 1981 and can be

described as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides and labor" (7 CFR, section 657.5 (a) (1)). The land could be cropland, pasture, rangeland or other land, but not urban built-up land or water. The FPPA is intended to minimize the conversion of farmland to nonagricultural uses. The Act also ensures that Federal programs are administered in a manner that, to the extent practicable, would be compatible with private, state, and local government programs and policies to protect farmland. The implementing procedures of the FPPA and Natural Resources Conservation Service (NRCS) require Federal agencies to evaluate the adverse effects (direct and indirect) of their programs on prime farmland and farmland, and to consider alternative actions that could avoid adverse effects. According to the FPPA, this evaluation is not applicable to non-Federal activities on private or non-Federal lands where Federal assistance for farmland conversion is not requested (7 CFR Part 658). Therefore, the FPPA is not applicable to the proposed Project.

Agriculture is one of the more minor land-based economic resources in the West Section. In 2010 cash receipts for agricultural operations were approximately $102 million in Roseau County and approximately $10 million in Lake of the Woods County (MDA 2012, (100)). Principal crops in Roseau and Lake of the Woods counties include sugar beets and wheat (Ye 2014, reference (105)). Farmers in the West Section raise livestock, including hogs and pigs, broiler or other meat-type chickens, cattle and sheep (USDA 2012, reference (106)). The following sections describe potential route-specific impacts to farmland, organic farms, livestock, aerial spraying, irrigation system and precision farming practices.

The ROI for this analysis of impacts to agriculture includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations. This ROI was selected based on an expectation that, given the construction activities proposed, the majority of impacts on agriculture would likely be limited to this area.

Bee keeping is an important agriculture practice within the West Section. There is some evidence to suggest that exposure to bees above 4.1 kV/m may impact bee behavior, queen loss, or honey bee foraging rate (Greenberg et al. 1981, reference (200)). The maximum field strength directly under the transmission line for the proposed Project would be 6.41 or 7.03 kV/m, depending on the type of structure used (Table 5-20). However, the maximum field strength at the edge of the ROW would drop to between 1.4 and 2.4 kV/m, depending on the type of structure used (Table 5-20). Bindokas et al. (1988, reference (201)) followed up on the Greenberg et al. (1981, reference (200)) study and examined the role of induced current in bee colonies. This study found that even up to 100 kV/m electric field strength in the bee colony entrances, there was no impact on hive weight if the tunnels were dry. By wetting the bee entrance either through condensation or rain, an induced current is able to flow and is focused in these tunnels. Where it is not possible to re-route the proposed transmission line to avoid existing bee colonies, hives should be moved from directly under the transmission line as a precautionary measure. The MN PUC could require the Applicant to work with bee keepers to move existing bee colonies towards the edge of the ROW or to minimize impacts by installing mesh metal screening that is grounded to the earth as a condition in the Route Permit.

Farmland

Agricultural land in the West Section includes lands designated as prime farmland, prime farmland if drained, farmland not classified as prime farmland, and farmland of statewide importance. As noted above, prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing crops and is also available for this use. Farmland of statewide importance includes other land that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops.

Potential impacts to prime farmland, prime farmland if drained, farmland not classified as prime farmland and farmland of statewide importance from the proposed Project are discussed in Chapter 6 of this EIS. Strategies for avoiding, minimizing, or mitigating potential impacts to these types of farmlands are similar to those described below for all agricultural lands.

Organic Farms

While the presence of a high voltage transmission line on or near an organic farm would not directly affect a farm's organic certification, special construction and maintenance procedures would need to be followed to avoid impacts to these farms. Herbicides, pesticides, or other substances prohibited by the USDA National Organic Program

could not be used on or near the organic farms, and construction vehicles would need to be cleaned prior to entering organic farms to prevent tracking offsite soil or plant material onto the farm.

Since potential impacts related to organic farms are expected to occur if special construction and maintenance procedures are followed and do not vary by proposed route or variation considered, organic farms are not discussed further in Chapter 6 of this EIS.

Livestock

Hog, poultry, cattle, and sheep farms are located in the West Section. Livestock operations could be temporarily affected during construction of the proposed Project. Construction activities could temporarily disrupt livestock access to pasture lands and disturb livestock with construction noise. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils.

Though no stray voltage impacts are anticipated as a result of the proposed Project, stray voltage could be of concern to livestock farmers, particularly on dairy farms, due to its potential impacts to milk production and quality. Stray voltage is discussed further in Section 5.2.2.3. Induced voltage also may be of concern to livestock farmers, for farms with buildings near a transmission line that would require grounding of the metal components of the building. No impacts due to induced voltage are anticipated from the proposed Project if effective grounding is implemented. Induced voltage is discussed further in Section 5.2.2.4. Since potential impacts related to livestock are expected to be limited and do not vary by proposed route or variation considered, livestock are not discussed further in Chapter 6 of this EIS.

Aerial Spraying

Transmission line structures could potentially affect the coverage and effectiveness of aerial spraying. Structures could limit the ability of aerial applicators to reach specific areas of fields, by limiting those areas where applicators could safely fly. Since potential impacts related to aerial spraying are expected to be limited from the proposed Project and do not vary by proposed route or variation considered, aerial spraying is not discussed further in Chapter 6 of this EIS.

Irrigation Systems

Transmission line structures in agricultural fields could potentially impede the use of irrigation systems, either by necessitating reconfiguration of an irrigation system to accommodate structures or by reducing crop revenue because all or a portion of a field could not be irrigated. No known center-pivot or other irrigation systems have been identified in the West Section; therefore, impacts to irrigation systems are not anticipated and mitigation would not be required. If an irrigation system is encountered during construction of the proposed Project, procedures specified in the Agriculture Impact Mitigation Plan (AIMP) would be implemented to minimize disruption of the system (Appendix O). Further discussion of the AIMP can be found in Section 2.13 and is a potential MN PUC Route Permit condition. Since potential impacts related to irrigation systems are not expected from the proposed Project and do not vary by proposed route or variation considered, irrigation systems are not discussed further in Chapter 6 of this EIS.

Precision Farming Systems

Precision farming involves the use of GPS and, more recently, real-time kinematic (RTK) GPS in farm machinery, allowing the machinery to be directed more accurately and maximize a farm's efficiency. Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming. Further discussion on interference can be located in Section 5.2.1.5. If interference with electronic devices, including precision farming systems, does occur and is caused by the presence or operation of the transmission line, Route Permits issued by the Commission require permittees to take those actions which are feasible to restore electronic reception to pre-project quality (Appendix B). Since potential impacts related to precision farming systems are not expected from the proposed Project and do not vary by proposed route or variation considered, precision farming systems are not discussed further in Chapter 6 of this EIS.

General Impacts

Potential impacts to agriculture associated with projects of this nature could be either short-term or long-term and are discussed generally below. Chapter 6 of this EIS assesses impacts on agriculture using USDA NRCS, Soil Survey Geographic (SSURGO) database Farmland Classification mapping to identify areas of prime farmland, prime farmland if drained, and farmland of statewide importance within the ROW.

Agricultural land uses would continue to be allowed in the ROW, but the presence of transmission structures may prevent some farm equipment from accessing land. Impacts to agricultural operations could be mitigated by prudent routing (i.e., by selecting routes that avoid agricultural fields by

following existing infrastructure ROWs, field lines and property lines). Where structures are placed in fields, impacts could be mitigated by not placing structures diagonally across fields, but rather parallel to existing field lines or spanning fields if diagonal crossings are necessary.

Impacts to agricultural lands could also be minimized by limiting the removal of crops to only those necessary for construction and on-going safe operation of the line. Additionally, the Applicant, in collaboration with the MDA would prepare an Agricultural Impact Mitigation Plan (AIMP) for the proposed Project. The AIMP identifies measures that the Applicant would take to avoid, mitigate, or provide compensation for agricultural impacts that could result from constructing and operating the project. The AIMP specifies procedures for repairing damaged drain tile, alleviating compaction, and removing construction debris. Compliance with the AIMP is not a permit condition in the MN PUC's generic route permit template, but has been included as a permit condition for other high voltage transmission line projects (Appendix B). Further discussion on the AIMP can be found in Section 2.13.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. These activities could limit the use of fields or could affect crops and soil by compacting soil, generating dust, damaging crops or drain tile, or causing erosion. Project construction activities would typically be limited to the transmission line ROW. Short-term impacts in agricultural lands are estimated as 0.92 acres per structure location.

Construction activities would result in long-term impacts to agriculture by the physical presence of transmission line structures and associated facilities in crop, pasture, or other agricultural lands. For the transmission line itself, the footprint of the structure proposed for the project is **1,936** square feet. The impact of such structures, however, could be greater than their footprint since they could impede the use of farm equipment and irrigation systems and interfere with aerial spraying. These physical impacts could result in lost farming income or decreased property values (Section 5.2.1.4). In addition, stray voltage could affect livestock if facilities are not properly wired/grounded (Section 5.2.2.3).

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on farmlands from the removal of crops, localized physical disturbance, and soil compaction caused by equipment. Maintenance and emergency repair-related impacts on farmland would be short-term and more localized than construction-related impacts.

5.3.2.2 Forestry

This section describes the forestry resources within the West Section and the potential impacts from the proposed Project.

Forestry resources are defined as forest lands and their associated harvestable products, including but not limited to, trees, saplings, seedlings, logs, brush, and slashing.

The ROI for this analysis of impacts to forestry includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

The EIS assesses impacts on forestry resources using MnDNR Division of Forestry, state forest boundaries and USFWS Interest mapping to identify areas of state forests and USFS national forest lands within the ROW.

This ROI was selected based on an expectation that, given the construction activities proposed, the majority of impacts on forestry would likely occur within this area.

Forestry in the West Section

The West Section includes a mix of agricultural and forested lands. State-owned forest lands, including the Beltrami Island, Lost River, and Lake of the Woods state forests, are managed by the MnDNR. The MnDNR Forestry Timber Sales Program manages timber harvesting on state-owned forest lands, which provides a source of funding for public services in Minnesota. Roseau and Lake of the Woods Counties are among Minnesota's top 20 timber harvest counties, each producing more than 50,000 cords annually (MnDNR 2011, reference (107)). **The West Section also includes other forested areas with private, corporate, or USFWS ownership.**

General Impacts

Potential impacts to forestry resources associated with transmission line projects could be either short-term or long-term.

Impacts to timber harvesting operations could be mitigated by prudent routing (i.e., by selecting routes that avoid forest lands by following existing infrastructure ROWs, access road ROWs, and property lines). ROW maintenance could be managed to reduce impacts on forestry resources. For example, leaving small fruiting trees and shrubs and using mechanical versus chemical vegetation management could help mitigate the loss of forestry resources.

Due to the possibility of permanent tree removal in forest lands, potentially significant impacts to forestry resources are expected as a result of construction and operation of the proposed Project, depending on the route or variation considered. Adverse, long-term, and regional impacts to forestry resources are expected and are considered significant in nature by the MnDNR. The estimated loss in public revenue from timber harvesting is currently unknown. Potential impacts related to forestry from the proposed Project are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. Construction activities could limit timber harvesting efforts, affect timber stands and soil by compaction, damage trees, or cause erosion. Project construction activities would typically be limited to the transmission line ROW. As mentioned above, short-term impacts are estimated as 0.92 acres per structure location. Long-term impacts to forestry resources would be caused by the clearing of trees and physical presence of transmission line structures and associated facilities in forest lands. As mentioned above, for the transmission line itself, the footprint of the structure proposed for the project is **1,936** square feet.

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on forest lands from the removal of vegetation, localized physical disturbance, and soil compaction caused by equipment. Maintenance and emergency repair-related impacts on forestry resources would be short-term and more localized than construction-related impacts.

5.3.2.3 Mining and Mineral Resources

This section describes mining and mineral resources within the West Section and the potential impacts on those resources from construction and operation of the proposed Project as required by MN PUC decision making for the Route Permit.

Mining and mineral resources are defined as areas with a concentration or occurrence of natural, solid, inorganic, or fossilized organic material in such form, quantity, grade, and quality that it has reasonable prospects for commercial extraction.

The ROI for this analysis of impacts to mining and mineral resources includes the anticipated 200-foot ROW of the transmission line and the permanent footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, and permanent access roads.

This ROI was selected based on an expectation that the potential direct and indirect impacts on mining and mineral resources would likely occur within this area.

The EIS assesses impacts on mining and mineral resources using the MnDNR Division of Lands and Minerals, All State Mineral Leases mapping and the MnDOT Aggregate Source Information System data to identify mining and mineral resources within the ROW. In situations where an aggregate resource data point appeared in close proximity to a proposed route or variation, the Aggregate Source Information System data was reviewed in conjunction with 2013 aerial photography; data points were shifted as necessary based on this review.

Mining and Mineral Resources in the West Section

Mining contributes less than one percent of the economy's total output in this region (Tuck 2014, reference (108); Tuck 2014, (109)). There are state mining leases identified in the West Section. Several abandoned metallic mineral mining sites are found along the proposed route and variations in the West Section. These sites include expired/terminated leases for the mining of metallic minerals (Map 5-5). Mining and mineral resources are described in more detail in Chapter 6.

There are no aggregate resources located within 100 feet of the proposed routes or variations in the

West Section; however, there is an aggregate source located within 1,500 feet from the Roseau Lake WMA Variation in the Roseau Lake WMA Variation Area (Map 5-4). In addition, the MnDNR has identified that state-owned surface estate mineral resources (peat, sand and gravel aggregate, crushed stone, clay, etc.) may be encumbered by the proposed Project (MnDNR 2014, reference (110)). The Applicant would be responsible to work with the MnDNR to evaluate (at Applicant's expense) and determine if and where compensation would be required for encumbrance of surface estate mineral resources.

General Impacts

Potential impacts to mining and mineral resources associated with high voltage transmission line projects could be either short-term or long-term. Impacts can be mitigated by prudent routing and structure placement and placement of the alignment within the route to avoid any planned potential mineral resources. Potential impacts related to mining and mineral resources from the proposed Project are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. The construction of transmission lines could affect future mining operations if the structures interfere with access to mineable resources or the ability to remove mineral resources. If there are potentially recoverable mineral reserves in the West Section, construction of the proposed Project could limit the ability to successfully mine these reserves, depending on the considered route or variation and the location of any mineable reserves.

Impacts from Operations, Maintenance, and Emergency Repairs

Maintenance and emergency repair activities would have minimal to no impact on mining and mineral resources from localized physical disturbance caused by the use of maintenance equipment.

5.3.3 Archaeology and Historic Architectural Resources

This section describes the archaeological, historic architectural, and Native American resources, collectively referred to as cultural resources, within the West Section and the potential impacts from the proposed Project on these resources. This section also describes those cultural resources that have been included in, or determined eligible for inclusion in, the National Register of Historic Places (NRHP). Therefore, cultural resources may be archaeological resources, historic architectural or built resources, or properties of traditional religious and cultural importance to a federally recognized Indian tribe, such as a traditional cultural property (TCP) or a traditional cultural landscape (TCL).

5.3.3.1 Archaeology and Historic Architectural Resources Regulations

Compliance with NEPA requires the evaluation of the potential impacts of a proposed action on cultural resources. Cultural resources generally consist of archaeological sites or districts, historic architectural or built resources, such as buildings, structures, districts, and objects, and Native American resources, such as properties of traditional religious and cultural importance to a federally recognized Indian tribe, like TCPs, or TCLs. Compliance with NEPA also requires demonstrating that a proposed action has been considered pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470f), as amended, and implementing regulations for Section 106 that were developed by the Advisory Council on Historic Preservation (ACHP) and codified in 36 CFR Part 800 (ACHP 2004, reference (111)).

The NHPA of 1966 (16 U.S.C. Part 470 *et. seq.*) is the primary federal law protecting cultural resources. Section 106 of the NHPA requires federal agencies to identify cultural resources that are historic properties within the Area of Potential Effect (APE) for a federal undertaking, consider the potential effects of their proposed federal undertakings on historic properties, and develop measures to avoid, minimize, or mitigate any adverse effects on historic properties (36 CFR Parts 800.4(d) and 800.5; ACHP 2004, reference (111)).

Historic properties are those cultural resources that are listed in or determined eligible for listing in the NRHP and may be any prehistoric or historic district, site, building, structure, object, including properties of traditional religious and cultural importance to a federally recognized Indian tribe that meet the National Register criteria (36 CFR Part 800.16(l)(1); ACHP 2004, reference (111)). Cultural resources are considered to be NRHP-eligible, and therefore, historic properties, if they display the quality of significance in one or more of the following areas: American history, architecture, archaeology, engineering, or culture. They also must possess integrity of location, design, setting, workmanship, feeling, and association, and generally have to meet one of the following four National Register criteria:

- Criterion A – properties that are associated with the events that have made a significant

contribution to the broad patterns of American history; or

- Criterion B – properties that are associated with the lives of persons significant in our past; or
- Criterion C – properties that embody the distinctive characteristic of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant or distinguishable entity whose components may lack individual distinction; or
- Criterion D – properties that have yielded or may likely yield information important in prehistory or history (National Park Service 1995, reference (112)).

For the purposes of compliance with Section 106 of the NHPA, the proposed DOE undertaking is the potential granting of a Presidential permit for the international border crossing requested by the Applicant as part of its proposed Project, as defined in the ACHP's implementing regulations for Section 106 of the NHPA (36 CFR Part 800.16(y)), and is a federal undertaking that has potential to cause effects on historic properties (36 CFR 800.3; ACHP 2004, reference (111)). DOE is coordinating its compliance with Section 106 of the NHPA with its review under NEPA according to the process set out in 36 CFR Part 800.3(c). DOE is also acting as lead agency under Section 106 for its cooperating federal agency partners, and will consider the potential effects of its cooperating agencies' proposed actions on historic properties as part of the Section 106 compliance process for the DOE undertaking (36 CFR 800.2(a)(2); ACHP 2004, reference (111)).

For the purposes of the impact analysis on cultural resources and historic properties, DOE determined that the ROI will be the APE for the proposed Project. The DOE's APE for the proposed Project currently consists of a direct APE, within which direct impacts or effects (generally from construction and/or maintenance activities) may occur on cultural resources and historic properties, and an indirect APE, within which indirect impacts (generally visual or audible that may occur during construction, operation, and/or maintenance activities) may occur on cultural resources and historic properties. DOE's final determination of the direct and indirect APE for the proposed undertaking will be made in consultation with the SHPO, federally recognized Indian tribes, and additional consulting parties as part of ongoing Section 106 consultation for the federal undertaking and the proposed Project.

For this analysis, the direct APE includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1 (the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites). The direct APE was defined to recognize the potential for disturbance to surface and subsurface soils in association with construction activity. The indirect APE includes the direct APE plus a one mile radius on each side of the anticipated alignment of the proposed transmission line or the center of the footprint of the other elements of the proposed Project. The larger indirect APE serves to address the potential indirect adverse visual or other **impacts** the proposed Project could have upon the setting of cultural resources and historic properties, particularly for historic architectural or other built resources, TCPS, and TCLs, where setting is or would be a character-defining feature that contributes to the significance of these cultural resources or historic properties.

DOE is phasing the identification and evaluation of historic properties within the APE and the application of the criteria of adverse effects in accordance with 36 CFR Part 800.4(b)(2) and 36 CFR Part 800.5(a)(3), respectively, because the proposed Project alternatives consist of routes, variations, and alignment modifications covering a large land area. Additionally, because the potential effects of the proposed Project on historic properties, including cultural resources, cannot be fully determined prior to approval of the proposed Project, DOE intends to execute a Programmatic Agreement (**Draft PA, Appendix V**) in accordance with 36 CFR Part 800.14(b)(1)(ii) (ACHP 2004, reference (111)). **DOE intends to execute the PA prior to issuance of the Record of Decision (ROD) or otherwise comply with procedures set forth in 36 CFR Part 800. DOE will execute a PA to** ensure that stipulations developed to identify cultural resources and historic properties, determine the effects of the proposed Project on historic properties, and determine measures to avoid, minimize, and mitigate adverse effects on historic properties are implemented. **The PA is being developed in consultation with the Minnesota SHPO, the ACHP, federally recognized Indian tribes, the Applicant, representatives of local governments, and other consulting parties. Signatories include the Minnesota SHPO, DOE, and USACE. Invited Signatories include the Applicant and Red Lake Band of Chippewa Indians, Minnesota.** DOE initiated the Section 106 consultation process for the proposed undertaking with the Minnesota SHPO via a November 19, 2014, letter, notifying them of proposed Project,

the DOE's determination that the proposed Project is a federal undertaking that has the potential to affect cultural resources and historic properties, and defining the APE for the proposed Project. In a December 30, 2014 response letter to DOE, Minnesota SHPO acknowledged DOE's initiation of Section 106 consultation, and concurred with the DOE's definition of the APE for the undertaking and the agency's proposal to develop and execute a PA for the undertaking. DOE also invited the ACHP to participate in the development of its proposed PA for the proposed Project, and the ACHP accepted the agency's invitation to participate in the Section 106 consultation process on March 27, 2015. A record of DOE's consultation with the Minnesota SHPO and Advisory Council conducted to date is included in Appendix P.

To support the phased identification of cultural resources and historic properties, DOE performed a Phase IA cultural resources survey (i.e., desktop literature review) in order to identify previously recorded cultural resources and historic properties within the APE for the proposed Project (see Appendix P). The purpose of the DOE's Phase IA cultural resources survey was to develop a sufficient amount of information for known cultural resources and historic properties to allow DOE to consider the potential effects of the proposed Project on historic properties under Section 106 of the NHPA. Additionally, the information obtained in DOE's Phase IA cultural resources survey was used to independently verify the information provided by the Applicant for their proposed routes and to identify similar information for the alternatives, including proposed variations that are being evaluated as part of the NEPA process. The Phase IA cultural resources survey presents information obtained from site file searches and literature reviews conducted at the Minnesota Historical Society, SHPO Office, and Office of the State Archaeologist. The Minnesota SHPO maintains a comprehensive database on all prehistoric and historic archaeological sites as well as historic architectural resources (individual buildings and structures as well as historic districts) and cultural landscapes for the entire state. This database is the source of the majority of the information for previously identified cultural resources data within the APE for the proposed Project, pending the completion of cultural resources investigations once the final route for the proposed Project has been determined. The results of DOE's Phase IA cultural resources survey are summarized in Sections 5.3.3, 5.4.3, and 5.5.3 and discussed more specifically for each variation area in Sections 6.2, 6.3, and 6.4.

Because the APE for the proposed undertaking also includes lands that were inhabited by American Indian tribes before Euro-American settlement, DOE is consulting with federally recognized Indian tribes to identify Native American resources that may be impacted or affected by the proposed Project, including any Native American resources that are historic properties, such as NRHP-listed or -eligible archaeological sites, TCPs, or TCLs, that are not included in the Minnesota SHPO database. As proposed, the Project does not directly involve tribal reservation lands or require a ROW grant or special use grant from tribes. However, the proposed Project has the potential to impact resources that are of traditional religious and cultural importance to federally recognized Indian tribes with current or historic interest in the APE. The U.S. entered into a number of treaties with American Indian tribes in the area under which tribal members retain rights to many of the resources found in the APE (see Section 5.3.1.3). Federally recognized Indian tribes retain sovereignty over lands within their reservation boundaries and also retain rights for resources and activities on lands ceded to the U.S. under these treaties. DOE, like all federal agencies, has a trust obligation to assure that the proposed undertaking does not infringe or negate the tribes' abilities to exercise these retained treaty rights.

On June 27, 2014, DOE initiated its Section 106 consultation with tribes potentially affected by the proposed undertaking in accordance with its responsibilities under NEPA, Section 106 of NHPA, the American Indian Religious Freedom Act (16 U.S.C. 1996), the Archeological Resource Protection and Repatriation Act of 1990 (25 U.S.C. 470aa-mm), the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001, et. Seq.), Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments* (2000, reference (113)), and DOE's "American Indian and Alaska Native Tribal Government Policy," (USDOE 2009, reference (114)) (Appendix A). As a part of this effort, DOE identified and invited over thirty federally recognized American Indian tribes with potential current or historic interests in the area of the proposed Project to tribal consultation meetings on July 15, 2014 in Red Lake, Minnesota, and on July 22, 2014, in Deer River, Minnesota. The purpose of these consultation meetings was to gain the opinions and insights of tribes regarding cultural values that the tribes subscribe to the area and its resources, as well as to identify the opinions and insights of tribes that no longer live in the area of the proposed undertaking.

A total of 28 federally recognized Indian tribes responded to DOE's initiation of the Section 106 process: 22 tribes indicated that they wished to be considered Section 106 consulting parties, five tribes indicated that they did not wish to be Section 106 consulting parties but would like to be kept informed of the project, and one tribe indicated that they did not wish to be Section 106 consulting party and had no further interest in the proposed Project (see Appendix A). Responses from the remaining nine federally recognized Indian tribes have not been received by DOE to date.

On March 24–25, 2015, DOE held another round of tribal consultation meetings under Section 106 of the NHPA at the Mystic Lake Hotel and Casino in Prior Lake, Minnesota. The purpose of these meetings was to establish a path forward for DOE's proposed approach for phased identification and evaluation of historic properties, including TCPs, through a proposed PA. A total of 16 tribes attended one day or more of the tribal meetings. As an outcome of the tribal meetings, the DOE invited the Red Lake Band of Chippewa Indians to be a cooperating agency in the NEPA process for the proposed Project as well as a consulting party to the Section 106 process and an invited signatory to the PA that is being developed for the proposed Project. Four additional tribes were identified as participants for the development of the PA for the Project as invited signatories (the Bois Forte Band of Chippewa Indians, the Mille Lacs Band of Chippewa, the White Earth Band of Chippewa, and the Leech Lake Band of Chippewa Indians). The remaining tribes indicated that they wished to continue as Section 106 consulting parties.

Additional information at the March 24–25, 2015 meeting was provided by the tribes regarding the need for TCPs surveys and the consideration of treaty rights for subsistence and ceremonial purposes to be considered in both the PA and the EIS for the proposed Project as part of the NHPA and NEPA compliance processes. Specifically, Native American **resources, including resources of traditional religious and cultural importance to a tribe,** TCPs and TCLs need to be identified and evaluated under the Section 106 process. In order to complete this effort, background research related to previously documented ethnographic, ethnohistoric, and environmental data associated with the proposed Project area are necessary. Further tribal outreach and ethnographic interviews with Tribal Historic Preservation Officers (THPOs) and other leaders of tribes that are Section 106 consulting parties in order to document the locations of TCPs and the potential effects that could result from the proposed Project would also be necessary. DOE's government-to-government consultation with American Indian tribes under Section 106, including discussions related to tribal cultural resources and TCPs, is currently on-going, and DOE will continue to work with consulting tribes to identify historic properties that are not included within the Minnesota SHPO database. This effort is described in greater detail in Section 1.2.4.1. A record of DOE's consultation with federally recognized Indian tribes conducted to date is also included in Appendix A.

DOE also initiated the Section 106 consultation process for the proposed undertaking with other consulting parties that may have an interest in the project, including representatives of local governments, historical societies and other historic preservation agencies or groups. A total of two groups responded to DOE's initiation of the Section 106 process, indicating that they wished to participate in the Section 106 consultation process for the proposed Project. No responses from other consulting parties have been received by DOE to date. A record of DOE's consultation with representatives of local governments, historical societies, and other historic preservation agencies or groups conducted to date is also included in Appendix P, It is noted here that, while DOE is coordinating its compliance with Section 106 of the NHPA with its review under NEPA according to the process set out in 36 CFR Part 800.3(c), DOE has used the NEPA scoping meetings and the public hearings and comment periods for the EIS for involvement of the public in the Section 106 process in accordance with 36 CFR 800.2(d). **DOE will continue to make Section 106 documentation public, as appropriate, throughout the close of the consultation process at http://greatnortherneis.org.**

5.3.3.2 Cultural Resources in the West Section

The West Section is primarily situated within the ecoregions of the Lake Agassiz Plain and the Aspen Parklands (Map 5-2). The ecological subsections for the West Section are shown on Map 5-2 and are described in more detail in Section 5.3.4.2 and Section 5.3.1.1.

Two archaeological regions are encompassed within the West Section: the Red River Valley North and the Northern Bog Region (Map 5-6). The Red River Valley North Archaeological Region includes flat plains and beach ridges that were once covered by tall grass prairie interspersed with forest stands along river bottoms and around seasonal shallow marshes. Previously recorded pre-contact archaeological sites, those sites having human

activity prior to European contact within the Red River Valley Archaeological Region, are associated with Paleoindian, Archaic, and Woodland traditions. American Indians present during the Paleoindian tradition were small, mobile, and primarily hunted bison due to the extinction of many large mammals (e.g., mammoth, mastodon) that began to occur at the end of the Pleistocene. Gathering of wild plants and hunting of small animals also supplemented their diet. As such, American Indians made large lanceolate projectile points during this period. During the Archaic tradition, American Indians became more diverse in their diet and thus in their tool selection. Tools during this period included new projectile point forms, atlatls (spear thrower that allowed spears to be thrown farther and with more force), copper tools, and ground and pecked stone tools. Archaeological sites associated with both the Paleoindian and Archaic traditions tend to be small and ephemeral. Similar to the Archaic tradition, the Woodland tradition was diverse diet of plants and animal, but with the addition of ceramic vessels. In the late or terminal woodland period larger, more permanent populations started growing typically situated near rivers. The potential for encountering pre-contact archaeological sites is highest where the proposed routes and variations cross rivers and beach ridges associated with Glacial Lake Agassiz and the shorelines of former lakes (Gibbon et al. 2002, reference (115)).

The eastern portion of the West Section includes the Northern Bog Archaeological Region, which is primarily composed of peatlands and marshes. Forested conifer areas and forested wetlands are also found in portions of the region. Prior to the arrival of Europeans, archaeological sites within the Northern Bog Archaeological Region can be associated with Archaic and Woodland traditions. The potential for encountering additional pre-contact archaeological sites is highest where the proposed routes and variations cross rivers, glacial lake beach ridges, moraine complexes, and the shorelines of former lakes (Gibbon et al. 2002, reference (115)).

Historic period archaeological sites in both the Red River Valley North and the Northern Bog archaeological regions are not distributed in the same pattern as pre-contact archaeological sites. The contact/post contact period starts with the arrival of Europeans until intensive Euro-American settlement of the region. Minnesota's historical period began in 1673 when French explorers Marquette and Joliet discovered the upper portion of the Mississippi River. With arrival of the Europeans came more development, with the lumber industry being one of the earliest industries peaking between 1899 and 1905. Agriculture was also important in Minnesota with wheat and flour mills dominating the state until the 1930s. The dominance of the iron ore mining industry created roads and towns allowing people to access previously uninhabited remote areas of Minnesota. The abundance of historic archaeological sites tend to be located along water, railroad, or road transportation routes and can include the remains of abandoned farmsteads, abandoned businesses, logging and mining facilities, facilities related to railroads, and hunter and fur trapper cabins.

Additionally, historic architectural or other built resources can be found wherever conditions are suitable (as in the case of homesteads on higher elevations or in areas suitable for agriculture) or areas where structures were necessary (such as bridge crossings at rivers and streams, or a roadway through a swamp, or a level railroad bed that required cutting and filling to maintain acceptable grades). Historic architectural resources tend to be located in areas adjacent to a road, railroad, or water transportation route. The time periods represented by these sites are likely to extend from the Fur Trade and Contact Period though the modern industrial development period of the 1940s, 1950s, and 1960s (Dobbs 1990, reference (116)).

Archaeological and historic architectural resources data are shown on Map 5-6 by the number of records found by inventory type (archaeological sites and historic buildings or structures). Detailed data is provided in Appendix P. A more detailed description of the cultural resources present within the West Section and the potential effects are provided in Section 6.2.

Additionally, the Bois Forte Band of the Minnesota Chippewa Tribe, Minnesota, has provided background information for natural and cultural resources that have previously been identified as having traditional religious and cultural significance to the tribe during the Draft EIS public comment period and are included in Appendix Y. These resources are generally associated with traditional hunting, fishing, and gathering activities by the tribe that have occurred in the past and continue to occur today. Natural resources may include game, particularly deer and fish, as well as plants including wild rice, berries, sugar bushes, birch, and medicinal plants. Cultural resources identified by the tribe are generally related to traditional practices and activities associated with procuring natural resources. These can include land and water trails to and between the locations of such natural resources, campsites in the vicinity of such resources, burial

sites which tend to be associated with campsite locations, and locations where ceremonies occurred, including locations where offerings of thanks were and continue to be made for resources that have been, or are about to be, taken. Tribal members have noted that such locations would have been used prehistorically and historically by the Bois Forte Band and/or other Native Americans groups living in the area, and continue to be used by the Bois Forte Band today. The Bois Forte Band world view considers the land and the resources that it provides to be sacred, such that areas that contain natural and cultural resources are spiritually significant to the tribe, as well as physically or socioeconomically significant (Latady and Isham 2013, 2014, 2015, references (202, 203, 204). Therefore, the West Section may contain areas with natural and cultural resources of traditional religious and cultural importance to federally recognized Indian tribes.

5.3.3.3 General Impacts to Cultural Resources

Impacts to cultural resources **could** result from direct and indirect impacts as described below. Section 6.2 summarizes the potential impacts of the proposed routes and variations on archaeological **sites, historic architectural resources, and/or Native American** resources in the West Section, including those **sites or** resources that are historic properties. As stated above, DOE is consulting with federally recognized Indian tribes to identify Native American resources and historic properties. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on cultural resources and historic properties. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Impacts on cultural resources during construction could result from ground-disturbing activities and/or demolition or removal of historic buildings or structures. Ground-disturbing activities associated with the proposed Project include excavation, grading, or other sub-surface disturbance that could damage or destroy surface and subsurface features comprising archaeological resources **or natural and cultural resources associated with tribal resources or comprising properties of traditional religious and cultural importance to a tribe, TCPs, or TCLs**. Construction of the proposed Project could **also** cause direct impacts to historic buildings or structures should construction activities require demolition or removal of historic buildings or structures.

The PA that DOE intends to execute for the proposed Project will include stipulated measures to address the potential construction impacts on cultural resources and historic properties **(Appendix V)**. Stipulations would be developed to identify cultural resources and historic properties, determine the effects of the proposed Project on historic properties, and determine measures that would be implemented to avoid, minimize, and mitigate adverse effects on historic properties.

Operation, Maintenance, and Emergency Repair Impacts

Indirect impacts on cultural resources are generally associated with historic architectural sites **or Native American resources such as** TCPs or TCLs. Indirect impacts could result from operation of the proposed Project if it is located near or within views of or from a historic building or structure, TCP, or TCL, and it results in new or different landscape features within the viewshed of any historic architectural or built resource, **TCP or TCL,** or introduces a new or different audible feature within its setting. This is particularly a concern for those cultural resources and historic properties for which setting is a character-defining feature that contributes to the significance of the resource. **Additionally, indirect impacts could result from operation of the proposed Project if it temporarily or permanently restricts access to and/or use of tribal resources, including those that are TCPs or TCLs.**

In the case of maintenance and emergency repair impacts, any impacts associated with ground disturbance would be the same as those identified for construction, although it is likely that this potential ground disturbance would occur in areas that were previously disturbed during construction. Any visual or audible impacts associated with maintenance and emergency repairs are likely to be temporary or short-term and limited to the duration of these activities.

The PA that DOE intends to execute for the proposed Project will include stipulated measures to address the potential operation, maintenance, and emergency repair impacts on cultural resources and historic properties **(Draft PA, Appendix V)**. Stipulations would be developed to identify cultural resources and historic properties, determine the effects of the proposed Project on historic properties, and determine measures that would be implemented to avoid, minimize, and mitigate adverse effects on historic properties **and/or Native American resources such as TCPs or TCLs**.

5.3.4 Natural Environment

This section describes water resources, vegetation, and wildlife, which are present within the West Section and the potential impacts on those resources from construction and operation of the proposed Project.

5.3.4.1 Water Resources

This section describes water resources, including rivers and streams (i.e. watercourses), lakes and ponds (i.e., water bodies), wetlands, floodplains, and groundwater resources, that occur in the West Section, as shown on Map 5-7, and the potential impacts on those resources from construction and operation of the proposed Project.

The ROI for this analysis of impacts to water resources includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations. This ROI was selected based on the expectation that, given the construction activities proposed and associated BMPs to minimize and mitigate impacts, the majority of water resources impacts would likely occur within this area.

Watercourses and Waterbodies

The Clean Water Act (CWA) establishes the structure for regulating the discharge of pollutants into waters of the United States and for developing water quality standards for surface waters (33 U.S.C. 1344 and 1311 et seq). Under the CWA, the EPA has established water quality standards for contaminants in surface waters. Under the CWA, the EPA regulates discharge of pollutants from point and non-point sources into surface waters unless a National Pollutant Discharge Elimination System (NPDES) permit, **including an associated Stormwater Pollution Prevention Plan (SWPPP)** is obtained (33 U.S.C. 1342). In Minnesota, a NPDES permit must be obtained for stormwater discharge from construction activities that disrupt more than one acre. **If a project disturbs more than 50 acres of land, MPCA staff review of the SWPPP is required.**

Under Section 303(d) of the CWA, states are required to monitor and assess their waters to determine if they meet water quality standards and, thereby, support the beneficial uses they are intended to provide (33 U.S.C. 1313(d)). Waters that do not meet their designated uses because of water quality standard violations are impaired. States are required to develop a list of impaired waters that require total maximum daily loads (TMDL) studies and submit an updated list of impaired waters to the EPA every two years. In Minnesota, the MPCA monitors and assesses Minnesota waters to determine if they meet water quality standards for designated uses and lists waters that do not meet their designated uses due to water quality standard exceedances as impaired. **The MPCA also regulates water quality under Section 401 of the CWA.**

Surface waters are also regulated under Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 et seq.) and Section 404 of the CWA. The Rivers and Harbors act regulates such activities as excavating and dredging in, placing structures and materials on, and altering the course of these waterways (33 U.S.C. 403). The USACE issues permits under Section 10. The CWA Section 404 prohibits the discharge of dredged and fill materials without a permit. It extends to more waterbodies than the Rivers and Harbors Act, namely all water of the United States, which includes among other things, navigable waters, interstate waters and wetlands, wetlands adjacent to water of the US and tributaries (33 CFR 320.1(d); 33 CFR 328.3). Wetland regulations are discussed in more detail later. The Applicant is currently coordinating with the USACE regarding Sections 404 and 10 permits for the proposed Project. **The proposed Project also requires Section 401 water quality certification from the MPCA as part of the Section 404 approval process.**

Although regulated separately, surface and ground water are intricately linked. Surface waters are open to the atmosphere, such as rivers, lakes, ponds, streams, and reservoirs and are replenished by groundwater and precipitation. Uses of surface water include drinking water, irrigation, cooling of thermoelectric power industry equipment, agriculture, mining, and commercial/industrial uses (USGS 2014, reference (117)). Groundwater is located beneath the surface in soil pore spaces and in fractures in rock. It is recharged by precipitation that falls on the surface and is pulled by gravity through the soil until it reaches water saturated rock material. Groundwater can help provide baseflow to rivers and lakes during dry periods, can recharge surface water sources, can sustain saturated conditions in wetlands, and can support aquatic habitat. Groundwater has many important uses, including irrigation, manufacturing, and commercial uses.

Groundwater resources are afforded federal and state protections. The Federal Safe Drinking Water Act requires states to develop programs to protect public water supplies from contamination (2 U.S.C. 300(f) et seq). The State of Minnesota regulates drinking water in Minnesota Rules, chapter 7050.

The MDH implements safe drinking water standards for the state through its Wellhead Protection Program (Minnesota Rules, chapter 4720). Ground and surface waters are also managed by the MnDNR through the Water Appropriations Permit Program. Minnesota Statutes, section 103G.265 requires the MnDNR to manage water resources to ensure an adequate supply to meet long-range seasonal requirements for domestic, agricultural, fish and wildlife, recreational, power, navigation, and quality control purposes. The state Water Appropriation Permit Program was created to balance competing objectives for both development and protection of Minnesota's water resources. A Water Use (appropriation) Permit from the MnDNR is required for all users withdrawing more than 10,000 gallons of water per day or 1 million gallons per year.

Watercourses and Waterbodies in the West Section

The West Section is located in both the Red River and Rainy River regional watersheds. Major watersheds include Roseau, Two Rivers, Lake of the Woods, and Lower Rainy River. Several watercourses and drainage ditches traverse the area, including MnDNR Public Water Inventory (PWI) watercourses. Watercourses in this area tend to be moderate to small in size and highly sinuous. Major watercourses include the Roseau River, Warroad River, and Winter Road River. Smaller watercourses include Bear Creek, Hay Creek, Sprague Creek, Pine Creek, Sucker Creek, Williams Creek, and Willow Creek; several unnamed watercourses are also present. Headwaters of these watercourses are predominantly associated with regional peatlands. Drainage ditches are present throughout the peatland areas, and were constructed in an attempt to drain these areas to support agricultural activities. Waterbodies are not common in the area; however, a few unnamed waterbodies are present in the West Section.

Several impaired waters are located in the West Section. Table 5-24 lists the impaired waters found in the West Section and summarizes the impairments (stressors) and affected designated uses for each of these impaired waters.

Floodplains

Floodplains are flat or nearly flat land adjacent to a river or stream that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows; and the flood fringe, which includes areas covered by the flood, but which do not experience a strong current. Floodplains function to prevent flood damage by detaining debris, sediment, water, and ice. The Federal Emergency Management Agency (FEMA) delineates floodplains and determines flood risks in areas susceptible to flooding. The base flood that FEMA uses, known as the 100-year flood, has a one percent chance of occurring during each year. Executive Order 11988, entitled Floodplain Management, requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

DOE also has rules specifically addressing floodplains (and wetlands) (10 CFR 1022). It requires identification of proposed actions located in a floodplain with an opportunity for early public review of such proposed actions, preparing floodplain assessments, and issuing statements of findings for such actions in a floodplain. In assessing the proposed Project's impacts on floodplains, DOE's assessment must discuss: (a) positive and negative, direct and indirect, and long and short-term effects on floodplains and (b) impacts on natural and beneficial floodplains values (10 CFR 1022.13(a)(2)). This regulation also requires that the effects of a proposed floodplain action on lives and property be evaluated.

At the state level, the MnDNR Floodplain Management Unit oversees the administration

Table 5-24 Summary of Impaired Waters in the West Section

Watercourse	Impairment (Stressor)	Affected Designated Use
Roseau River	Turbidity, mercury in fish tissue, dissolved oxygen	Aquatic consumption, Aquatic life
Sprague Creek	Turbidity	Aquatic life
East Branch Warroad River	Mercury in fish tissue	Aquatic consumption
West Branch Warroad River	Mercury in fish tissue	Aquatic consumption
Willow Creek	Dissolved oxygen	Aquatic life
Lake of the Woods	Nutrient/eutrophication, biological indicators	Aquatic recreation

Source(s): MPCA 2014, reference (118); MPCA 2014, reference (119)

of the State Floodplain Management Program by promoting and ensuring sound land use development in floodplain areas in order to promote the health and safety of the public, minimize loss of life, and reduce economic losses caused by flood damages. This unit also oversees the National Flood Insurance Program for the state of Minnesota. Floodplains are also regulated at the local level. Within the project area, the Roseau County Floodplain Management Ordinance allows for utility transmission lines as a conditional use for Floodway Districts and General Floodplain Districts, as discussed in Section 5.3.1.2.

Floodplains in the West Section

Floodplains in the West Section tend to be broad due to fairly flat topography. FEMA has designated Zone A (100-year) and Zone B (500-year) floodplains along the Roseau River and a Zone A floodplain along the Warroad River. Other West Section watercourses with FEMA-designated floodplains include Sprague Creek, Hay Creek, and the East and West Branches of the Warroad River.

Wetlands

Wetlands are areas with hydric (wetland) soils, hydrophytic (water-loving) vegetation, and wetland hydrology (inundated or saturated much of the year). Wetlands are part of the foundation of water resources and are vital to the health of waterways and communities that are downstream. Wetlands can be one source of hydrology in downstream watercourses and waterbodies, detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetlands are also economic drivers because of their key role in fishing, hunting, agriculture, and recreation. Wetland types include marshes, swamps, bogs, and fens. Wetlands vary widely due to differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors (EPA 2013, reference (120)).

Wetlands across the proposed Project are identified using USFWS National Wetland Inventory (NWI) maps and are classified into different types according to the USFWS's Cowardin Classification System (Cowardin et al. 1979, reference (121)). The NWI tends to underestimate wetlands on the landscape, especially in forested conditions. As such, the presence of wetlands will be field surveyed as part of the permitting process.

Wetlands are protected as "waters of the United States" in the CWA (33 U.S.C. 1344). Although the USACE issues CWA Section 404 permits, the EPA has veto authority over those permits (33 U.S.C. 1344(c)). In implementing Section 404, the USACE and EPA jointly define wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The Federal government, including the DOE, operates on a policy of "no net loss" of wetlands, meaning that operations and activities shall avoid the net loss of size, function, or value of wetlands.

Under Section 404 of the CWA, a permit is required for the discharge of dredged or fill materials into wetlands. As part of the permitting process, wetlands along the entire proposed project ROW would be identified and delineated by the Applicant according to the Federal Routine Determination Method, as described in the 1987 USACE Wetland Delineation Manual and associated regional supplements. For unavoidable impacts, compensatory mitigation is required to replace the loss of wetland, stream, or other aquatic resource functions. The USACE is responsible for determining the appropriate form and amount of compensatory mitigation required.

Executive Order 11990, entitled Protection of Wetlands, requires federal agencies to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. To meet these objectives, the order requires federal agencies to consider alternatives to wetland impacts and to minimize potential wetland impacts if an activity affecting a wetland cannot be avoided.

As noted above in the floodplain section, DOE has rules specifically addressing wetlands (10 CFR 1022.1-1022.24). For an action proposed in a wetland, the effects on the survival, quality, and values of the wetland shall be evaluated. In assessing the proposed Project's impacts on wetlands, DOE's assessment must discuss: (a) positive and negative, direct and indirect, and long and short-term effects on wetlands and (b) impacts on natural and beneficial wetland values (10 CFR 1022.13(a)(2)). Section 1022.14 states that, if there is no practicable alternative to avoiding wetland impacts, "then DOE shall design or modify its action in order to minimize potential harm to or within the….wetland consistent with the policies set forth in Executive Order 11988 and Executive Order 11990."

Minnesota has a number of state-level mechanisms protecting wetlands. The Minnesota Wetland Conservation Act (WCA) (Minnesota Rules, chapter 8420) is administered by the Board of Soil and Water Resources and was established to

maintain and protect Minnesota's wetlands and the benefits they provide. The WCA's goal of no-net-loss of wetlands requires that proposals to drain, fill, or excavate a wetland must first avoid disturbing the wetland, next minimize wetland impacts, and finally replace lost wetland acres, functions, and values. Certain activities are exempt from the WCA, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

A second state-level program that offers protection to the state's waters and wetlands is the Public Waters Inventory (PWI), administered by the MnDNR (Minnesota Statutes, section 103G.005). The agency's Waters Permit Unit regulates work below the ordinary high water level of PWI wetlands and waters through the Public Waters Work Permit Program. Examples of work activities addressed by this program include filling, excavation, bridges and culverts, dredging, structures, and other construction activities.

A final state-level wetland regulation applicable to the proposed Project is the Minnesota Peatland Protection Act. As described in Minnesota Statute, section 84.035, Peatland Protection, the Minnesota Peatland Protection Act protects and preserves peatlands through establishment and designation of certain peatland core areas as SNAs. Calcareous fens are a rare, groundwater-based type of wetland typically found in peatlands, and the only natural community specifically protected by the Minnesota Peatland Protection Act.

Wetlands in the West Section

Wetlands in the West Section primarily consist of large peatland complexes, including shrubby bog areas intermixed with forested and emergent wetlands. Pine Island Peatlands, Ross Peatlands, Thief Lake Peatlands, and Lude Beaches and Peatlands are present in the West Section (Map 5-1). The following wetland types are present throughout the West Section: palustrine emergent wetland (PEM), palustrine shrub wetland (PSS), palustrine forested wetland (PFO), and palustrine unconsolidated bottom pond (PUB). The MnDNR has mapped two calcareous fens within variation areas in the West Section; both calcareous fens are located in the Border Crossing Variation Area (Map 5-9). Only one calcareous fen is located within one mile of the anticipated ROW for a proposed route or variation. Currently, only the Pine Creek Peatland SNA and the Winter Road Lake Peatland SNA are protected by the Minnesota Peatland Protection Act, and both are located in the West Section; however, neither are crossed by the proposed routes or variations. SNAs are intended to preserve natural features and rare resources of exceptional scientific and educational value.

Additionally, MnDNR has established Watershed Protection Areas (WPAs) for peatland SNAs to protect the hydrology of groundwater-dependent natural communities, such as peatlands and calcareous fens. The Pine Creek Peatland SNA WPA and Sprague Creek SNA WPA are located within the Border Crossing and Roseau Lake WMA variation areas; both are crossed by proposed routes or variations. The Winter Road Lake Peatland SNA WPA is located in the Beltrami North and Beltrami North Central variation areas, which is crossed by proposed routes or variations. Section 5.3.5 provides additional information regarding fens and other rare wetland communities.

General Impacts

Construction and operation of the proposed Project may result in short-term and long-term impacts on water resources. Impacts to watercourses and waterbodies are primarily assessed by determining whether the ROW would require water crossings. The EIS assesses floodplain impacts by first quantifying the floodplain acreage within the ROW and then determining if the span between structures is long enough to require transmission structure placement in the floodplain. Similar to floodplain impacts, permanent wetland impacts are determined by whether fill associated with a transmission structure would be placed within wetland boundaries. Conversion of one wetland type to another through removal of woody vegetation as well as any changes to wetland functions or values due to impacts are also considered.

The potential impacts of the proposed routes and variations on water resources in the West Section are discussed in Section 6.2.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on vegetation.

Impacts from Construction

Short-term impacts on watercourses and waterbodies include localized physical disturbance caused by construction equipment during site preparation, including vegetation clearing, grading, excavation, and soil stockpiling. These activities increase the potential for soil erosion and subsequent sedimentation of local watercourses and waterbodies. The presence of exposed topsoil or disturbed vegetation during construction may also increase sediment runoff from stormwater, which

may affect turbidity and dissolved oxygen levels in receiving waters. Long-term, indirect water resources impacts may include removal of riparian or shoreline forest areas within the ROW. In addition to habitat changes, this vegetation clearing could increase light penetration to watercourses and waterbodies, potentially resulting in localized increases in water temperatures and changes to aquatic communities.

Wetlands may also be temporarily impacted by soil erosion and sediment deposition during construction. Sedimentation and ground disturbance in wetlands can make them more susceptible to establishment of invasive plant species, such as reed canary grass, which would adversely impact wetland function by reducing vegetative biodiversity and altering wildlife habitat. Water resources also have the potential to become contaminated during construction, due to accidental spilling of fuels or other hazardous substances.

Construction activities, including the establishment and use of temporary access roads, staging, and stringing areas, may require access across wetlands and other water resources to facilitate construction of parts of the proposed Project that are not easily accessible by public roadways. Preparing the site and installing structures may have short-term impacts on 0.92 acres per structure (200 feet by 200 feet) by soil compaction associated with concentrating surface disturbance and equipment use (Minnesota Power 2014, reference (123)). Impacts in stringing and staging areas will be determined once the final route has been selected by the MN PUC. Impacts to water resources could be minimized or mitigated through use of construction matting to traverse wetlands, limiting crossing of watercourses and using the shortest practical route, timing construction in these areas to take place during frozen conditions, and use of low ground pressure equipment to the extent practical. Construction access through wetlands could also be minimized through the use of helicopters to assist with construction activities, as appropriate.

It would be expected that all watercourses (including impaired waters), ditches, and ponds would be spanned, as the crossing distance for each of the watercourses and waterbodies in the West Section is shorter than the 1,250-foot typical spannable distance (Section 2.1). Direct impacts on these water resources are not anticipated because the Applicant would use BMPs, as described in Section 2.13. Floodplain or wetland crossings that are greater than the 1,250-foot typical spannable distance may require permanent placement of fill to construct one or more structure foundation within the floodplain or wetland. Where complete avoidance of floodplains is not feasible, it would be expected that structure placement would have limited effects on water flow, flood water storage capacity, or flooding in those floodplains as the volume displaced by the structures would likely be small in the context of the setting. FEMA does not require mitigation for construction within the floodplain, though local floodplain permitting entities could require mitigation, such as compensatory storage, as part of their floodplain permit conditions. Where avoidance of wetlands is not feasible, the potential adverse impacts to wetland function from these activities include local changes to wetland hydrology from compaction of soils as well as changes in nutrient and water uptake from changes in vegetative cover. Mitigation would be required for structure foundations placed within wetland boundaries, as well as for conversion of wetland from one type to another. The Applicant is currently developing a wetland mitigation plan in collaboration with the USACE to meet the agency's compensatory mitigation requirements. If a PWI wetland cannot be spanned and a structure foundation needs to be placed within its boundaries, the surrounding PWI wetland areas would be mitigated and restored in accordance with MnDNR permit specifications.

Groundwater may be temporarily impacted during construction if dewatering is necessary to install structures or if pumping wells are needed to supply water for concrete batch plant operations. Dewatering or pumping would require water appropriations permits from the MnDNR. Groundwater hydrology, including that of SNA WPAs, is not anticipated to be permanently impacted by construction. Structure installation is not expected to extend deep enough to substantially impact wellhead protection areas. Groundwater would not be permanently drawn away from the system and would be expected to recharge itself after temporary dewatering and pumping activities. Since SNA WPAs, wellhead protection areas, and other groundwater resources are not expected to be permanently impacted by the proposed Project, they are not discussed further in Chapter 6 of this EIS.

Impacts from Operation, Maintenance, and Emergency Repairs

Long-term, operational impacts on water resources would be primarily associated with maintenance and repairs. The Applicant would routinely clear woody vegetation within the ROW to maintain low-stature vegetation, which is needed for safe and efficient operations of the transmission line. Removing woody vegetation within a forested or shrub wetland would not reduce overall wetland

acreage, but it would convert the forested or shrub wetland area to a different vegetation community and wetland type. Operational activities are not anticipated to impact water resources beyond wetland clearing discussed above.

5.3.4.2 Vegetation

Executive Order 13112, entitled Invasive Species, requires federal agencies to identify actions that could affect the status of invasive species, prevent and control the spread of invasive species on its projects, and not to authorize actions that are likely to introduce or spread invasive species unless the benefits of such actions outweigh potential harm caused by invasive species. All feasible and prudent measures to minimize harm are to be taken in conjunction with actions that would introduce invasive species.

In Minnesota, noxious weeds are managed at the state level through the Minnesota Department of Agriculture (MDA), which administers the Minnesota Noxious Weed Law. The MDA lists four categories of noxious weeds with differing levels of eradication, control, reporting, transport, sales, and propagation requirements (MDA 2015, reference (122)). There are 12 weeds on the eradicate list, 8 on the control list, 5 restricted species, and 4 specially regulated plants. Prohibited noxious weeds "are known to be detrimental to human or animal health, the environment, public roads, crops, livestock or other property" (MDA 2015, reference (122)). None of the plants on these lists is to be transported, propagated, or sold in the state. Weeds on the list include annual, biennial, and perennial plants. Counties may create and administer their own lists of noxious weeds; however, the counties across the proposed Project have not listed any species or rules above and beyond the MDA noxious weed lists.

Federal and state regulations in place to protect threatened and endangered plant species are discussed in Section 5.3.5.

The USFWS has expressed its commitment to the June 20, 2014, Presidential Memorandum "Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators." As such, the USFWS has recommended that protection of native plant communities and pollinators is a component of the re-vegetation strategy.

The ROI for this analysis of impacts to vegetation includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. This ROI was selected based on the expectation that, given the construction activities proposed and associated BMPs to minimize and mitigate impacts, the majority of vegetation impacts would likely occur within this area.

Vegetation in the West Section

This section describes the vegetation resources within the West Section and the potential impacts on those resources from construction and operation of the proposed Project.

The MnDNR USFS developed a hierarchical ecological classification system (ECS), which is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features, such as climate, geology, vegetation, and other landscape factors (MnDNR 2015, reference (92)). According to the ECS, the West Section is primarily located in the Agassiz Lowlands subsection, which is located in the Northern Minnesota and Ontario Peatlands section of the Laurentian Mixed Forest Province. The western portion of the West Section, including parts of the Border Crossing and Roseau Lake WMA variation areas, is located in the Aspen Parklands subsection, which is located in the Lake Agassiz, Aspen Parklands section of the Tallgrass Aspen Parklands Province. The ECS subsections in the West Section are identified on Map 5-2.

The Agassiz Lowlands subsection is predominantly comprised of vast peatlands and upland sand ridges resulting from the retreat of Glacial Lake Agassiz to the west. Peatlands are a mosaic of forests dominated by black spruce or tamarack, or herbaceous sedge meadow, fresh meadow, and poor or rich fens. Sand ridges are commonly dominated by aspen and birch, or jack pine forests and woodlands. The subsection is generally very flat and poorly drained. Past attempts at ditching and farming the peatlands have been largely unsuccessful and most of the subsection is uninhabited (MnDNR 2015, reference (92)).

The Aspen Parklands subsection is considered a transitional landscape between prairies to the west and forest provinces to the east. The characteristic landscape setting is typically low-lying lands with minimal topography. The regional water table is near the surface in much of the subsection, creating a mosaic of vegetation types including prairie, brushland, woodland, and forest. Peatlands are a common component in the subsection where the water table is near the ground surface. Fires were

an important factor for maintaining vegetation communities where conditions were dry enough to allow for natural or human-set burns (MnDNR 2015, reference (92)).

Based on the USGS GAP data, the variation areas in the West Section are primarily comprised of herbaceous agricultural vegetation, upland forests, and lowland swamps (Map 5-5). Additional land cover types present in the West Section include grassland and shrub land, open water, emergent wetlands, developed/urban land, and disturbed or modified land (Appendix E).

Several state forests, including the Lost River State Forest, Beltrami Island State Forest, and Lake of the Woods State Forest, are located within or adjacent to variation areas in the West Section (Map 5-5). In addition, several sensitive ecological resources, such as MnDNR High Conservation Value Forest, Wildlife Management Areas (WMAs), Minnesota Biological Survey (MBS) Sites of Biodiversity Significance, and rare native plant communities are located within or adjacent to variation areas in the West Section (see Section 5.3.4.3 and Section 5.3.5).

General Impacts

Construction and operation of the proposed Project may cause short-term and/or long-term impacts on vegetation. The EIS assesses impacts on vegetation by primarily using the USGS GAP land cover mapping to identify vegetation cover within the ROW and by evaluating the proximity of the ROW to state forests, wetlands, and sensitive ecological resources.

Section 6.2 summarizes the potential impacts of the proposed routes and variations on vegetation in the West Section.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on vegetation. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

The use of construction equipment during site preparation (grading, excavation, and soil stockpiling) may result in short-term adverse impacts on existing vegetation, including localized physical disturbance and compaction. Construction activities, such as site preparation and installation of structures, may have short-term impacts on 0.92 acres of vegetation per structure (200 feet by 200 feet; Minnesota Power 2014, reference (123)). Construction activities involving establishment and use of access roads, staging, and stringing areas would also have short-term impacts on vegetation by concentrating surface disturbance and equipment use.

Construction activities would cause long-term impacts on vegetation by permanently removing vegetation at each structure footprint (**1,936** square feet per structure; Minnesota Power 2015, reference (124)) and within portions of the ROW that are currently dominated by forest or other woody vegetation. The Applicant would permanently convert forested areas and shrub lands to low-stature vegetation by clearing woody vegetation throughout the entire ROW. Permanent loss of forest would lead to fragmentation by reducing intact blocks of forest vegetation and create long-term, regional, adverse, indirect impacts to species dependent on large contiguous blocks of interior forest. Construction-related removal of vegetation and conversion to open habitats could have indirect impacts on native vegetation by increasing the potential for spread of invasive species as well as increasing the effects of light penetration, wind, and humidity that occur more prominent at edges between habitats.

Construction-related clearing of woody vegetation within the ROW would result in the widening of existing corridors or bisecting (fragmenting) forests and shrub lands to establish new ROWs. Alteration of vegetation community composition and structure would occur at the edge of newly cleared forests or shrub lands. In areas where the new transmission line would be located adjacent to an existing ROW, these effects would largely be limited to one side of the ROW and would not create newly fragmented areas. Impacts related to the permanent conversion of forest vegetation to low-stature open vegetation are expected to be extensive in areas where new ROW would be created and less so in situations where an existing ROW is expanded. Section 5.3.4.3 provides additional information related to fragmentation of forested areas.

Construction of any transmission line could lead to the introduction or spread of noxious weeds or other invasive species. Construction activities that could potentially lead to introduction of noxious weeds and invasive species include ground disturbance that leaves soils exposed for extended periods, introduction of topsoil contaminated with weed seeds, vehicles importing weed seed from a contaminated site to an uncontaminated site, and through conversion of landscape type, particularly from forested to open settings. Noxious weeds have potential to dominate and displace native plants and plant communities, permanently altering ecosystem functions.

Impacts from Operation, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on vegetation from removal of vegetation, localized physical disturbance, and compaction caused by the use of equipment. Maintenance and emergency repair-related impacts on vegetation would be short-term and more localized than construction-related impacts.

5.3.4.3 Wildlife

Both federal and state laws protect certain wildlife, including those that are not endangered or threatened. The federal Migratory Bird Treaty Act (MBTA), for example, prohibits the "take" of migratory birds, including any species also listed under the Endangered Species Act (ESA), which is discussed below (16 U.S.C. 703-712). The MBTA requires Federal agencies to consult with the USFWS to determine if an agency's proposed action would have, or is likely to have, measurable negative effects on migratory bird populations, and if so, to develop measures intended to avoid any negative effects on migratory birds. **The Memorandum of Understanding between the DOE and USFWS (September 12, 2013) provides for the implementation of Executive Order 13186, which discusses the responsibilities of federal agencies to protect migratory birds.**

The Federal Bald and Golden Eagle Protection Act prohibits the taking of bald and golden eagles (*Haliaeetus leucocephalus* and *Aquila chrysaetos*, respectively) (16 U.S.C. 668-668c). The Federal Bald and Golden Eagle Protection Act requires consultation with the USFWS to determine if a proposed project may have potential impacts on bald and golden eagles and, if applicable, to develop habitat conservation plans intended to avoid and minimize the project's impacts on the bald and golden eagles.

The USFWS has established Grassland Bird Conservation Areas in the upper Midwest, including in Minnesota. Grassland Bird Conservation Areas are priority areas for grassland protection and enhancement that are thought to provide suitable habitat for many priority grassland bird species in the tallgrass prairies of region.

Wildlife management at the state level is primarily associated with MnDNR programs, including WMAs and the Shallow Lakes Program. WMAs in Minnesota were established to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. The MnDNR manages these areas in order to protect wildlife for future generations; provide citizens with opportunities for hunting, fishing, and wildlife watching; and promoting wildlife-based tourism in the state. The MnDNR Shallow Lakes Program was developed to protect and enhance wildlife habitat on lakes dominated by shallow water/littoral zones.

Federal and state regulations in place to protect threatened and endangered wildlife species are discussed in Section 5.3.5.

The ROI for this analysis of impacts to vegetation includes the ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations. This ROI was selected based on the expectation that, given the construction activities proposed and associated BMPs to minimize and mitigate impacts, the majority of wildlife impacts would likely occur within this area.

Wildlife in the West Section

This section describes the wildlife resources that occur within the West Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning wildlife resources, as well as a discussion of the ROI for wildlife, can be found **in Section 5.3.4.3**.

The landscape types and vegetation communities throughout the West Section of the proposed Project provide forage, shelter, nesting, overwintering, and stopover habitat for a wide range of resident and migratory wildlife species. Habitat types are diverse and range from grassland-dominant habitat types in the western part of the section to increasingly forested habitat types to the east. Similarly, wildlife communities also change along this same vegetative gradient from west to east.

As discussed in Section 5.3.4.2, the West Section is located within two Ecological Classification System (ECS) subsections classified by the MnDNR and USFS (MnDNR 2015, reference (92)); the Agassiz Lowlands and Aspen Parklands subsections (Map 5-2). MnDNR's comprehensive wildlife plan, *Tomorrow's Habitat for the Wild and Rare an Action Plan for Minnesota Wildlife* (MnDNR 2006, reference (125)), which corresponds to the ECS native plant communities, was used to summarize

the wildlife likely present in the two ecological subsections in the West Section of the proposed Project. Identified within each ECS subsection are species of greatest conservation need (SGCN), which are those species whose populations are rare, declining, or vulnerable in Minnesota. Approximately half of the SGCN are also Minnesota state-listed species (MnDNR 2006, reference (125)).

Native community types located within the Agassiz Lowlands subsection provide habitat for species associated with lowland conifer, dune, and non-forested wetland vegetation communities. Birds found in this subsection include white pelican, common tern, American bittern, yellow rail, and numerous migratory shorebird, waterfowl, and perching species. Typical mammals that occupy these habitats include beaver, otter, and bog lemming. Forest communities present in this subsection include habitats that harbor species such as spruce grouse, great gray owl, short-eared owls, and sharp-tailed grouse. Approximately 88 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within community types present within this subsection (MnDNR 2006, reference (125)).

Native community types located within the Aspen Parklands subsection provide habitat for species associated with grassland and woodland habitats. Species include short-eared owl, greater prairie chicken, northern harrier, elk, Franklin's ground squirrel, marbled godwit, and upland sandpiper. Approximately 85 species designated as endangered, threatened, special concern, or SGCN may occur within community types present within this subsection (MnDNR 2006, reference (125)).

In addition to the natural wildlife habitat present throughout the West Section, there are several areas of managed wildlife habitat present in the West Section. Several MnDNR WMAs are present in the variation areas in the West Section, including the Roseau Lake WMA and Cedar Bend WMA (Map 5-8). The MnDNR establishes WMAs to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, and fishing.

The National Audubon Society Big Bog Important Bird Area, which is part of the Big Bog State Recreation Area, is located within the southeastern portion of the West Section, in the Beltrami North and Beltrami North Central variation areas (Map 5-8). The National Audubon Society has established Important Bird Areas in an effort to identify and conserve areas that are vital to birds and other biodiversity.

Several USFWS Grassland Bird Conservation Areas, which serve as priority conservation areas for grassland nesting bird species, are present in the variation areas located in the western part of the West Section (Border Crossing, Roseau Lake WMA, and Cedar Bend), where more grassland vegetation is present (Map 5-8). The USFWS defines three core types (Type 1, Type 2, and Type 3) of Grassland Bird Conservation Areas based on size, width, amount of grass in the landscape, and the types of wetlands considered compatible for these birds. All three Grassland Bird Conservation Area core types are present in the western part of the West Section; for simplicity these three core types are grouped into one category, as impacts would be similar regardless of Grassland Bird Conservation Area core type.

There is a MnDNR-designated great gray owl (*Strix nebulosa*) reserve within the Border Crossing Variation Area. This reserve is located in the Lost River State Forest (Maps 5-5 and 5-8). The MnDNR has studied gray owls in northern Roseau County for over 33 years. The studies determined that both breeding owls and winter visitors are present in greater numbers in this part of Minnesota than in any other location in the state (MnDNR 2006, reference (126)).

There is an MnDNR-designated shallow lake within the Cedar Bend WMA Variation Area (Map 5-8). The MnDNR established the Shallow Lakes Program to protect and enhance wildlife habitat on lakes dominated by a shallow water zone (littoral zone), since these lakes generally provide important wildlife habitat.

The West Section also contains three state forests (discussed in Section 5.3.4.2), several rare native plant communities, and many other sensitive ecological resources (discussed in Section 5.3.5), all of which provide habitat for common and rare wildlife species.

General Impacts

Construction and operation of the proposed Project may cause short-term and long-term impacts on wildlife resources. The EIS assesses impacts on wildlife by evaluating the vegetation cover/habitat in the ROW, the proximity of the ROW to sensitive wildlife habitats, such as those described above, and known occurrences of sensitive wildlife species.

Section 6.2 summarizes the potential impacts of the proposed routes and variations on wildlife in the West Section.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate potential

impacts on wildlife. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Construction activities that generate noise, dust, or disturbance of habitat may result in short-term indirect impacts on wildlife. During construction of the proposed Project, wildlife would generally be displaced within the anticipated ROW. These impacts are expected to be short-term and localized. Common species habituated to human presence may continue to utilize habitats adjacent to the ROW during construction.

Construction of the proposed Project may result in long-term adverse impacts on wildlife from the loss or conversion of habitat and habitat fragmentation. The proposed Project would expand existing cleared corridors and/or create new corridors, some of which would be converted from forest and shrub land to low-stature vegetation. The Applicant would permanently clear woody vegetation within the anticipated ROW by either widening existing ROWs or creating new ROWs through existing forests and shrub lands. Wildlife species previously occupying forested communities in the ROW would be displaced in favor of species that prefer more open vegetation communities. Impacts are expected to be extensive in areas where new ROW would be created and more localized in situations where an existing ROW is expanded.

Conversion of vegetation structure alters species use by changing plant community composition and structure. When forested plant communities are converted to open communities, there are corresponding changes in wildlife communities. Species that rely on well-developed forest canopies for nesting, foraging, or shelter are displaced from the portion of the landscape where this alteration occurs. Species that rely on shrubby or grassland habitats may be less susceptible to, and may even benefit under alterations associated with transmission lines because they would undergo fewer changes in vegetation community structure and environmental factors, such as light intensity.

Habitat fragmentation reduces the size of contiguous blocks of vegetation, such as forest; this reduces the total area of contiguous habitat available to wildlife species and increases the isolation of the habitat. Opportunistic and adaptable animals often succeed in highly fragmented habitats. Non-native invasive or pioneering plant species may encroach where disturbance provides a competitive advantage and an avenue of introduction, such as where habitat fragments occur. The alteration of plant community composition and structure can adversely affect those species that rely on the presence of certain plant species or vegetative cover. Fragmentation effects are greatest where large contiguous blocks are broken up into smaller patches that reduces interior forest habitat necessary for some species such as song birds. The effects would generally be greatest where new corridor is created, rather than where the transmission line parallels an existing corridor.

Impacts from Operation, Maintenance, and Emergency Repairs

The Applicant would routinely maintain the ROW to support low-stature non-woody vegetation; emergency repairs may require additional vegetation clearing. Operation, maintenance, and emergency repair activities may have long-term indirect impacts on wildlife, including the displacement of birds, burrowing animals, and other species utilizing the ROW or its vicinity for foraging, breeding, or nesting. These impacts are expected to be long-term and localized.

Operation of the proposed Project may result in long-term impacts on wildlife, including the potential risk of avian collisions with transmission conductors and equipment, which could result in injury or death of individuals. Through use of Applicant proposed minimization measures, as described in Section 2.13, these impacts are expected to be limited. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Increased risk of avian collisions and potential electrocution with transmission conductors and equipment is possible with the development of all transmission lines. Electrocution occurs when an arc is created by contact between a bird and energized lines or an energized line and grounded structure equipment. Electrocution occurs more frequently with larger bird species, such as hawks, because they have wider wingspans that are more likely to create contact with the conductors. Electrocution occurs more frequently with distribution lines than transmission lines, because the conductors are often closer together or closer to grounded hardware on distribution lines. Because the structures would be larger and the phase spacing for the proposed Project's conductors greater compared to distribution lines, avian electrocutions are unlikely.

Transmission lines may present the possibility for avian collisions. Several factors, such as body size, weight, and flight behavior, affect the potential for birds to collide with overhead power lines. Larger

birds, such as waterfowl, are generally the most likely to collide with transmission lines. Impacts are likely to be higher around features that attract birds, such as wetlands, lakes, and feeding sites.

5.3.5 Rare and Unique Natural Resources

The ESA provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, as well as conservation of the habitats upon which they depend. An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become an endangered species in the foreseeable future. Section 7(a)(2) of the ESA at 16 U.S.C. 1536 requires that any actions a Federal agency carries out, permits, licenses, funds, or otherwise authorizes that may affect a federally listed threatened or endangered species must involve consultation with the USFWS to ensure its actions are not likely to jeopardize the continued existence of any listed species. Section 7(a)(4) of the ESA requires federal agencies to confer with the USFWS on any action that is likely to jeopardize the continued existence of any species proposed for federal listing or on actions that would result in adverse modification of critical habitat proposed to be designated. DOE's informal consultation under Section 7 of the ESA with USFWS is currently on-going (Appendix Q).

Minnesota Statutes, section 84.0895, Protection of Threatened and Endangered Species, requires the MnDNR to adopt rules designating species as endangered, threatened, or species of special concern. The resulting list of these species is codified in Minnesota Rules, chapter 6134, Endangered Threatened, and Special Concern Species. The Endangered Species Statute also authorizes the MnDNR to adopt rules that regulate treatment of species designated as endangered and threatened at the state level at Minnesota Rules, part 6212.1800 to part 6212.2300, Threatened and Endangered Species. A state-listed endangered species is threatened with extinction throughout all or a significant portion of its range within Minnesota. A state-listed threatened species is likely to become endangered in the foreseeable future throughout all or a significant portion of its range in Minnesota. A species is considered to be of special concern if, although the species is not endangered or threatened at the state level, it is extremely uncommon in Minnesota or has unique or highly-specific habitat requirements that deserves careful monitoring of its status. Minnesota's Endangered Species Statutes and the associated rules impose a variety of restrictions, a take permit program, and several exemptions pertaining to threatened or endangered species. Species of special concern, though often ecologically important, are not protected by Minnesota's Endangered Species Statue or the associated rules.

The MnDNR has established several classifications of rare communities across the state, including SNAs, MBS Sites of Biodiversity Significance, MnDNR High Conservation Value Forest, and MBS native plant communities.

SNAs are areas of land designated to preserve natural features and rare resources of exceptional scientific and educational values. Though SNAs are open to the public for nature observation and education, they are not meant for intensive recreational activities. SNAs in northern Minnesota are generally associated with peatlands and forest features.

The MnDNR MBS assigns a biodiversity significance rank to all sites surveyed across the state. These ranks are used to communicate statewide native biological diversity of each site and help to guide conservation and management activities. There are four biodiversity significance ranks: outstanding, high, moderate, and below. A site's biodiversity significance rank is based on the presence of rare species populations, the size, and condition of native plant communities within the site, and the landscape context of the site.

MnDNR High Conservation Value Forests are broadly defined as areas of outstanding biological or cultural significance. The MnDNR is required by Minnesota Statutes, chapter 89, State Forests; Tree Planting; Forest Roads and Minnesota Statutes, chapter 89A, Sustainable Forest Resources, to manage a broad set of objectives and forest resources, including the management and protection of rare species, communities, features, and values across the landscape. This directive coincides with the Forest Stewardship Council – United States' National Forest Management Standard, which requires that forests of high conservation value be identified and managed to maintain or enhance identified high conservation values. Most sites managed as MnDNR High Conservation Value Forests are to remain working forests.

The MnDNR MBS also identifies native plant communities across the state. A native plant community is a group of native plants that interact with each other and their environment in ways that have not been greatly altered by modern human activity or introduced organisms. Native plant

communities provide a range of ecological functions that are increasingly recognized as valuable for the quality of life in Minnesota. In addition to the habitat value native plant communities provide, they have also played an important role in the development of Minnesota's cultural history and heritage.

The ROI for rare and unique natural resources varies for species and communities. The ROI for an analysis of impacts to federally and state-listed species includes a one-mile buffer surrounding the proposed routes and variations in order to obtain a broad view of species that may be present across the proposed Project, since no formal surveys have been conducted for the proposed Project. The ROI for the analysis of impacts to rare communities includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. These ROIs were selected based on the expectation that the majority of rare and unique natural resource impacts would likely occur within these areas.

5.3.5.1 Rare and Unique Natural Resources in the West Section

This section describes the rare and unique natural resources, including federally and state protected species and rare communities, which are present within the West Section. Potential impacts on these resources from construction and operation of the proposed Project are also discussed below.

Federally Listed Species in the West Section

The USFWS technical assistance website was reviewed to determine if any federally listed species or federally designated critical habitats are known to be present within Roseau and Lake of the Woods counties, where the West Section is located (USFWS 2015, reference (127)). The USFWS lists six species as occurring in Roseau and/or Lake of the Woods counties, including the federally endangered butterfly, Poweshiek skipperling (*Oarisma poweshiek)* in Roseau County; the federally threatened gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*), and northern long-eared bat (*Myotis septentrionalis*) in both Roseau and Lake of the Woods counties; the federally threatened piping plover (*Charadrius melodus*) in Lake of the Woods County; and the federal candidate bird, Sprague's pipit (*Anthus spragueii*) in Roseau County (USFWS 2015, reference (127); Table 5-25).

Designated-critical habitat associated with federally listed species consists of "the specific areas within the geographical area occupied by the species, at the time it is listed…on which are found within those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection" (50 CFR 1533[b][2]). There is no designated critical habitat in any of the variation areas in the West Section for the federally listed species in Roseau and Lake of the Woods counties.

Poweshiek skipperling. The Poweshiek skipperling, a small butterfly that inhabits native wet-mesic to dry tallgrass prairie remnants, was listed as federally endangered in 2014 (79 Federal Register 63671-63748). No designated critical habitat has been finalized for this species; however, the nearest proposed designated critical habitat for the poweshiek skipperling is located in Mahnomen County, Minnesota, which is over 60 miles from any of the proposed routes or variations.

Gray wolf. The gray wolf was federally listed as an endangered species in 1974 and was reclassified as threatened in 1977 (42 Federal Register 29527-29532). In 2011, the wolf was delisted by the USFWS (76 Federal Register 57943-57944). However, in 2014, a federal court reversed the USFWS decision to delist the gray wolf, restoring federal threatened status and designated critical habitat in Minnesota. Gray wolves occupy a diversity of habitats, including

Table 5-25 Federally Listed Species Known to Occur in Roseau and/or Lake of the Woods Counties

Scientific Name	Common Name	Federal Status	State Status
Oarisma poweshiek	Poweshiek skipperling	Endangered	Endangered
Canis lupus	Gray wolf	Threatened	Special Concern
Lynx Canadensis	Canada lynx	Threatened	Special Concern
Charadrius melodus	Piping plover	Threatened	Endangered
Anthus spragueii	Sprague's pipit	Candidate	Endangered
Myotis septentrionalis	Northern long-eared bat	Threatened	Special Concern

Source: USFWS 2015, reference (127)

forests, prairies, and swamps (USFWS 2012, reference (128)). There is no designated critical habitat for gray wolf in the West Section; however critical habitat is present just south of the West Section, throughout the Central Section, and in the northern part of the East Section (Map 5-8, Map 5-15, and Map 5-22).

Canada lynx. The Canada lynx was listed as a federally threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies in 2000 (65 Federal Register 16052-16086). Canada lynx inhabit boreal and mixed coniferous and deciduous forests, where snowshoe hare, their preferred diet, are present (USFWS 2013, reference (129)). The nearest designated critical habitat for lynx is over 60 miles east of the West Section and at least 11 miles east of the proposed routes or any variation in the proposed Project.

Piping plover. The northern Great Plains population of the piping plover was listed as federally threatened in 1985 (50 Federal Register 50726-50734). Piping plovers inhabit wide, flat, open, sandy beaches with very little grass or other vegetation present (USFWS 2001, reference (130)). The nearest designated critical habitat for piping plover is Lake of the Woods, approximately 11 miles north of the northernmost variation in the Cedar Bend WMA Variation Area in the West Section (Map 5-8).

Sprague's pipit. The Sprague's pipit, a bird that inhabits native mixed or tallgrass prairies, was designated a federal candidate species in 2010 (75 Federal Register 56028-56050). Designated critical habitat has not been designated for the Sprague's pipit at this time.

Northern long-eared bat. The northern long-eared bat was proposed for listing as a federally endangered species in 2013 (78 Federal Register 61046-61080). In April of 2015, the USFWS listed the northern long-eared bat as federally threatened (80 Federal Register 18023-18028).The northern long-eared bat inhabits caves and mines in winter; in summer northern long-eared bats roost in live and dead trees with loose, flakey, or shaggy bark, crevices, or hollows (USFWS 2015, reference (131)). The USFWS has not identified designated critical habitat for the northern long-eared bat at this time.

Additional information on federally listed species is available in the Biological Assessment in order to determine the impacts of the proposed Project on federally listed species and to facilitate ESA Section 7 consultation (Appendix R).

State Listed Species in the West Section

The MnDNR Natural Heritage Information System (NHIS) database was queried in **September** of 2015 to obtain the locations of rare species documented within the West Section (MnDNR **2015**, reference (132)). The NHIS database includes records of rare species, some of which are federally and/or state protected. The NHIS database also includes species that are either special concern or tracked by the MnDNR. The MnDNR database does not track documented records of gray wolf or Canada lynx.

Because no formal surveys for rare species have been conducted for the proposed Project, a one-mile buffer surrounding the proposed routes and variations in the West Section was used to obtain a broad view of the rare species that may be present across this portion of the proposed Project. The NHIS database documents the following state-threatened or endangered species within one-mile of the proposed routes and variations in the West Section: state-endangered and federal candidate Sprague's pipit (*Anthus spragueii*); state-endangered upward-lobed moonwort (*Botrychium ascendens*); and the state-threatened common moonwort (*Botrychium lunaria*), sterile sedge (Carex sterilis), ram's-head lady's slipper (*Cypripedium arietinum*), and eastern spotted skunk (*Spilogale putorius*) (Table 5-26). In addition to these state-endangered and threatened species, several state-special concern species have been documented within one-mile of the proposed routes and variations in the West Section; these include **10** vascular plants, four birds, one mammal, two mussels, and one fish. State-endangered, threatened, and special concern species and their associated habitats are summarized in Table 5-26. In addition to these species, the MnDNR also has a group of species that are being tracked in order to determine conservation needs. Tracked species that have been documented within one mile of the proposed routes and variations in the West Section are summarized in Appendix F.

State Rare Communities in the West Section

Several rare communities have been identified within or adjacent to the variation areas in the West Section; these include SNAs, MBS Sites of Biodiversity Significance, MnDNR High Conservation Value Forests, and MBS native plant communities (Map 5-9). Many rare communities present in the West Section are located within one of the three state forests in this area; these include Lost River State Forest, Beltrami Island State Forest, and Lake of the Woods State Forest (Map 5-5). State forests are discussed in Section 5.3.4.2. Other resources that

Table 5-26 State-Endangered, Threatened, and Special Concern Species Documented within One Mile of the Proposed Routes and Variations in the West Section

Scientific Name	Common Name	Federal Status	State Status	Type	Associated Habitat
Anthus spragueii	Sprague's Pipit	Candidate	Endangered	Bird	Large tracts of well drained native prairies and grasslands.
Botrychium ascendens	Upward-lobed Moonwort	None	Endangered	Vascular Plant	Disturbance-related habitats such as old mine tailings basins in early successional forests.
Botrychium lunaria	Common Moonwort	None	Threatened	Vascular Plant	Disturbance-related habitats including drained tailings basins, gravel banks, rocky ledges, and talus. Open or sparsely vegetated habitats with grasses and scattered shrubs.
Carex sterilis	Sterile Sedge	None	Threatened	Vascular Plant	Calcareous fens.
Cypripedium arietinum	Ram's-head Lady's-slipper	None	Threatened	Vascular Plant	Coniferous swamps, bogs, or lowland forests. Drier upland pine forests.
Spilogale putorius	Eastern Spotted Skunk	None	Threatened	Mammal	Open lands with sufficient cover, such as fence rows, shelter belts, thickets, brush, and riparian woodlands.
Androsace septentrionalis	**Northern Androsace**	**None**	**Special Concern**	**Vascular Plant**	**Dry prairie or prairie-like habitats.**
Botrychium minganense	Mingan Moonwort	None	Special Concern	Vascular Plant	Typically in mesic hardwood forests. Also observed in upland cedar forest, aspen-fir forest, wet cliff (mossy ledge of waterfalls), and old openings and trails.
Botrychium pallidum	Pale Moonwort	None	Special Concern	Vascular Plant	Disturbance-related habitats including drained tailings basins, ROWs, exposed soils in open or sparsely vegetated habitats, grassy fields with scattered shrubs.
Botrychium rugulosum	St. Lawrence Grapefern	None	Special Concern	Vascular Plant	Low, moist habitats in brushy or grassy areas and in open forest areas.
Botrychium simplex	Least Moonwort	None	Special Concern	Vascular Plant	Disturbance-related habitats including drained tailings basins, ROWs, exposed soils in open or sparsely vegetated habitats, grassy fields with scattered shrubs, and forest edges.
Cladium mariscoides	Twig-rush	None	Special Concern	Vascular Plant	Fen communities within bog complexes or calcareous fens.
Drosera anglica	English Sundew	None	Special Concern	Vascular Plant	Fens of open rich peatlands, primarily in water tracks in the interiors of large peatlands.
Drosera linearis	Linear-leaved Sundew	None	Special Concern	Vascular Plant	Fens of open peatlands, primarily in water tracks in the interiors of large peatlands.
Malaxis monophyllos var. brachypoda	White Adder's-mouth	None	Special Concern	Vascular Plant	Coniferous swamps within forested rich peatland, near upland margin of swamps.
Ranunculus lapponicus	Lapland Buttercup	None	Special Concern	Vascular Plant	Rich forested swamp, usually under a canopy of northern white cedar or black spruce.
Accipiter gentilis	Northern Goshawk	None	Special Concern	Bird	Large tracts of mature, closed canopy, deciduous, coniferous, and mixed forests with an open understory
Ammodramus nelsoni	Nelson's Sparrow	None	Special Concern	Bird	Sedge or grass-dominated wetlands, particularly wet prairie, rich fens, and wet meadows. Avoids cattail-dominated marshes.
Coturnicops noveboracensis	Yellow Rail	None	Special Concern	Bird	Sedge or grass-dominated wetlands, particularly wet prairie or rich fens.
Limosa fedoa	Marbled Godwit	None	Special Concern	Bird	Large expanses of native grasslands with sparse to moderate cover, adjacent to a complex of wetlands.
Mustela nivalis	Least Weasel	None	Special Concern	Mammal	Meadows, grasslands, and marshy and shrubby habitats
Lasmigona compressa	Creek Heelsplitter	None	Special Concern	Mussel	Creeks, small rivers, and the upstream portions of large rivers.
Ligumia recta	Black Sandshell	None	Special Concern	Mussel	Riffle and run areas of medium to large rivers.
Ichthyomyzon fossor	Northern Brook Lamprey	None	Special Concern	Fish	Adults are found in swifter waters, riffles, or runs. Ammocoetes (the larval stage of lampreys) are found in side channels or other quiet water.

Source: MnDNR 2015, reference (132)

may provide potential habitat for rare species, such as WMAs, Important Bird Areas, and Grassland Bird Conservation Areas, are discussed in Section 5.3.4.3 and shown on Map 5-8.

Scientific and Natural Area

There are three SNAs located in the West Section; two in the Border Crossing Variation Area (Pine Creek Peatland and Sprague Creek Peatland) and one in the Beltrami North Variation Area (Winter Road Lake Peatland); however only the Pine Creek Peatland SNA is located within close proximity (less than 1,500 feet) to a proposed route or variation (Map 5-9). The MnDNR designates SNAs to "protect and perpetuate in an undisturbed natural state those natural features which possess exceptional scientific or educational value" (Minnesota Statue 86A05, Subd. 5). Typically, SNAs contain native plant communities that harbor rare plants and animals or unique geological features. State regulations prohibit high voltage transmission lines from crossing SNAs (Minnesota Rules, part 7850.4300, subpart 2).

MBS Sites of Biodiversity Significance

Several areas mapped by the MBS as Sites of Biodiversity Significance are located throughout the northwestern and southeastern portions of the West Section (Map 5-9). While the mapping of Sites of Biodiversity Significance has been completed for Roseau County, mapping is only preliminary in Lake of the Woods County and the other counties across the proposed Project. The MBS designates four biodiversity significance ranks for Sites of Biodiversity Significance, these include:

- Outstanding (best occurrences of the rarest species and native plant communities).
- High (good quality occurrences of the rarest species and high-quality examples of native plant communities).
- Moderate (occurrences of rare species, moderately disturbed native plant communities).
- Below (sites with moderately disturbed native plant communities, but lacking occurrences of rare species).

Because data are preliminary across portions of the proposed Project, biodiversity significance ranks have not been designated in every location; these areas are designated "rank unknown" on Map 5-9. The Minnesota WCA affords protection for any native plant community contained within an area mapped or determined by the MBS to be eligible for mapping as an outstanding or high biodiversity significance ranking (Minnesota Rules, part 8420.0515, subpart 3).

Sites of all levels of biodiversity significance are present in the West Section, with the majority of sites ranked as moderate. The MBS has ranked Sites of Biodiversity Significance as outstanding within the Pine Creek Peatland SNA, Sprague Creek Peatland SNA, and the area where the Roseau Lake WMA, Cedar Bend WMA, and Beltrami North variation areas meet; these sites of outstanding biodiversity significance contain several native plant communities and are also designated as areas of MnDNR High Conservation Value Forest (discussed below; Map 5-9).

High Conservation Value Forest

The MnDNR has designated areas as High Conservation Value Forest within state forest land, with four of these areas present in the West Section (Map 5-9). High Conservation Value Forests are defined by the Forest Stewardship Council as "areas of outstanding biological or cultural significance" (MnDNR 2013, reference (133)). "Management activities in High Conservation Value Forests shall maintain or enhance the attributes which define such forests. Decisions regarding High Conservation Value Forests shall always be considered in the context of a precautionary approach. Minnesota Statutes, chapters 89 and 89A require that the state manage High Conservation Value Forests for protection of rare species, communities, features, and values across the landscape" (MnDNR 2013, reference (133)).

The MnDNR's process for selection of High Conservation Value Forest has been ongoing. The MnDNR has determined that current management of many SNAs and MnDNR forests are sufficient to meet the Forest Stewardship Council High Conservation Value Forest program requirements. While High Conservation Value Forests have been identified in Roseau County, they have not been identified in Lake of the Woods County.

MBS Native Plant Communities

The MBS has mapped several native plant communities throughout the West Section. In the West Section, mapping of native plant communities has only been completed for Roseau County. The Beltrami North Central Variation Area is located in Lake of the Woods County; however, while native plant communities are likely present in Lake of the Woods County, no data are available (MnDNR 2014, reference (134)).

In Roseau County, there are MBS native plant communities mapped in areas designated as Sites

of Outstanding and High Biodiversity Significance (Map 5-9). As previously mentioned, these native plant communities are also generally associated with State Forests, SNAs, and MnDNR High Conservation Value Forests (Map 5-9). Each native plant community is assigned a state conservation status as follows:

- S1 – community is critically imperiled
- S2 – community is imperiled
- S3 – community is vulnerable to extirpation or extinction
- S4 – community is apparently secure
- S5 – community is demonstrably widespread, abundant, and secure

The Minnesota WCA affords protection for any native plant community having a conservation status rank of S1, S2, or S3 that are mapped or determined eligible for mapping by the Natural Heritage and Nongame Research Program or MBS (Minnesota Rules, part 8420.0515, subpart 3).

In the West Section (Roseau County only), 20 native plant community types have been identified within 1,500 feet of the proposed route or variations, these are identified in Appendix G None of these native plant community types have a conservation status of S1, however, nine of the native plant community types have a conservation status of S2 or S3, indicating that these community types are not secure across the landscape. These native plant community types include the following:

- Graminoid Rich Fen (Water Track), Flark Subtype (S2)
- Alder – (Red Currant – Meadow-Rue) Swamp (S3)
- Graminoid Rich Fen (Water Track), Featureless Water Track Subtype (S3)
- Lowland White Cedar Forest (Northern) (S3)
- Rich Black Spruce Swamp (Water Track) (S3)
- Rich Fen (Peatland) (S3)
- Tamarack – Black Spruce Swamp (Aspen Parkland) (S3)
- White Cedar Swamp (Northwestern) (S3)
- Aspen – Fir Forest (S3/S4)

In addition to these native plant community types, the MnDNR has mapped two calcareous fens within variation areas in the West Section; both fens are located in the Border Crossing Variation Area (Map 5-9). Calcareous fen data is mapped as centroid points by the MnDNR and the boundaries of the fen are not delineated. Because of this nuance, the calcareous fen centroid points that are located within one mile of the proposed routes and variations in the West Section were used to evaluate potential impacts on calcareous fens.

Calcareous fens are a globally rare and unique groundwater-fed wetland type, and are protected by the State of Minnesota under the Minnesota WCA. Calcareous fens are characterized by a substrate of non-acidic peat and are dependent on a constant flow of groundwater that is rich in dissolved calcium and magnesium bicarbonates. This supply of mineral rich groundwater supports plant communities that are dominated by calciphyllic plants or that tolerate the mineral rich environment. Calcareous fens are susceptible to disturbance, specifically a reduction in groundwater supply.

The MnDNR has established WPAs for Peatland SNAs; these WPAs are intended to provide protective buffers to protect the hydrology of peatlands and calcareous fens in particular. Section 5.3.4.1 provides additional discussion on calcareous fen hydrology.

5.3.5.2 General Impacts

Construction and operation of the proposed Project may cause short-term and long-term impacts on rare and unique natural resources. The EIS assesses impacts on rare and unique natural resources by evaluating the presence of rare species and their associated habitats within or near the ROW and the proximity of the ROW to rare resources and communities, such as those described above.

Federally listed species that could occur in the ROW or associated construction areas are summarized above. The proposed Project may affect, but is not likely to adversely affect these federally listed species or designated critical habitat; the Biological Assessment (Appendix R) provides discussion on potential impacts of the proposed Project on federally listed species and designated critical habitat. The potential impacts of the proposed routes and variations on rare and unique natural resources in the West Section are discussed further in Section 6.2.

Impacts from Construction

Rare Species

Construction-related potential short-term indirect impacts on rare wildlife species would be similar to those described for non-listed species in Section 5.3.4.3 and may include displacement of rare species during construction activities that

generate noise, dust, or disturbance of habitat. These species would likely temporarily abandon their habitat during construction in favor of suitable habitats nearby. These impacts are expected to be short-term and localized.

Construction activities that may impact rare vascular plant species include physical disturbance from construction equipment and the removal of woody vegetation in the ROW. The Applicant would conduct rare species field surveys prior to construction and would coordinate with the USFWS and/or the MnDNR if any federally or state-listed species are found. Clearing could potentially have the positive impact of creating habitat for certain state-listed species, such as species of *Botrychium* (grapeferns and moonworts) that frequently colonize disturbed areas.

As described for non-listed species in Section 5.3.4.3 and Section 5.3.4.3, construction of the proposed Project may result in long-term adverse impacts on rare species from the loss or conversion of habitat and habitat fragmentation. Impacts are expected to be extensive in areas where new ROW would be created and more localized in situations where an existing ROW is expanded.

As discussed in Section 5.3.4.2 and Section 5.3.4.3, the Applicant would expand existing ROWs and/or create new ROWs, which would convert existing occupied habitat to primarily open, maintained ROW. Rare plant and animal species that rely upon forested or tall-shrub habitat would generally be displaced in favor of species that utilize open communities or species that are habitat generalists, a characteristic not common with rare species. Rare plant and animal species that utilize open habitats, such as wetlands, native grasslands, or prairies, may benefit from the clearing of trees and creation of open habitat. However, these species could also be adversely impacted by the introduction of non-native plant species, which could alter the quality and function of habitats.

The creation of new ROW corridors within the forested portions of the proposed Project would replace contiguous forest habitat with more open and edge habitat, which would reduce the total area of contiguous habitat available for rare plant and animal species that require large unbroken blocks of forested habitat. In addition, this could provide more habitat that is used by non-native and invasive plant species and habitat generalists that could out-compete or colonize areas previously suitable for sensitive rare species. These impacts would be less pronounced where clearing of woody vegetation occurs along the existing ROW. This is because there would be a wider open area, but little or no increase in the amount of edge habitat over that currently present. When placed alongside existing cleared ROW corridor, edge effects from the proposed Project would therefore be approximately the same as the existing condition.

Rare Communities

Construction activities may have short-term and long-term impacts on rare communities. The use of construction equipment during site preparation (grading, excavation, and soil stockpiling) may result in short-term adverse impacts on rare communities, including localized physical disturbance and soil compaction. While the Applicant would span rare communities to the extent feasible, it is possible that some structures would need to be placed within them; this would result in short-term and long-term impacts.

Construction activities would cause long-term impacts by permanently removing vegetation at each structure footprint (**1,936** square feet per structure) and within portions of the ROW that are currently dominated by forest or other woody vegetation. The Applicant would permanently convert rare forested and/or shrubland communities in the ROW to low-stature vegetation communities. Permanent loss of forest would lead to fragmentation by reducing intact blocks of forest vegetation. Removal of vegetation and conversion to open habitats would increase the potential for spread of invasive plant species and would alter the structure and function of rare communities, potentially making them less suitable for the rare species that would typically inhabit them. Impacts are expected to be extensive in areas where new ROW would be created and less so in situations where an existing ROW is expanded because fragmented forest would already be present.

Sections 5.3.4.1 and 6.2 (Water Resources) discuss potential hydrological impacts on calcareous fens and associated SNA WPAs.

Impacts from Operation, Maintenance, and Emergency Repairs

Rare Species

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation; emergency repairs may require additional vegetation clearing.

Operation, maintenance, and emergency repair activities may have short-term indirect adverse impacts on rare species, including the displacement of rare birds, burrowing animals, and other species

utilizing the ROW or its vicinity for foraging, breeding, or nesting.

As discussed in Section 5.3.4.3, operation of the proposed Project would result in the potential risk of avian collisions and electrocutions with transmission conductors and equipment, which may cause long-term impacts on rare birds. Through use of Applicant proposed minimization measures, as described in Section 2.13, these impacts are expected to be limited. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Rare Communities

The Applicant would routinely clear woody vegetation in rare communities present within the ROW in order to maintain low-stature vegetation that would not interfere with operation of the transmission line. Maintenance and emergency repair activities could result in direct impacts on rare communities from removal of vegetation, localized physical disturbance, and soil compaction caused by the use of equipment. Maintenance and emergency repair-related impacts on vegetation communities would be short-term and more localized than construction-related impacts.

5.3.6 Corridor Sharing

This section describes corridor sharing or paralleling opportunities within the West Section and the potential impacts from the proposed Project. Corridor sharing is one of the factors MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subparts H and J).

Minnesota Rules, part 7850.4200, subparts H and J require that MN PUC consider corridor sharing in determining whether to issue a permit for a high voltage transmission line. Corridor sharing can include use or paralleling of existing infrastructure including existing transportation, pipeline, and electrical transmission systems or rights-of-way, or use of established boundaries such as survey lines or agricultural field lines. Sharing corridors with existing infrastructure or paralleling existing ROWs minimizes fragmentation of the landscape and can minimize impacts to adjacent property.

While paralleling an existing transmission line generally presents a routing opportunity, there is also some risk that a single incident could affect service on both lines. As discussed in Section 5.3.7, that reliability risk should be taken into account when identifying transmission line paralleling opportunities.

The ROI for this analysis of corridor sharing generally includes infrastructure corridors within approximately 0.25 miles of the proposed routes and variations. This ROI was selected because as distance from existing corridors increases, the benefits of corridor sharing diminish and at a distance greater than approximately 0.25 miles, benefits are unlikely to be observed.

5.3.6.1 Corridor Sharing in the West Section

The corridor sharing opportunities in the West Section are shown on Map 5-10. These opportunities are located where the ROW for the proposed routes and variations would parallel the corridor of an existing transmission line, field or section line, roadway, or other infrastructure. Where a new transmission line parallels an existing corridor, it generally reduces the amount of additional impacts to land under private, corporate, state, or federal ownership. In addition, it may reduce visual impacts as described in Section 5.3.1.1.

In the West Section, the proposed route and variations parallel corridors including existing 230 kV and 500 kV transmission lines, roads, field lines, trails, public land survey sections (PLSS), combinations of these corridors, or no corridor. Additional details related to corridor sharing in the West Section for the proposed Project are discussed further in Chapter 6 and Chapter 7 of this EIS.

As described above, constructing and operating the proposed Project could potentially impact human settlements, land-based economies, archaeological and historic resources, and the natural environment in the proposed Project area. These impacts could be mitigated by prudent routing and corridor sharing with existing ROWs.

By following existing corridors, and reducing the need to create new transmission line corridors for the proposed Project, potential impacts to human settlements, land-based economies, and the natural environment would be minimized. Specifically, the following impacts could be minimized by corridor sharing:

- Impacts to human settlement can be minimized by selecting route alternatives that maximize corridor sharing with existing linear ROW (e.g., transmission lines, roadways and railroads) to reduce aesthetic impacts in open spaces and developed areas, and to reduce impacts to cultural values that conflict with new infrastructure corridors.

- Impacts on land-based economies can be reduced by sharing ROW to minimize the total ROW needed and paralleling existing corridors to consolidate encumbrances to certain land based economies like forestry and mining.
- Impacts on the natural environment can be minimized through corridor sharing that reduces habitat fragmentation.

5.3.6.2 General Impacts

When a transmission line parallels roads, railroads or other transmission lines and can share ROW, the easement required from an adjacent landowner is relatively smaller. When paralleling existing roadways, for example, the general practice is to place the structures on the adjacent private property, a few feet outside the existing ROW, as required by state or local regulations. So, although the structure is still located on private property, the transmission line can share or occupy some of the public ROW, thereby reducing the size of the easement required from the private landowner. If the normally required ROW width is 200 feet, for example, and the structure is placed 10 feet off an existing road ROW, only a 110-foot easement would be required from the landowner rather than a 200-foot easement. The roadway and transmission line would share the other 90-foot-wide section of ROW.

MnDOT's utility accommodation policy outlines the policies and procedures governing use of state trunk highway ROWs by utilities. The policy was developed in accordance with the requirements of state and federal law (23 CFR, part 645, subpart B). It is designed to ensure that the placement of utilities does not interfere with the flow of traffic or the safe operation of vehicles.

MnDOT is responsible for preserving the public investment in the transportation system and for ensuring that non-highway uses of the ROW do not interfere with the ability of the state to make long-term highway improvements, such as adding lanes, interchanges or bridges, or to safely operate and maintain the existing system. The requirements of MnDOT's accommodation policy vary based on whether the utility is crossing the highway or running parallel to it and on the type of highway.

Impacts from Construction

Corridor sharing would minimize potential impacts to the affected environment by minimizing the proliferation of new utility ROW and, where ROW sharing is possible, reducing the overall ROW footprint of impact. Sharing ROW with existing infrastructure would likely require coordination during construction and acquiring necessary approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW (like MnDOT).

Impacts from Operation, Maintenance, or Emergency Repairs

Sharing or paralleling existing infrastructure may also require coordination for maintenance or emergency repair and may require approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW.

5.3.7 Electrical System Reliability

This section of the EIS summarizes the electric transmission reliability requirements and reliability-related construction and operation issues presented by the proposed Project. Electrical system reliability is one of the factors MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subpart K). Potential impacts related to electrical system reliability from the proposed Project are discussed further in Chapter 6 and Chapter 7 of this EIS.

As discussed in Section 2.2, one of the Applicants' stated purposes for the proposed Project is to enhance electrical system reliability and help meet long-term regional needs. The Applicant contends in the state certificate of need docket that the reliability benefits due to the proposed Project have been substantiated by both its own studies and by those of Midcontinent Independent System Operator (MISO).[77]

Currently, there are two high voltage transmission lines that connect Manitoba and Minnesota: the Riel-Forbes 500 kV transmission line and a 230 kV transmission line that crosses the international border just east of the 500 kV transmission line. **In their certificate of need application, the Applicant identified that an unexpected outage of the existing 500 kV transmission line is currently the second largest contingency in the MISO footprint**. According to the Applicant, if the proposed Project was not built, the additional energy transfer required by the Applicant's agreements with Manitoba Hydro would cause more power to flow on the existing Riel-Forbes 500 kV transmission line, increasing the severity of an unexpected outage of that transmission line. **An unexpected outage of the** existing 500 kV transmission line **is currently** the second-largest contingency in the MISO footprint. According to the Applicant, the proposed Project, therefore, is designed to both ensure the reliability

77 Available at: http://mn.gov/commerce/energyfacilities/Docket.html?Id=33608.

of the Riel-Forbes 500 kV transmission line and facilitate the incremental transfer capacity necessary to serve the Applicant's customers.

In addition, based on information provided by the Applicant (see Comment letter 190 in Appendix Y), to ensure safety, constructing crossing spans would require an outage of the transmission line being crossed. Increasing the number of crossings could increase the number of discrete outages required during construction. These additional outages could limit construction time frames because system requirements may not always permit such outages.

In addition to these general grid reliability issues, all of the Applicant's proposed routes and the route variations include segments that would run parallel and adjacent to, but not within, the ROW of one of the two existing high voltage transmission lines. For example, the Proposed Blue Route and the Proposed Orange Route parallel existing electrical transmission lines for approximately 66.4 miles and 84.2 miles, respectively.

The NERC has established mandatory reliability standards for American utilities including conditions for the operation of high voltage transmission lines on adjacent or common ROWs. The applicable Category D contingencies **from NERC standard TPL-044** are loss of all transmission lines along a common ROW and loss of an entire voltage level at a substation. The effects of these transmission contingencies on the system (and the transmission system's ability to serve load) must be monitored and managed by utilities. The more that parallel or common ROWs are used for multiple transmission lines, particularly high voltage facilities, the more likely it becomes that an outage involving multiple facilities could occur. There are trade-offs between electrical system reliability and environmental benefits of corridor sharing, so the analysis for the proposed Project would be on a case-by-case basis by the Applicant based on NERC standards.

When the proposed Project parallels an existing transmission line, the Applicant is proposing to offset the proposed transmission line by 50 feet from the ROW of the existing transmission line. In addition, the Applicant has proposed to minimize the number of crossings of the existing transmission lines with the proposed transmission line.

Even using these wider non-overlapping ROWs, parallel configurations can present reliability concerns because of the resulting concentration of transmission facilities in a common corridor. When facilities are located in close proximity, there is a greater risk that a single event can take out multiple lines.

Unexpected transmission line outages occur for a number of reasons including extreme weather events (lightning, high winds, extreme icing, or tornadoes) and equipment failures (conductors, shield wires, insulators, or structures). Extreme weather events could result in a simultaneous outage of the 500 kV transmission lines if the localized effect at the parallel corridor was extreme enough to cause damage to the transmission lines. Failure of transmission line equipment could result in a simultaneous or near-simultaneous outage if the separation distance between the transmission lines was not adequate, thereby, allowing the failed equipment of one transmission line to damage the other transmission line.

However, according to the Applicant, in practice, unexpected transmission line outages are rare, and simultaneous unexpected outages of parallel transmission lines that do not share a common structure are even rarer. The likelihood of an actual event severely impacting the 500 kV transmission lines (or the new 500 kV and the existing 230 kV line) can be reduced by maintaining **an appropriate** offset between **the transmission lines** and incorporating appropriate transmission line design considerations into the engineering, measures which the Applicant has included as part of its proposed Project.

The proposed Project and variations, therefore, would meet applicable NERC standards. Although any approved route must meet applicable NERC standards, the close proximity of parallel lines can make constructing and repairing the lines more difficult. These difficulties could, for example, increase outage times, should an outage occur. Some specific route variations could present construction and operation problems, such as where three high voltage transmission lines are proposed along parallel ROW.

The ROI for this analysis of impacts to electrical system reliability is defined as the corridors for the existing transmission lines. This ROI was selected based on an expectation that, given the construction activities proposed, the majority of impacts on electrical system reliability would likely occur within this area.

5.3.7.1 Electrical System Reliability in the West Section

This section describes the electrical system reliability within the West Section and the potential impacts

on those resources from the proposed Project for the purposes of MN PUC decision making.

The proposed Project is similar in size and purpose to the existing Riel-Forbes 500 kV transmission line owned by Xcel Energy, which originates at the Riel Substation near Winnipeg, Manitoba. The Riel-Forbes 500 kV transmission line is the larger of the two existing transmission lines that currently connect Manitoba and Minnesota; a 230 kV transmission line also crosses the international border just east of the Riel-Forbes 500 kV transmission line crossing (Map 5-4).

From the Winnipeg area, the Riel-Forbes 500 kV line crosses the Minnesota-Manitoba border near Roseau, Minnesota, and connects to the Forbes Substation on Minnesota's Iron Range, where a second 500 kV line continues from Forbes to the Chisago Substation near the Twin Cities. The existing 230 kV transmission line crosses the existing 500 kV transmission line in two locations in the West Section.

The proposed route and variations would parallel either the 500 kV or 230 kV transmission lines throughout the section. There would be a maximum of two transmission lines co-located within a corridor in the West Section and the proposed transmission line would be adjacent to, but not within, the existing transmission line ROW. In the West Section, the proposed route would not cross either of these existing transmission lines, but multiple variations would cross one or both transmission lines.

The proposed Project would result in no more than two transmission lines co-located within a corridor in the West Section. Based on information provided by the Applicant, the likelihood of an actual event severely impacting both transmission lines can be reduced by incorporating appropriate transmission line design considerations (including maintaining a 50 foot separation between ROWs) into the engineering of the proposed Project (Minnesota Power 2014, reference (123)).

Therefore, reliability impacts are not expected as a result of construction of the proposed Project, regardless of the route or variation considered in the West Section.

5.3.7.2 General Impacts

Construction, operation, maintenance, or emergency repairs of the proposed Project would not interfere with the operation of existing transmission lines as the appropriate separation distance would be maintained for clearance and safety issues. Since potential impacts related to electrical system reliability are not expected from the operation, maintenance, or emergency repairs of the proposed Project for any proposed route or variation considered, electrical system reliability in the West Section is not discussed further in Chapter 6 of this EIS.

Construction

Construction of the proposed Project would not interfere with the operation of existing transmission lines as the appropriate separation distance would be maintained for clearance and safety issues. No impacts are expected as a result of construction of the proposed Project, regardless of the route or variation considered. Since potential impacts related to electrical system reliability are not expected from construction and operation of the proposed Project for any route or variation considered in the West Section, electrical reliability for the West Section is not discussed further in Chapter 6 of this EIS.

Operation, Maintenance, and Emergency Repairs

Operation, maintenance, or emergency repairs of the proposed Project would not interfere with the operation of existing transmission lines as the appropriate separation distance would be maintained for clearance and safety issues. No impacts are expected as a result of construction of the proposed Project, regardless of the route or variation considered. Since impacts related to electrical system reliability are not expected from the operation, maintenance, or emergency repairs of the proposed Project for any proposed route or variation considered in the West Section, electrical system reliability for the West Section is not discussed further in Chapter 6 of this EIS.

In addition to ROW offsets, the Applicant states that the reliability of the Riel-Forbes 500 kV transmission line outage is currently addressed with a special protection system (SPS). The existing special protection system acts nearly instantaneously to reduce the power transfer from Manitoba to the U.S. in the event of an unexpected outage of one or more of the four existing tie transmission lines between Manitoba and the U.S. As an additional Manitoba-to-United States tie transmission line, the proposed Project would also come under the existing special protection system (see Section 2.8.3 for more information).

The Applicant has proposed a variety of additional measures to maintain system reliability where the proposed Project would be constructed in parallel with the existing 500 kV or 230 kV transmission lines:

- Addressing potential simultaneous outages of the proposed Project and the existing 500 kV transmission line due to weather events, by developing a weather study to define and incorporate the appropriate design considerations based on actual weather data. Based on the weather study, the design criteria for the proposed Project may be adjusted to increase the robustness of the design where the proposed Project parallels the existing 500 kV transmission line.
- Considering more frequent use of anti-cascade structures, maintaining an increased supply of emergency spare structures, or even locating a permanent storage facility for emergency spare structures where design criteria cannot fully address potential simultaneous outages due to weather events, such as tornadoes.
- Installing a protective relay scheme that allows power to continue being transferred over the transmission line even if one of the three phases is struck by lightning. Since the majority of lightning events only affect one phase of a transmission line, single pole tripping should alleviate any concerns with simultaneous outages due to lightning.

Therefore, the reliability impacts in the U.S. of an unexpected simultaneous outage of both the proposed and existing 500 kV tie transmission lines in the West Section (and the Central and East Sections) would largely be addressed by these measures in conjunction with the proposed special protection system and corresponding power transfer reductions.

5.3.8 Costs of Constructing, Operating, and Maintaining the Facility which are Dependent on Design and Route

This section of the EIS summarizes the costs of constructing, operating, and maintaining the facility which are dependent on design and route of the Proposed Project. Cost evaluation is one of the factors the MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4100, subpart L). A summary of the costs associated with constructing the proposed routes and variations in the West Section is provided in Table 5-27.

The Applicant developed these cost estimates based on an estimated cost per mile for the general structure type planned for each proposed route or variation. The cost estimates have a range of

Table 5-27 Construction Costs for the Proposed Routes and Variations in the West Section

Variation Area	Name in the EIS	Cost (Total)	Average Cost (per mile)	Length (mi)
Border Crossing	Proposed Border Crossing-Blue/Orange Route	$29,012,219	$1,160,489	25.0
	Border Crossing Pine Creek Variation	$29,292,118	$1,139,771	25.7
	Border Crossing Hwy 310 Variation	$21,144,610	$1,136,807	18.6
	Border Crossing 500 kV Variation	$11,512,144	$1,151,214	10.1
	Border Crossing 230 kV Variation	**$9,862,110**	**$1,202, 696**	8.2
Roseau Lake WMA	Proposed Blue/Orange Route	$33,247,089	$1,081,910	30.7
	Roseau Lake WMA Variation 1	$57,086,075	$1,293,882	44.1
	Roseau Lake WMA Variation 2	$46,162,144	$1,273,438	37.5
Cedar Bend WMA	Proposed Blue/Orange Route	$27,197,650	$1,101,119	24.7
	Cedar Bend WMA Variation	**$23,172,312**	**$1,182,261**	19.6
Beltrami North	Proposed Blue/Orange Route	$18,984,370	$1,150,568	16.5
	Beltrami North Variation 1	**$19,591,668**	**$1,239,979**	15.8
	Beltrami North Variation 2	$24,571,721	$1,247,295	19.7
Beltrami North Central	Proposed Blue/Orange Route	$12,574,123	$1,083,976	11.6
	Beltrami North Central Variation 1	**$14,368,602**	**$1,048,803**	13.7
	Beltrami North Central Variation 2	$14,478,550	$1,149,091	12.6
	Beltrami North Central Variation 3	**$16,815,266**	**$1,378,300**	12.2
	Beltrami North Central Variation 4	**$17,498,969**	**$1,296,220**	13.5
	Beltrami North Central Variation 5	**$16,966,730**	**$1,131,115**	15.0

Source: Minnesota Power 2014, reference (9)

plus or minus 30 percent. Since there is a lack of certainty regarding property acquisition, access costs, or segment-specific design criteria (i.e. increased return period where the proposed route or variation parallels existing corridors) these are not full construction estimates and were developed for comparative purposes only and a contingency has not been built into these numbers because it would require further engineering and analysis.

The cost for routine maintenance would depend on the topology and the type of maintenance required, but typically runs from $1,100 to $1,600 per mile annually (Minnesota Power 2013, reference (135)). Using the $1,600 per mile for operation and maintenance, the estimated cost would range from $13,000 to $71,000 annually for these alternatives in the West Section.

5.4 Route-Specific Impacts to Central Section

Section 5.4 described impacts that are unique to one or more of the alternatives contained within the Central Section. The Central Section contains nine alternatives, which are as follows: the Proposed Blue Route, the Proposed Orange Route, one variation in the Beltrami South Central Variation Area, one variation in the Beltrami South Variation Area, one variation in the North Black River Variation Area, one variation in the C2 Segment Option Variation, one variation in the J2 Segment Option Variation Area, one variation in the Northome Variation Area, and one variation in the Cutfoot Variation Area.

5.4.1 Human Settlement

5.4.1.1 Aesthetics

This section describes the aesthetic, or visual, resources within the Central Section and the potential impacts from the proposed Project.

Aesthetic, or visual resources, are generally defined as the natural and built features of a landscape that may be viewed by the public and contribute to the visual quality and character of an area. Aesthetic resources form the overall impression that an observer has of an area or its landscape character. Visual quality is generally defined as the visual significance or appeal of a landscape based on cultural values and the landscape's intrinsic physical elements (Smardon, R.C. et al 1988, reference (87)). Visual sensitivity refers generally to viewer interest and concern for the visual quality of the landscape and potential changes to it. For a more detailed discussion of terms and concepts related to aesthetics, please see Section 5.3.1.1.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.1.1)) and is 1,500 feet from the anticipated alignment of the transmission line and within 1,500 feet from the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Visual Character of Central Section

The existing landscape character provides the context for assessing the effects of changes to the landscape. Major components of landscape character that define the appearance of the landscape include landform, water, vegetation, and human or cultural modifications. The landscape character of the Central Section is described below based on ecological subsections developed by the MnDNR (2015, reference (92)) in combination with observations of human or cultural modifications to the landscape. Ecological subsections are shown on Map 5-2 and described in more detail in Section 5.4.4.2.

The Central Section is comprised primarily of three ecological subsections, the Agassiz Lowlands, Littlefork-Vermillion Uplands, and Chippewa Plains. A fourth ecological subsection, the St. Louis Moraines, occurs in a small area in the extreme southeastern corner of the Central Section. The Agassiz Lowlands ecological subsection occupies most of the Central Section and occurs in the northern, western, and central portions. The Agassiz Lowlands is generally flat with some low sand ridges. Streams, wetlands, ponds, and lakes are fairly common. Vegetation consists of extensive peatlands in low-lying areas and upland forests of aspen and birch or jack pine in the higher sand ridge areas. Peatlands consist of a mosaic of black spruce or tamarack forests, meadows, and fens.

The Littlefork-Vermillion Uplands ecological subsection occurs primarily in far eastern and southern portions of the Central Section. Its landform is generally flat to gently rolling. Rivers and streams meander extensively throughout the area. Major streams in the section include the Big Fork and Little Fork rivers which both flow north. The area contains extensive wetlands and peatlands as well as scattered small ponds. Vegetation is a mosaic of prairie, brushland, woodland, and peatlands, and forests are common. Quaking aspen forests are extensive throughout the upland areas.

The Chippewa Plains ecological subsection occurs in a small area in the far south-central part of the Central Section. Its topography is generally level to gently rolling. The area contains numerous small streams and several lakes, including Island Lake, Moose Lake, Big and Little Constance Lakes, Teufer Lake, Lake Cameron, Pine Lake, and Battle Lake. The area contains extensive forests consisting mostly of aspen with mixed stands of aspen, birch, maple, oak, spruce, and pine.

The St. Louis Moraines ecological subsection occurs in a small area in the extreme southeastern corner of the Central Section. The topography in this portion of the Central Section is gently rolling to rolling and contains numerous small ponds and a few small streams, including the upper reaches of the Big Fork River, Deer Creek, and Coon Creek. Much of the area is forested with aspen, pine, birch, and northern hardwoods, with aspen the most common.

Much of the Central Section is forested and contains extensive peatlands. A number of state forests occur in the section, including Beltrami Island, Lake of the Woods, Red Lake, Smokey Bear, Koochiching, George Washington, Big Fork, and Pine Island (Map 5-12). Pine Island State Forest occupies the central part and covers the largest area of the Central Section. Upper and Lower Red Lakes are large lakes located in the western part of the Central Section. Major streams in the section include the Rapid, Big Fork, and Little Fork rivers, all of which drain to the north. A variety of tributaries to these and smaller streams meander through the Central Section as well. Due largely to the extensive forests and peatlands in the Central Section, agriculture is not extensive, but occurs mostly in small, scattered concentrations in the northwestern, northern, northeastern and southwestern potions of the Central Section. Agriculture in these areas consists mostly of row crops, pastures, and hay fields. Fields are often lined by drainage ditches laid out in rectilinear patterns.

Human settlement is sparse throughout the Central Section and most often occurs in association with areas of agriculture and recreation. Human settlement primarily consists of scattered rural residences, often with associated farm buildings, and a few small communities, which are mostly located in the southern portion of the Central Section (e.g., Effie, Mizpah, Northome, Funkley, and Kelliher). The communities of Big Fork and Littlefork are located in the central-eastern and eastern portions of the Central Section. Several large transmission lines run through the Central Section and several tall communication towers also are scattered through the area (Map 5-11). Views in agricultural areas of the Central Section are often somewhat enclosed and limited in distance by surrounding forests. Views in forested areas tend to be very enclosed and limited due to screening by the dense trees.

No county parks, state parks, state forest campgrounds, national parks, or water access points were found within 1,500 feet of the proposed routes and variations in the Central Section; however the remaining features included in the analysis (residences, historic architectural sites, state forests, national forests, scenic byways, state trails, snowmobile trails, and state water trails) were identified within the footprint or within 1,500 feet of the anticipated alignment in Section 5.2.1.1 and Section 6.3.

General Impacts

General impacts on existing aesthetic resources in the Central Section are similar to those in the West Section and are described in Section 5.3.1.1. Impacts may be caused by construction and operation of the proposed Project and could include short-term and long-term impacts. Impacts on aesthetics are assessed based on the extent of changes to landscape character and scenic quality, the level of contrast introduced by the proposed Project, its proximity to viewers, and the visual sensitivity related to views of the proposed Project.

To further characterize the potential impacts in the Central Section, photographs were taken and simulations created for several locations where the proposed Project directly cross, or are located near, aesthetic resources. Photo simulations were created for the locations where the proposed Orange Route is located near the Big Bog State Recreation Area in the Pine Island Variation Area (Viewpoint 01 in Appendix N) and a fire lookout tower just north of Waskish on the east side of Upper Red Lake (Viewpoint 02 in Appendix N) also in the Pine Island Variation Area. A photo simulation was also created for the location where the J2 Segment Option Variation in the J2 Segment Option Variation Area crosses the Edge of the Wilderness Scenic Byway south of Effie (Viewpoint 05 in Appendix N). Further discussion of the potential aesthetic impacts of the proposed Project routes and variations on those aesthetic resources are included in the Pine Island Variation Area discussion (Section 6.3.1) and the J2 Segment Option Variation Area (Sections 6.3.6).

For a more detailed discussion of short- and long-term aesthetic impacts of transmission line projects, please see Section 5.3.1.1. The potential impacts of the proposed route and variations on aesthetic resources in the Central Section are discussed in

Section 6.3. Applicant proposed measures to avoid, minimize, or mitigate impacts on aesthetic resources is provided in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Short-term, adverse aesthetic impacts could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations for transmission line construction. Construction related impacts to aesthetics are discussed in Section 5.3.1.1.

Operation, Maintenance, and Emergency Repair Impacts

Long-term, adverse impacts on aesthetic resources are most likely to occur during operation of the transmission line and would occur over the life of the proposed Project. Operation, maintenance, and emergency repair impacts to aesthetics are discussed in Section 5.3.1.1.

5.4.1.2 Land Use Compatibility

This section describes existing land uses and applicable land use policies and zoning within the Central Section of the proposed Project and the potential impacts to that resource from the proposed Project.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.1.2) and includes land within 1,500 feet of the anticipated alignment of the transmission line and within 1,500 feet of the footprint of the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Land Use Compatibility in the Central Section

The Central Section is located in Lake of the Woods, Beltrami, Koochiching, and Itasca counties in areas that are primarily rural with sparse development. The proposed routes and variations would pass near the cities of Keliher, Northome, Mizpah, Effie, Big Falls, and Littlefork. The predominant land use in the Central Section is undeveloped forest and swampland; much of which is state forest land and state fee land, including Lake of the Woods State Forest, Pine Island State Forest, Koochiching State Forest, and Beltrami State Forest (Map 5-12). Any route crossing state lands or waters would require a license to cross as required under Minnesota Statutes, section 84.415 and Minnesota Rules, chapter 6135.

In addition, there are scattered parcels of USFWS Interest Lands in the northwest part of the Central Section. Any route crossing USFWS Interest Lands (including easements) would require a ROW permit under 50 CFR 29. **There are also two federal aid parcels that coincide with the USFWS Interest Lands at the Silver Creek WMA (Map 5-12).**

The Central Section also includes some concentration of agricultural land uses in the northern and southern borders of the section. Developed land, including residences are scattered near the agriculture land and incorporated cities. Several airports and air strips are also located near developed areas, as described in Section 5.2.1.6. The various land uses present along the proposed routes and variations are shown in Map 5-12.

The proposed routes and variations would be located primarily in rural, unincorporated communities; therefore, no local township land use plan or ordinances were identified. Relevant elements of county comprehensive plans and ordinances are described below. Although as previously stated, a MN PUC Route Permit would supersede all local zoning, building, or land use regulations; including local, county and regional regulations (Minnesota Statutes, section 216E.03).

The **Lake of the Woods County Comprehensive Plan** and the **Lake of the Woods County Zoning Ordinance**, as described in Section 5.3.1.2, are also applicable to the Central Section of the proposed Project.

The **Beltrami County Shoreland Management Ordinance** provides land use controls along a number of waterbodies in the County. The ordinance identifies utility transmission power lines as a conditional use in shoreland management districts. Conditional uses require submission of a Conditional Use Permit to the county's Environmental Services Director and Planning Commission for review and approval. Approval may be contingent on increases to setbacks, landscaping and vegetative screening, and other reasonable requirements to fulfill the intent of the county's ordinance (Beltrami County 2006, reference (136)).

The **Koochiching County Development Ordinance** identifies utilities including power transmission towers, structures and lines, transformers, and substations as a conditional use in most districts. Utility uses are not listed as a permitted, conditional, or prohibited use for Commercial, Manufacturing,

Open Space, or Rural Village districts. Conditional uses require review of the proposed project by the county's Planning Commission and approval by the Koochiching County Board. Approval may be contingent on increases to setbacks; limiting heights of buildings; requiring screening for nearby properties; and other conditions to protect the public health, safety, and welfare (Koochiching County 2008, reference (137)).

The **Itasca County Zoning Ordinance** identifies tower structures as a permitted or conditional use in all zoning districts with the exception of rural residential districts. However, the ordinance indicates towers associated with utility transmission lines regulated by the MN PUC are not governed by the specific tower requirements contained in the ordinance (Itasca County 2012, reference (138)).

The **Minnesota Forest Resource Strategies**, as discussed previously in Section 5.3.1.2, are also applicable to the Central Section of the proposed Project.

The **Beltrami Island Land Utilization Project Comprehensive Conservation Management Plan** as discussed previously in Section 5.3.1.2, are also applicable to the Central Section of the proposed Project.

General Impacts

Construction, operation, maintenance, and emergency repairs of the proposed Project in the Central Section would result in similar impacts as are expected and described for the West Section in Section 5.3.1.2.

Section 6.3 summarizes the potential impacts of the proposed routes and variations on land use in the Central Section. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on land use. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Construction of the proposed Project in the Central Section would result in similar impacts as are expected and described for the West Section in Section 5.3.1.2.

Operation, Maintenance, and Emergency Repair Impacts

Operation, maintenance, and emergency repairs of the proposed Project would result in long-term impacts on land use within the Central Section, similar to those described for the West Section in Section 5.3.1.2.

5.4.1.3 Cultural Values

This section describes the cultural values within the Central Section and the potential impacts to cultural values from the proposed Project.

Cultural values are shared beliefs or attitudes that define what is acceptable or unacceptable, important or unimportant, right or wrong, workable or unworkable and provide a framework for unity and sense of identity for a community, region, or people.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.1.3) and includes Beltrami, Itasca, Koochiching, and Lake of the Woods counties which are crossed by the proposed routes and variations.

Ceded treaty areas, and tribal reservations in the Central Section are shown on Map 5-13. Archaeological and historic resources data are also shown on Map 5-13 by the number of records found by inventory type. Detailed data is provided in the initial Cultural Resources Report provided in Appendix P of this EIS.

Cultural Values in the Central Section

Cultural values in the Central Section are in many ways similar to the cultural values in the West Section generally, with some important differences due to the proximity of the Red Lake and Bois Forte Bands of Chippewa and the related history of treaties and rights retained by the Bands for hunting, gathering, and fishing in the area. Euro-American cultural values unique to the Central Section are largely tied to the transition to more sparsely populated, forested and peatland areas.

Like Roseau and Lake of the Woods counties, Koochiching County is identified as "Emptying Nest" type according to Chinni and Gimpel's analysis (Chinni and Gimpel 2010, reference (100)). According to Chinni and Gimpel's analysis, Beltrami County is categorized as a "Boom Town" type, characterized by fast growing communities with rapidly diversifying communities. However, the portion of Beltrami County located within the Central Section appears to share many of the "Emptying Nest" features of the counties next door. Similar to the West Section, themes mentioned on the websites of regional cities and business communities stress hard work, optimism, and appreciation of the natural world. The major values within the region include pragmatism, appreciation, and use of natural resources, individualism, political and social

conservatism, community pride, and economic well-being. The majority of public comments provided during the EIS scoping meetings in the Central Section raised concerns primarily related to possible visual and environmental impacts, implying cultural values of visual aesthetics of the landscape and sustained environmental conditions. In addition, commenters identified the importance of avoiding impacts to agricultural activities associated with wild rice cultivation, an indication of the value placed on preservation of the agricultural activities unique to this region (DOE and DOC-EERA 2014, reference (102)).

Euro-American cultural values unique to the Central Section are largely tied to the transition to more sparsely populated, forested and peatland areas. Particularly in these areas of sparse population, there appears to be a strong link between individuals' sense of identity and the relative solitude and remoteness that the region has to offer. This seems to manifest as a particular flavor of individualism that places a value on a sort of undisturbed independence in the wilderness.

Residents of this region appear to have a particularly strong sense of the significant physical presence of the Big Bog and the challenging post Euro-American settlement history associated with the Big Bog (Bradoff 1992, reference (139)). This appears to have, over time, cultivated a certain culture of respect and appreciation for the Big Bog as a natural resource (MnDNR 2015, reference (140)).

Tribal Values in the Central Section

The Anishinabe people have traditionally placed strong value on peatlands as central to their way of life. The network of lakes, forest, and peatland in the region supported the wild rice crop, cranberry bushes, fish, and various animals (Mayer 1992, reference (103)). The discussion of tribal cultural values in the Central Section revolves around the Red Lake and Bois Forte Bands of Chippewa.

Red Lake Band

Prior to the influx of white settlers, the Red Lake Band inhabited a large area of northwestern Minnesota encompassing about 13 million acres. The 1855 Treaty, which involved three Anishinabe Bands (the Mississippi, Pillager, and Lake Winnibigoshish), ceded territory in north central Minnesota, west of 1854 Treaty border. In 1863, the Red Lake Band, in its first significant treaty with the federal government, ceded about 11 million acres of their land to the United States. The second land cession by the Red Lake Band occurred in 1889. In that year Congress passed the Nelson Act, which authorized negotiations for the purchase of land from the Red Lake Band. A three member commission, which became known as the Rice Commission, was appointed to conduct negotiations.

The final land cession by the Red Lake Band occurred in 1904. Congress authorized negotiations in March 1901 and Inspector James McLaughlin negotiated an agreement with the Red Lake Band in 1902. The agreement was not ratified by Congress because of disagreement over method of payment, but Congress in 1904 did consummate the cession on terms substantially identical to the 1902 agreement, except for method of payment. Under this treaty, the Red Lake Band ceded 256,132 acres adjoining the Thief River and Red River Valley, land known as the "Western Townships". The Red Lake Band, through treaties and agreements summarized above, gave up land, but never ceded the main reservation surrounding the Lower Red Lake and a portion of Upper Red Lake. This unceded land is spoken of as the "diminished" reservation.

Historic differences between Euro-American cultural values and native Indian values in the area might be summarized by the history of the Volstead Act. Passed by the Minnesota Legislature in 1908, the Act was aimed at draining the public wetlands in northern Minnesota. Minnesota state law makers believed the Volstead Act projects would produce revenue for the Indians, revenue for the state, and farmland for homesteaders. Anishinabe leaders, on the other hand, explained that because of its influence on the level and quality of the waters of Red Lake, the wetlands supported plant and animal life central to their way of life. The Anishinabe well understood that the network of lakes, peatland, and forest supported the wild rice, cranberry bushes, fish, and wildlife (Mayer 1992, reference (103)).

The entire Anishinabe subsistence cycle depended, and still depends, on this network of water and resources. This example demonstrates a difference of opinion between the Bands and Euro-Anglo peoples based on deeply held cultural values. The Red Lake economy today continues to be based largely on the same resources that native inhabitants of the region have used for generations. Similarly, the Red Lake Band has also resisted the allotting of reservation land to individual families, in order to preserve the centuries-old spiritual connection of Anishinabe people to the land.

Peatland that had been ceded by the Red Lake Band was a large portion of the wetlands targeted by the Volstead Act. The Red Lake Band, however, eventually retained ownership of some parcels of

the ceded lands where homestead entry was never made or where homesteaders failed to fulfill the terms of the legislation to receive title. This accounts for the current dispersal of Red Lake Reservation land throughout the peatland, outside of the main "diminished" reservation area. Of the total 840,000 acres that make up the Red Lake Reservation, the diminished reservation is 636,954 acres, including most of Red Lake itself (Map 5-13). The scattered parcels and the Northwest Angle section, returned to the Red Lake Band in 1934, total about 156,900 acres.

Key cultural values for the Red Lake Band therefore include preserving the natural environment, especially water resources, including Red Lake and the surrounding peatland and forest, which support wild rice, cranberry bogs, plants, fish, and wildlife.

The Red Lake Band take their status as a sovereign entity very seriously, with inherent rights pre-dating the U.S. Constitution. An important area of current contention between cultural values held in the Central Section relates to the possession of hunting and fishing rights by the Red Lake Band, which the various acts and treaties previously discussed may not have clearly defined but are fundamental to the Red Lake Band's way of life.

Bois Forte Band

As mentioned in Section 5.3.1.3 above, the proposed Project also passes through the area in which lands of the Bois Forte Band of Chippewa are located **in the Central Section and East Section of the proposed Project.**

There are three parts that comprise the Bois Forte Reservation. The only part of the Bois Forte Reservation within the proposed Project area is the 23,000 acre Deer Creek sector located in Itasca County. While the Deer River sector is part of the Bois Forte Reservation and the Tribe manages the natural resources, no tribal members currently live there.

The largest sector of the Reservation is at Nett Lake in St. Louis and Koochiching counties, which is home to the majority of Bois Forte Band members and the Band's Tribal Government Offices. Fifty percent of the Nett Lake sector is wetland and is considered to be the largest producer of wild rice in the United States.

The third sector, the Vermilion Reservation, is located near the city of Tower on Lake Vermilion in St. Louis County and is home to Fortune Bay Resort Casino, the Bois Forte Heritage Center, the Vermilion Family Wellness Center, and the Vermilion Community Center and Health/Dental Clinics.

The community first entered into a treaty with the U.S. in 1854 that set aside an undefined region around Lake Vermilion as a reservation. The sectors at Nett Lake and Itasca County – Deer Creek – were officially established in an 1866 treaty, and the Lake Vermilion lands were defined in an 1881 Executive Order. In 1936, Bois Forte Band members living at Nett Lake incorporated with other Ojibwe as the Minnesota Chippewa Tribe, following the passage of the Indian Reorganization Act of 1934. This Act established the powers of tribal governments as equal to state or city governments. In 1997, the Bois Forte Reservation Tribal Council assumed full responsibility for the delivery of all government programs and services to its people.

The people of the Bois Forte Band have seen many changes. However, in the modern economy, they have preserved their ancient traditions and seasonal patterns of hunting, fishing, and plant gathering: hunting deer and rabbits, fishing, harvesting wild rice, tapping maple trees, picking berries, collecting birch bark, and collecting medicinal plants, to name a few. The Bois Forte Band does not distinguish between the practical and spiritual nature of these ancient traditions and seasonal patterns. In particular, wild rice is of central importance to the Bois Forte Band, and the Ojibwe as a whole, as it is the reason for the people's western migration and ultimate arrival in Minnesota. They consider the land and its resources to be sacred, practicing ceremonies with offerings, such as tobacco, to give thanks for the resources they are about to, or have, gathered. The Bois Forte Band has observed a decline in resources of cultural importance to them, and considers this decline a result of poor stewardship practices associated with increasing development and other broader factors such as climate change (Latady and Isham 2013, 2014, 2015, references (202, 203, 204). As such, the Bois Forte Band has many cultural values in common with the Red Lake Band, which include preserving the natural environment, recognizing the importance of water resources, and maintaining their independence and ability to practice traditional hunting, fishing, and plant gathering activities.

General Impacts

General impacts to cultural values are detailed in Section 5.3.1.3. While impacts to individualism and appreciation for natural resources may be associated with the natural resource impacts discussed further in Chapter 6 of this document, the relative homogeneity of the human and natural environment along the proposed routes and variations in the Central Section, measurable

differences in impacts to **Euro-American** cultural values at the community or regional scale are not expected across the various proposed routes and variations. **However, impacts to tribal values at the individual/local, community, or regional scale have the potential to occur across the various proposed routes and variations in the Central Section, where areas containing locations of natural or cultural resources associated with traditional hunting, fishing, and plant gathering activities are located along or within the proposed routes or variations in the Central Section.**

Impacts to cultural values can be minimized primarily through corridor sharing with existing transmission infrastructure. Where existing infrastructure is present, impacts to the **Euro-American and tribal values addressed in Section 5.4.1.3 are likely to be marginal. However, where existing infrastructure is not present, impacts on resources associated with tribal values addressed in Section 5.4.1.3 would be identified, avoided, or minimized to the extent practical, in accordance with measures developed through government-to-government consultation with tribes, including the Red Lake Band and the Bois Forte Band. Such measures could include surveys to identify areas containing natural and cultural resources associated with tribal values and continued government-to-government consultation to develop measures to avoid, minimize, or mitigate such impacts so that they are not significant.**

Although some permanent impacts to cultural values may be felt on a local basis, particularly where transmission lines run close to communities with values that are at odds with the presence of new, large infrastructure projects, at a **community** or regional level no conflicts with cultural values is anticipated. Since potential impacts related to cultural values at the community or regional scale from the proposed Project are not expected for any proposed route or variation considered, cultural values are not analyzed and discussed further in Chapter 6 of this EIS.

Construction Impacts

General impacts to cultural values from the proposed project are discussed above. The construction phase of the proposed Project is not expected to result in any unique impacts to cultural values held by Euro-Americans. **However, construction activities have the potential to result in impacts on natural or cultural resources associated with tribal cultural values, as addressed in Section 5.4.1.3, particularly those resources in or near the construction footprint. Such impacts may include temporary or permanent interruption of access to such resources when they are seasonally available, or disturbance or destruction of areas containing such resources such that they are temporarily or permanently not available. This could include affecting habitat for game or fish species for a season or two during construction and restoration activities, or permanently altering habitat for plant species such as wild rice, berries, tree, or medicinal plants, such that they are no longer present.**

Due to tribal views expressed by the Red Lake and Bois Forte Bands that such locations and resources are both physical and spiritual, such impacts would represent a significant impact on tribal cultural values, impacts on resources associated with tribal values addressed in Section 5.4.1.3 would be identified, avoided or minimized to the extent practical, in accordance with measures developed through government-to-government consultation with tribes, including the Red Lake Band and the Bois Forte Band. Such measures could include surveys to identify areas containing natural and cultural resources associated with tribal cultural values and continued government-to-government consultation to develop measures to avoid, minimize, or mitigate such impacts so that they are not significant.

Operation, Maintenance, and Emergency Repair

General impacts to cultural values from the proposed project are discussed above. Operation, maintenance, and emergency repair are not expected to result in any unique impacts to cultural values held by Euro-Americans or American Indian tribes.

5.4.2 Land-Based Economies

Constructing and operating the proposed Project could potentially affect land-based economies in the proposed Project area. Transmission lines and associated structures are a physical, long-term presence on the landscape, which could prevent or otherwise limit use of the land for other purposes. When placed in an agricultural field, transmission line structures have a relatively small footprint, yet they could potentially interfere with farming operations. In addition, tall trees are not allowed in transmission line ROWs, a restriction that could affect forestry operations along the ROW, and transmission line structures could affect access to mineral resources **and EMFs associated with transmission lines may mask or prevent geophysical detection of mineral resources.**

5.4.2.1 Agriculture

This section describes the agricultural resources within the Central Section and the potential impacts from the proposed Project. The definition and regulations for agriculture are described in Section 5.3.2.1.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.2.1)) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Agriculture in the Central Section

Agriculture is a minor land-based economic resource in the Central Section. In 2010, cash receipts for agricultural operations were approximately $25 million in Beltrami County, $7 million in Koochiching County, and $10 million dollars in Itasca County (MDA, 2012, reference (104)). Principal crops in Lake of the Woods and Beltrami counties are sugar beets and wheat, while Koochiching County is predominantly forested (Ye 2014, reference (105)). Farmers in the Central Section raise primarily cattle, but also limited numbers of hogs and pigs, broiler or other meat-type chickens, and sheep (USDA 2012, reference (106)). **Bee keeping is an important agriculture practice within the Central Section. Potential impacts to bees from the proposed Project are discussed in Section 5.3.2.1.** The following sections describe potential route-specific impacts to farmland, organic farms, livestock, aerial spraying, irrigation system and precision farming practices.

Farmland

Agricultural land in the Central Section includes lands designated as prime farmland, prime farmland if drained, and farmland of statewide importance. The FPPA defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides and labor" (CFR, title 7, section 657.5 (a) (1)). Farmland of statewide importance includes other land that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops.

Potential impacts related to prime farmland, prime farmland if drained, farmland not classified as prime farmland, and farmland of statewide importance from the proposed Project are discussed in Chapter 6 of this EIS. Mitigation strategies for potential impacts to these types of farmlands are similar to those described below for all agricultural lands.

Organic Farms

As noted in Section 5.3.2.1, since potential impacts related to organic farms are expected to occur if special construction and maintenance procedures are followed and do not vary by proposed route or variation considered, organic farms are not discussed further in Chapter 6 of this EIS.

Livestock

Hog, poultry, cattle, and sheep farms are located in the Central Section. Livestock operations could be temporarily affected during construction of the proposed Project. Construction activities could temporarily disrupt livestock access to pasture lands and disturb livestock with construction noise. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils. Measures to minimize impacts to livestock during construction could include erecting temporary fences, temporarily relocating livestock from construction areas, restoring vegetative cover using landowner-approved seed mixes suitable for livestock grazing, and washing equipment prior to entering poultry farms.

Though no stray voltage impacts are anticipated as a result of the proposed Project, stray voltage could be of concern to livestock farmers, particularly on dairy farms, due to its potential impacts to milk production and quality. Stray voltage is discussed further in Section 5.2.2.3. Induced voltage also may be of concern to livestock farmers, especially for farms with buildings near a transmission line that would require grounding of the metal components of the building. No impacts due to induced voltage are anticipated from the proposed Project if effective grounding is implemented. Induced voltage is discussed further in Section 5.2.2.4. Since potential impacts related to livestock are expected to be limited and do not vary by proposed route or variation considered, livestock are not discussed further in Chapter 6 of this EIS.

Aerial Spraying

Transmission line structures could potentially affect the coverage and effectiveness of aerial spraying. Structures could limit the ability of aerial applicators to reach specific areas of fields, by limiting those areas where applicators could safely fly. Adverse effects on aerial spraying and to crops could be mitigated by aligning the proposed Project in a

configuration that is consistent with current aerial spraying patterns or by using land-based herbicides or pesticides in the areas near the transmission line. Since potential impacts related to aerial spraying are expected to be limited and do not vary by proposed route or variation considered, aerial spraying is not discussed further in Chapter 6 of this EIS.

Irrigation Systems

Transmission line structures in agricultural fields could potentially impede the use of irrigation systems, either by necessitating reconfiguration of an irrigation system to accommodate structures or by reducing crop revenue because all or a portion of a field could not be irrigated. No known center-pivot or other irrigation systems have been identified in the Central Section; therefore, impacts to irrigation systems are not anticipated and mitigation would not be required. If an irrigation system is encountered during construction of the proposed Project, procedures specified in the AIMP would be implemented to minimize disruption of the system. Further discussion of the AIMP can be found in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions. Since potential impacts related to irrigation systems are not expected from the proposed Project and do not vary by proposed route or variation considered, irrigation systems are not discussed further in Chapter 6 of this EIS.

Precision Farming Systems

Precision farming involves the use of GPS and, more recently, RTK GPS in farm machinery, allowing the machinery to be directed more accurately and maximize a farm's efficiency. Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming. Further discussion on interference can be located in Section 5.2.1.5. If interference with electronic devices, including precision farming systems, does occur and is caused by the presence or operation of the transmission line, Route Permits issued by the MN PUC require permittees to take those actions which are feasible to restore electronic reception to pre-project quality (Appendix B). Since potential impacts related to precision farming systems are expected to be limited and do not vary by proposed route or variation considered, precision farming systems are not discussed further in Chapter 6 of this EIS.

General Impacts

Potential impacts to agriculture associated with projects of this nature could be either short-term or long-term and are discussed generally below. Chapter 6 of this EIS assesses impacts on agriculture using USDA NRCS, SSURGO Farmland Classification mapping to identify areas of prime farmland, prime farmland if drained, and farmland of statewide importance within the ROW.

Agricultural land uses would continue to be allowed in the ROW, but the presence of transmission structures may prevent some farm equipment from accessing land. Impacts to agricultural operations could be mitigated by prudent routing (i.e., by selecting routes that avoid agricultural fields by following existing infrastructure ROWs, field lines and property lines). Where structures are placed in fields, impacts could be mitigated by not placing structures diagonally across fields, but rather parallel to existing field lines or spanning fields if diagonal crossings are necessary.

Impacts to agricultural lands could also be minimized by limiting the removal of crops to only those necessary for construction and on-going safe operation of the line. Additionally, the Applicant, in collaboration with the MDA would prepare an AIMP for the proposed Project. The AIMP identifies measures that the Applicant would take to avoid, mitigate, or provide compensation for agricultural impacts that could result from constructing and operating the project. The AIMP specifies procedures for repairing damaged drain tile, alleviating compaction, and removing construction debris. Compliance with the AIMP is not a permit condition in the MN PUC's generic route permit template, but has been included as a permit condition for other high voltage transmission line projects (Appendix B). Further discussion on the AIMP can be found in Section 2.13.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. These activities could limit the use of fields or could affect crops and soil by compacting soil, generating dust, damaging crops or drain tile, or causing erosion. Project construction activities would typically be limited to the transmission line ROW. Short-term impacts in agricultural lands are estimated as 0.92 acres per structure location.

Construction activities would cause long-term impacts to agriculture by the physical presence of transmission line structures and associated facilities in crop, pasture, or other agricultural lands. For the transmission line itself, the footprint of the structure proposed for the project is **1,936** square feet. The impact of such structures, however, could be greater than their footprint since they could impede the use of farm equipment and irrigation systems and

interfere with aerial spraying. These physical impacts could result in lost farming income or decreased property values (Section 5.2.1.4). In addition, stray voltage could affect livestock if not properly mitigated (Section 5.2.2.3).

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on farmlands from the removal of crops, localized physical disturbance, and soil compaction caused by equipment. Maintenance and emergency repair-related impacts on farmland would be short-term and more localized than construction-related impacts.

5.4.2.2 Forestry

This section describes the forestry resources within the Central Section and the potential impacts on those resources from construction and operation of the proposed Project.

Forestry resources are defined as forest lands and their associated harvestable products, including but not limited to, trees, saplings, seedlings, logs, brush, and slashing.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.2.2) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Forestry in the Central Section

The Central Section includes primarily forested lands. State-owned forest lands, including the Beltrami Island, Lake of the Woods, Smokey Bear, Pine Island, Red Lake, Koochiching, and Big Fork State Forests, are managed by the MnDNR. The MnDNR Forestry Timber Sales Program manages timber harvesting on state-owned forest lands, which provides a source of funding for public services in Minnesota. Itasca, Koochiching, and Beltrami counties are among Minnesota's top five timber harvest counties, with Itasca County producing more than 300,000 cords annually and Beltrami and Koochiching counties producing more than 200,000 cords annually. Lake of the Woods County produces more than 50,000 cords annually (MnDNR 2011, reference (107)). The southern portion of the Central Section includes the Chippewa National Forest. The Central Section also includes other forested areas with private, corporate, or federal (USFS) ownership.

General Impacts

Potential impacts to forestry resources associated with projects of this nature could be either short-term or long-term. The EIS assesses impacts on forestry resources using MnDNR Division of Forestry, State Forest Boundaries and USFWS Interest mapping to identify areas of state forests and USFS national forest lands within the ROW.

Impacts to timber harvesting operations could be mitigated by prudent routing (i.e., by selecting routes that avoid forest lands by following existing infrastructure ROWs, access road ROWs, and property lines). ROW maintenance could be managed to reduce impacts on forestry resources. For example, leaving small fruiting trees and shrubs and using mechanical versus chemical vegetation management could help mitigate the loss of forestry resources. In addition, increasing the time between line maintenance in forested areas could result in harvestable products. Finally, elevated spanning, in areas with high elevations, could reduce forest clearing.

Due to the possibility of permanent tree removal in forest lands, potentially significant impacts to forestry resources are expected as a result of construction and operation of the proposed Project, depending on the route or variation considered. Adverse, long-term, and regional impacts to forestry resources are expected, and they are considered significant by the MnDNR; however, the estimated loss in public revenue from timber harvesting is unknown. Potential impacts related to forestry from the proposed Project are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. Construction activities could limit timber harvesting efforts, affect timber stands and soil by compaction, damage trees, or cause erosion. Project construction activities would typically be limited to the transmission line ROW. As mentioned above, short-term impacts are estimated as 0.92 acres per structure location and for the transmission line itself, the footprint of the structure proposed for the project is **1,936** square feet. Long-term impacts to forestry resources are caused by the clearing of

trees and physical presence of transmission line structures and associated facilities in forest lands.

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on forest lands from the removal of vegetation, localized physical disturbance, and compaction caused by equipment. Maintenance and emergency repair-related impacts on forestry resources would be short-term and more localized than construction-related impacts.

5.4.2.3 Mining and Mineral Resources

This section describes mining and mineral resources within the Central Section and the potential impacts from the proposed Project as required by MN PUC decision making for the Route Permit.

Mining and mineral resources are defined as areas with a concentration or occurrence of natural, solid, inorganic, or fossilized organic material in such form, quantity, grade, and quality that it has reasonable prospects for commercial extraction.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.2.3) and includes the ROW of the transmission line and the permanent footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, and permanent access roads.

Mining and Mineral Resources in the Central Section

Moving from northwest to southeast across this section, mining's contribution to the economy's total output varies from 1 percent in the northwest portion of this section of the Project area which overlaps with the Northwest region as defined in Tuck 2014, reference (109) to 15 percent (in the southwest portion of this section of the Project area which overlaps with the Headwaters region as defined in Tuck (2014, reference (141)). There are state mining leases identified in the Central Section. Several abandoned metallic mineral and iron ore mining sites are found along the proposed routes and variations in the Central Section. These sites include expired/terminated leases for the mining of metallic minerals, and to a lesser extent iron ore.

The MnDNR has identified an area of recent and historic metallic occurrence, leasing, and exploration in northwestern Koochiching County (Township 159 North, Range 27 West), in the vicinity of the North Black River Variation Area (Map 5-12; MnDNR 2014, reference (110)). The MnDNR provided comments during the scoping process suggesting a route variation that would be less likely to impede future exploration for metallic mineral resources; this is discussed further in Section 6.3.4.2.

In the Central Section, there are aggregate sources located within 100 feet from the Pine Island Proposed Orange Route (2 sites) in the Pine Island Variation Area, the Proposed Orange Route (2 sites) and J2 Segment Option Variation (1 site) in the J2 Segment Option Variation Area, and the Proposed Orange Route (1 site) and the Cutfoot Variation (1 site) in the Cutfoot Variation Area (Map 5-11). There are also several aggregate sources located within 1,500 feet from the proposed routes and variations in the West Section. The MnDNR has identified their concern regarding the potential encumbrance of state-owned surface estate mineral resources (peat, sand and gravel aggregate, crushed stone, clay, etc.), which is described in Section 5.3.2.3.

General Impacts

Potential impacts to mining and mineral resources associated with high voltage transmission line projects could be either short-term or long-term. The EIS assesses impacts on mining and mineral resources using the MnDNR Division of Lands and Minerals, All State Mineral Leases (2014) mapping to identify areas with mineral leases within the ROW.

Impacts can be mitigated by prudent routing and by prudent structure placement and placement of the alignment within the route to avoid any planned mineral mining sites. Potential impacts related to mining and mineral resources from the proposed Project are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. The construction of transmission lines could affect future mining operations if the structures interfere with access to mineable resources or the ability to remove mineral resources. If there are potentially recoverable mineral reserves in the Central Section, construction of the proposed Project could limit the ability to successfully mine these reserves, depending on the route or variation and the location of any mineable reserves.

Impacts from Operations, Maintenance, and Emergency Repairs

Maintenance and emergency repair activities would have minimal to no impact on mining and mineral resources from localized physical disturbance caused by the use of maintenance equipment.

5.4.3 Archaeology and Historic Architectural Resources

This section describes the setting for archaeological, historic, and Native American resources, collectively referred to as cultural resources within the Central Section and the potential impacts from the proposed Project.

5.4.3.1 Archaeology and Historic Architectural Resources Regulations

A summary of the applicable regulatory requirements and Executive Orders relevant to cultural resources and historic properties are provided in Section 5.3.3.1.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.3) and includes the direct APE which is the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1 (the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites). It also includes the indirect APE, which includes the direct APE plus a one mile radius on each side of the anticipated alignment of the proposed transmission line or the center of the footprint of the other elements of the proposed Project.

5.4.3.2 Cultural Resources in the Central Section

The Central Section is comprised primarily of three ecological subsections, the Agassiz Lowlands, Littlefork-Vermillion Uplands, and Chippewa Plains. A fourth ecological subsection, the St. Louis Moraines, occurs in a small area in the extreme southeastern corner of the Central Section. The ecological subsections for the Central Section are shown on Map 5-13 and are described in more detail in Section 5.4.4.2 and Section 5.4.1.1.

The Central Section is composed of four archaeological regions: the Northern Bog West, Northern Bog East, Central Lakes Coniferous West, and Central Lakes Coniferous East (Map 5-13; Gibbon et al. 2002, reference (115)). The Northern Bog West and Northern Bog East archaeological regions are sub-regions of the greater Northern Bog Archaeological Region, as described in Section 5.3.3.2. The Central Lake Coniferous Archaeological Region is characterized by hilly terminal moraines extending though the region's center while the less rugged terrain of glacial origin covers the remaining portions; these include ground moraines, outwash plains, and lake plains. The Mississippi River traverses much of the region, flowing through or near several large lakes; lake distribution is very dense in the area with only the plain of Glacial Lake Upham and Glacial Lake Aitkin lacking significant bodies of standing water. Soil types vary greatly in the Central Lakes Coniferous Archaeological Region, but generally consist of course to medium textured forest soils. Peat deposits and fine textured forest soils can be found in the lakebeds of Glacial Lake Upham and Glacial Lake Aitkin. Pine trees, including white, jack, and red, once dominated the native vegetation. Deciduous trees such as elm, maple, basswood, ash, oak, aspen, and birch were also once present; peat bog vegetation covered the glacial lake plains in the southeast. Subsistence resources that thrived in this environment would have included deer, beaver, moose, and black bear. Fish and waterfowl were abundant and wild rice was a staple (Gibbon et al. 2002, reference (115)).

Prehistoric period settlement patterns and site distribution patterns in the Northern Bog West and East Archaeological sub-regions of the Central Section are similar to those described for the West Section in Section 5.3.3.2. Prehistoric period settlement patterns in the Central Lakes Coniferous Archaeological Region are not as fully understood, but a focus of activity seemed to occur near lakes. Sites are generally located on major lakes and rivers, with very few sites occurring in the interior; sites are also concentrated along abandoned channels of the Mississippi River. Prehistoric sites include villages, burial mounds, and earthworks; in addition, one bison kill site (21CE1) has been recorded within the region (Dobbs 1989, reference (142)). With an increasing focus on wild rice harvesting, village concentrations were often located on major lakes near wild rice beds.

Historic period archaeological sites and historic architectural or built resources in both the Northern Bog and Central Lakes Coniferous archaeological regions are expected to be distributed in the same pattern as was described for the West Section (see Section 5.3.3).

Archaeological and historic architectural resources data are shown on Map 5-13 by the number of records found by inventory type (archaeological sites and historic buildings and structures). Detailed data is provided in Appendix P. A more detailed description of the cultural resources present within the Central Section and the potential effects are provided in Section 6.3.

Additionally, as described in Section 5.3.3.2 for the West Section, the Bois Forte Band of the Minnesota Chippewa Tribe, Minnesota, provided background information for natural and cultural resources that have previously been identified as being of traditional religious and cultural significance to the tribe. These resources are also applicable to the Central Section of the proposed Project.

5.4.3.3 General Impacts

Impacts to cultural resources **could** result from direct and indirect impacts as described below. Section 6.3 summarizes the potential impacts of the proposed routes and variations on archaeological **sites, historic architectural resources, and/or Native American resources in the Central Section, including those sites** or resources that are historic properties. As stated above, DOE is consulting with federally recognized Indian tribes to identify Native American resources and historic properties in the Central Section. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on cultural resources and historic architectural properties. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Impacts to cultural resources in the Central Section could result from ground-disturbing activities and/or demolition or removal of historic buildings or structures. Ground-disturbing activities associated with the proposed Project include excavation, grading, or other subsurface disturbance associated with ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations for transmission line construction. A full description of the **potential** construction related impacts to archaeological sites, historic architectural **resources, and Native American resources** as described in Section 5.3.3.3. Measures to avoid, minimize and mitigate construction impacts on cultural **and tribal** resources and adverse effects on historic properties are the same as those identified in Section 5.3.3.3.

Operation, Maintenance, and Emergency Repair Impacts

Impacts to archaeological sites and historic architectural or built resources in the Central Section could also result from operation, maintenance, and emergency repairs and would be similar to those described in Section 5.3.3.3. Measures to avoid, minimize and mitigate operation, maintenance, and emergency repairs impacts on cultural resources and adverse effects on historic properties are the same as those identified in Section 5.3.3.3.

5.4.4 Natural Environment

This section describes water resources, vegetation, and wildlife, which are present within the Central Section and the potential impacts on those resources from construction and operation of the proposed Project.

5.4.4.1 Water Resources

This section describes water resources, including rivers and streams (i.e. watercourses), lakes and ponds (i.e. waterbodies), wetlands, floodplains, and groundwater resources, that occur in the Central Section, as shown on Map 5-14, and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning water resources for water resources can be found in Section 5.3.4.1.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.4.1) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Watercourses and Waterbodies in the Central Section

The Central Section is included in the Red River and Rainy River regional watersheds. Major watersheds include Red Lakes, Rapid River, Lower Rainy River, Rainy Lake, Little Fork River, and Big Fork River. Several rivers, streams, and creeks (collectively referred to as watercourses) and drainage ditches traverse the area, including MnDNR PWI watercourses and waterbodies. Similar to the West Section, rivers in this area tend to be moderate to small in size and highly sinuous. Major watercourses

Table 5-28 Summary of Impaired Waters in the Central Section

Watercourse/Waterbody	Impairment (Stressor)	Affected Designated Use
Big Fork River	Mercury in fish tissue	Aquatic consumption
Black River	Mercury in water column	Aquatic consumption
Black Duck River	Mercury in fish tissue	Aquatic consumption
Little Fork River	Turbidity, mercury in fish tissue	Aquatic life, aquatic consumption
Popple River	Fish bioassessments	Aquatic life
Rainy River	Mercury in fish tissue	Aquatic consumption
Island Lake	Mercury in fish tissue	Aquatic consumption
Dark Lake	Mercury in fish tissue	Aquatic consumption
Lower Red Lake	Mercury in fish tissue	Aquatic consumption
Upper Red Lake	Mercury in fish tissue	Aquatic consumption

Source(s): MPCA 2014, reference (118); MPCA 2014, reference (119)

include the Rapid River, Black River, Big Fork River, Sturgeon River, and Rainy River. Smaller named watercourses include the Popple River, Black Duck River, Peppermint Creek, Pitt Grade Creek, Deer Creek, Troy Creek, Elm Creek, Plum Creek, Chase Brook, Caldwell Brook, and Bowerman Brook. Headwaters of these watercourses are predominantly associated with regional peatlands. Drainage ditches are present throughout the peatland areas, and were constructed in an attempt to drain these areas to support agricultural activities. Waterbodies in this area are generally restricted to peatland-lakes or constructed impoundments. Upper Red Lake and Lower Red Lake can be found in the southwest portion of the Central Section. Several smaller waterbodies are located in the southern portion of this section, including Pine Lake, Battle Lake, Island Lake, Moose Lake, Grass Lake, and Thimble Lake. Small, unnamed waterbodies are also found on the landscape, more frequently in the southern half of the Central Section than the northern half.

The MPCA monitors and assesses Minnesota waters to determine if they meet water quality standards for designated uses. Waters that do not meet their designated uses due to water quality standard exceedances are listed as impaired waters. Table 5-28 lists the impaired waters found in the Central Section and summarizes the impairments (stressors) and affected designated uses for each of these impaired waters.

To protect the propagation of trout, MnDNR has established lakes and portions of streams and tributaries as designated trout lakes and streams statewide. Special fishing regulations apply to designated trout waters. One designated trout stream, Pitt Grade Creek, is located in the Central Section.

Floodplains in the Central Section

Floodplains in the northwest portion of the Central Section tend to be narrower than in the West Section due to more varied topography. FEMA has designated Zone A floodplains along the Rapid River, Black River, and Big Fork River.

Wetlands in the Central Section

Wetlands in the Central Section primarily consist of large peatland complexes, including shrubby bog areas intermixed with forested and emergent wetlands. Red Lake Peatlands, Beltrami-Pine Island Peatlands, Pine Island Peatlands, Koochiching Peatlands, and Myrtle Lake Peatlands are present in the Central Section. The following wetland types are present throughout the Central Section: palustrine emergent wetland (PEM), palustrine shrub wetland (PSS), palustrine forested wetland (PFO), and palustrine unconsolidated bottom pond (PUB).

The MnDNR has mapped three calcareous fens the Central Section. The fen in the Pine Island Variation Area is within one mile of the anticipated ROW for a proposed route or variation. The MnDNR has established WPAs for Peatland SNAs to protect hydrology of groundwater-dependent natural communities. The North Black River Peatland SNA WPA is located within the Pine Island and C2 Segment Option variation areas, while the Lost River Peatland SNA WPA is found in the Pine Island and J2 Segment Option variation areas. The Myrtle Lake Peatland SNA WPA is located in the Pine Island and North Black River variation areas, and the Pine Island Variation Area also contains the Red Lake Peatland SNA WPA. Additional information regarding rare and unique communities associated with these areas can be found in Section 5.4.5.

General Impacts

Potential construction and operational impacts on water resources that may be caused by the proposed Project are similar to those summarized in the West Section in Section 5.3.4.1.

The potential impacts of the proposed routes and variations on water resources in the Central Section are discussed in Section 6.3.

Impacts from Construction

Potential construction impacts on water resources that may be caused by the proposed Project are similar to those summarized in the West Section in Section 5.3.4.1.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repair on water resources that may be caused by the proposed Project are similar to those summarized in the West Section in Section 5.3.4.1. Water Resources.

5.4.4.2 Vegetation

This section describes the vegetation resources within the Central Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning vegetation resources can be found in Section 5.3.4.2.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.4.2) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Vegetation in the Central Section

According to the ECS, the Central Section is located in the Agassiz Lowlands and Littlefork-Vermillion Uplands subsections, which are located in the Northern Minnesota and Ontario Peatlands section of the Laurentian Mixed Forest Province. A small part of the southern portion of this section is located in the Chippewa Plains subsection, which is located in the Northern Minnesota Drift and Lake Plains section of the Laurentian Mixed Forest Province. The ECS subsections in the Central Section are identified on Map 5-2.

The Agassiz Lowlands subsection is predominantly comprised of vast peatlands and upland sand ridges resulting from the retreat of Glacial Lake Agassiz to the west. Peatlands are a mosaic of forests dominated by black spruce or tamarack, or herbaceous sedge meadow, fresh meadow, and poor or rich fens. Sand ridges are commonly dominated by aspen and birch, or jack pine forests and woodlands. The subsection is generally very flat and poorly drained. Past attempts at ditching and farming the peatlands have been largely unsuccessful and most of the subsection is uninhabited (MnDNR 2015, reference (92)).

The Littlefork-Vermillion Uplands subsection is a transition zone between the vast peatlands to the west and the shallow bedrock controlled, clayey soils to the east. This subsection contains a rich variety of vegetation types, much of it occupied by aspen-birch forest trending toward white pine, white spruce, and balsam fir. The eastern portion of the subsection is dominated by white pine, red pine, and jack pine forest. Poor and rich fens, black spruce bog, and cedar-black ash swamp are typical in lowlands (MnDNR 2015, reference (92)).

The Chippewa Plains subsection is comprised of level to gently-rolling till plain and lake plain settings, which form a mosaic of vegetation communities. Outwash plain settings tend toward sandy soils and support dry forest communities dominated by upland conifers. Vegetation communities in this subsection include upland conifer forest, shrub and woodland uplands, and non-forested wetlands (MnDNR 2015, reference (92)).

Based on USGS GAP data, the variation areas in the Central Section are primarily comprised of upland forests and lowland swamps; additional land cover types present in the Central Section include herbaceous agricultural, open water, developed/urban land, and disturbed or modified land (Map 5-12; Appendix E).

Several state forests are located within or adjacent to variation areas in the Central Section, including the Beltrami Island State Forest, Lake of the Woods State Forest, Pine Island State Forest, Red Lake State Forest, Big Fork State Forest, Smokey Bear State Forest, George Washington State Forest, and Koochiching State Forest (Map 5-12). The Chippewa National Forest is located in the southern part of the Central Section (Map 5-12). In addition, several sensitive ecological resources, such as WMAs, SNAs, MnDNR Ecologically Important Lowland Conifer Forests, and MBS Sites of Biodiversity Significance

(see Sections 5.4.4.3 and 5.4.5) are located within or adjacent to variation areas in the Central Section.

General Impacts

Potential construction and operation-related short-term and long-term impacts on existing vegetation in the Central Section are similar to those summarized for the West Section in Section 5.3.4.2.

Section 6.3 summarizes the potential impacts of the proposed routes and variations on vegetation in the Central Section.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on vegetation. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on existing vegetation in the Central Section are similar to those summarized for the West Section in Section 5.3.4.2.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on existing vegetation in the Central Section are similar to those summarized for the West Section in Section 5.3.4.2.

5.4.4.3 Wildlife

This section describes the wildlife resources that occur within the Central Section and the potential impacts on those resources from the proposed Project.

Federal and state regulations concerning wildlife resources can be found in Section 5.3.4.3.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.4.3) and includes the anticipated 200-foot ROW and the footprint of the other elements of the proposed Project, including the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

Wildlife in the Central Section

The landscape types and vegetation communities throughout the Central Section of the proposed Project provide forage, shelter, nesting, overwintering, and stopover habitat for a wide range of resident and migratory wildlife species. Habitat types in the Central Section primarily consist of various forested communities.

As discussed in Section 5.4.4.2, the Central Section is located within three ECS subsections classified by the MnDNR and USFS (MnDNR 2015, reference (92)); the Agassiz Lowlands, Littlefork-Vermillion Uplands, and Chippewa Plains subsections (Map 5-2). The MnDNR's comprehensive wildlife plan, *Tomorrow's Habitat for the Wild and Rare an Action Plan for Minnesota Wildlife* (MnDNR 2006, reference (125)), which corresponds to the ECS native plant communities, was used to summarize the wildlife likely present in the three ecological subsections in the Central Section of the proposed Project. Each ECS subsection identifies SGCN, which are those species whose populations are rare, declining, or vulnerable in Minnesota. Approximately half of the SGCN are also Minnesota state-listed species (MnDNR 2006, reference (125)).

Native community types located within the Agassiz Lowlands subsection provide habitat for species associated with lowland conifer, dune, and non-forested wetland vegetation communities. Birds found in this subsection include white pelican, common tern, American bittern, yellow rail, and numerous migratory shorebird, waterfowl, and perching species. Typical mammals that occupy these habitats include beaver, otter, and bog lemming. Forest communities present in this subsection include habitats that harbor species such as spruce grouse, great gray owl, short-eared owls, and sharp-tailed grouse. Approximately 88 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within community types present within this subsection (MnDNR 2006, reference (125)).

Native community types located within the Littlefork-Vermillion Uplands subsection provide habitat for species associated with lowland and upland conifer and mixed conifer deciduous forest vegetation communities. Forested community types within this subsection provide habitat for a variety of species, such as bald eagle, Canada lynx, great gray owl, boreal owl, and numerous game species such as ruffed grouse and white-tailed deer. Wetlands provide habitat for yellow rail, trumpeter swan, red-necked grebe, and a variety of waterfowl. Approximately 67 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

Native community types located within the Chippewa Plains subsection provide key habitat for species associated with upland conifer, shrub, and woodland uplands, and non-forested wetland vegetative communities. Bird species include

bald eagle, Virginia rail, yellow rail, black-backed woodpecker, and numerous migratory species such as shorebirds and waterfowl. Typical mammals that occupy these habitats include fisher, beaver, and gray wolves. Forest communities present in this subsection include habitats that harbor species such as ruffed grouse, great gray owl, saw-whet owl, red-disked alpine, and bog copper. Approximately 83 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

In addition to the natural wildlife habitat present throughout the Central Section, there are several areas of managed wildlife habitat present in the Central Section. These managed wildlife habitats include: WMAs in the northeastern part of the Central Section, including the Red Lake WMA and Carp Swamp WMA; the Big Bog and Chippewa Plains Important Bird Areas; a few small Grassland Bird Conservation Areas scattered throughout the Central Section; and a MnDNR-designated shallow lake in the Northome Variation Area (Map 5-15). Section 5.3.4.3 provides additional information on each of these wildlife resources.

Much of the Central Section is USFWS-designated critical habitat for gray wolf (Map 5-15); Section 5.4.5 provides further discussion of gray wolf critical habitat. The Central Section also contains a small portion of the Chippewa National Forest, several State Forests (discussed in Section 5.4.4.2), and sensitive ecological resources (discussed in Section 5.4.5), all of which provide habitat for common and rare wildlife species.

General Impacts

Potential construction and operation-related short-term and long-term impacts on wildlife in the Central Section are similar to those summarized for the West Section in Section 5.3.4.3.

Section 6.3 summarizes the potential impacts of the proposed routes and variations on wildlife in the Central Section. Sections 5.4.4.2 and 6.3 discuss potential impacts on vegetation, Sections 5.4.4.1 and 6.3 discuss potential impacts on wetland habitat, and Sections 5.4.5 and 6.3 discuss potential impacts on sensitive ecological resources used by wildlife.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on wildlife. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on wildlife in the Central Section are similar to those summarized for the West Section in Section 5.3.4.3.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on wildlife in the Central Section are similar to those summarized for the West Section in Section 5.3.4.3.

5.4.5 Rare and Unique Natural Resources

This section describes the rare and unique natural resources, including federal and state protected species and rare communities, which are present within the Central Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning rare and unique natural resources can be found in Section 5.3.5.

The ROI for an analysis of impacts to federally and state-listed species includes a one-mile buffer surrounding the proposed routes and variations in order to obtain a broad view of species that may be present across the proposed Project, since no formal surveys have been conducted for the proposed Project. The ROI for the analysis of impacts to rare communities includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

Table 5-29 Federally listed Species Known to Occur in Lake of the Woods, Koochiching, Beltrami, and/or Itasca Counties

Scientific Name	Common Name	Federal Status	State Status
Canis lupus	Gray wolf	Threatened	Special Concern
Lynx canadensis	Canada lynx	Threatened	Special Concern
Charadrius melodus	Piping plover	Threatened	Endangered
Myotis septentrionalis	Northern long-eared bat	Threatened	Special Concern

Source: USFWS 2015, reference (127)

5.4.5.1 Federally Listed Species in the Central Section

The USFWS technical assistance website was reviewed to determine if any federally listed species or designated critical habitats are known to be present within Lake of the Woods, Koochiching, Beltrami, and Itasca counties, where the Central Section is located (USFWS 2015, reference (127)). The USFWS lists four species as occurring in Lake of the Woods, Koochiching, Beltrami, and/or Itasca counties, including the federally threatened gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*), and northern long-eared bat (*Myotis septentrionalis*) in all four counties; and the federally threatened piping plover (*Charadrius melodus*) in Lake of the Woods County (USFWS 2015, reference (127); Table 5-29).

Designated-critical habitat associated with federally listed species consists of "the specific areas within the geographical area occupied by the species, at the time it is listed…on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection" (50 CFR 1533[b][2]).

Gray wolf. The gray wolf was federally listed as an endangered species in 1974 and was reclassified as threatened in 1977 (42 Federal Register 29527-29532). In 2011, the wolf was delisted by the USFWS (76 Federal Register 57943-57944). However, in 2014, a federal court reversed the USFWS decision to delist the gray wolf, restoring federal threatened status and designated critical habitat in Minnesota. Gray wolves occupy a diversity of habitats, including forests, prairies, and swamps (USFWS 2012, reference (128)). Designated critical habitat for gray wolf is present throughout the Central Section (Map 5-15).

Canada lynx. The Canada lynx was listed as a federally threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies in 2000 (65 Federal Register 16052-16086). Canada lynx inhabit boreal and mixed coniferous and deciduous forests, where snowshoe hare, their preferred diet, are present (USFWS 2013, reference (127)). The nearest designated critical habitat for lynx is at least 11 miles east of the proposed routes or any variation in the Central Section.

Piping plover. The northern Great Plains population of the piping plover was listed as federally threatened in 1985 (50 Federal Register 50726-50734). Piping plovers inhabit wide, flat, open, sandy beaches with very little grass or other vegetation present (USFWS 2001, reference (130)). The nearest designated critical habitat for piping plover is Lake of the Woods, over 20 miles from the Pine Island Variation Area in the Central Section (Map 5-8).

Northern long-eared bat. The northern long-eared bat was proposed for listing as a federally endangered species in 2013 (78 Federal Register 61046-61080). In April of 2015, the USFWS listed the northern long-eared bat as federally threatened (80 Federal Register 18023-18028). The northern long-eared bat inhabits caves and mines in winter; in summer northern long-eared bats roost in live and dead trees with loose, flakey, or shaggy bark, crevices, or hollows (USFWS 2015, reference (131)). The USFWS has not identified designated critical habitat for the northern long-eared bat at this time.

Additional information on federally listed species is available in the Biological Assessment, which was prepared to assist in determining the potential impacts of the proposed Project on federally listed species and to facilitate ESA Section 7 consultation (Appendix R).

5.4.5.2 State Listed Species in the Central Section

The MnDNR NHIS database was queried in **September** of 2015 to obtain the locations of rare species documented within the Central Section (MnDNR **2015**, reference (132)). Additional information on the NHIS database is provided in Section 5.3.5.

Because no formal surveys for rare species have been conducted for the proposed Project, a one-mile buffer surrounding the proposed routes and variations in the Central Section was used to obtain a broad view of the rare species that may be present across this portion of the proposed Project. The NHIS database documents the following state-threatened or endangered species within one-mile of the proposed routes and variations in the Central Section: state-endangered upward-lobed moonwort (*Botrychium ascendens*); and the state-threatened common moonwort (*Botrychium lunaria*), sterile sedge (*Carex sterilis*), ram's-head lady's slipper (*Cypripedium arietinum*), beaked spike rush (*Eleocharis rostellata*), and hair-like beak rush (*Rhynochospora capillacea*) (Table 5-30). In addition to these state-endangered and threatened species, several state-special concern species have been documented within one-mile of the proposed routes and variations in the Central Section; these include seven vascular plants, two birds, one insect, two mussels, and one fish. State-endangered, threatened, and special concern species and their

Table 5-30 State-endangered, Threatened, and Special Concern Species Documented within One Mile of the Proposed Routes and Variations in the Central Section

Scientific Name	Common Name	Federal Status	State Status	Type	Associated Habitat
Botrychium ascendens	Upward-lobed Moonwort	None	Endangered	Vascular Plant	Disturbance-related habitats such as old mine tailings basins in early successional forests.
Botrychium lunaria	Common Moonwort	None	Threatened	Vascular Plant	Disturbance-related habitats including drained tailings basins, gravel banks, rocky ledges, and talus. Open or sparsely vegetated habitats with grasses and scattered shrubs.
Carex sterilis	Sterile Sedge	None	Threatened	Vascular Plant	Calcareous fens.
Cypripedium arietinum	Ram's-head Lady's-slipper	None	Threatened	Vascular Plant	Coniferous swamps, bogs, or lowland forests. Drier upland pine forests.
Eleocharis rostellata	Beaked Spike-rush	None	Threatened	Vascular Plant	Calcareous fens.
Rhynchospora capillacea	Hair-like Beak-rush	None	Threatened	Vascular Plant	Calcareous fens.
Botrychium pallidum	Pale Moonwort	None	Special Concern	Vascular Plant	Disturbance-related habitats including drained tailings basins, ROWs, exposed soils in open or sparsely vegetated habitats, grassy fields with scattered shrubs.
Botrychium simplex	Least Moonwort	None	Special Concern	Vascular Plant	Disturbance-related habitats including drained tailings basins, ROWs, exposed soils in open or sparsely vegetated habitats, grassy fields with scattered shrubs, and forest edges.
Carex exilis	Coastal Sedge	None	Special Concern	Vascular Plant	Fens.
Cladium mariscoides	Twig-rush	None	Special Concern	Vascular Plant	Fen communities within bog complexes or calcareous fens.
Drosera anglica	English Sundew	None	Special Concern	Vascular Plant	Fens of open rich peatlands, primarily in water tracks in the interiors of large peatlands.
Juncus stygius var. americanus	Bog Rush	None	Special Concern	Vascular Plant	Rich and acid peatlands.
Torreyochloa pallida	Torrey's Manna-grass	None	Special Concern	Vascular Plant	Wetlands.
Asio flammeus	Short-eared Owl	None	Special Concern	Bird	Native prairie, pasture, sedge wetlands, shrub swamps, and open peatlands.
Coturnicops noveboracensis	Yellow Rail	None	Special Concern	Bird	Sedge or grass-dominated wetlands, particularly wet prairie or rich fens.
Oxyethira itascae	A Caddisfly	None	Special Concern	Insect	Larvae are found in lakes and streams; adults prefer meandering, silt-bottomed streams.
Lasmigona compressa	Creek Heelsplitter	None	Special Concern	Mussel	Creeks, small rivers, and the upstream portions of large rivers.
Ligumia recta	Black Sandshell	None	Special Concern	Mussel	Riffle and run areas of medium to large rivers.
Acipenser fulvescens	Lake Sturgeon	None	Special Concern	Fish	Large rivers and lakes.

Source: MnDNR 2015, reference (132)

associated habitats are summarized in Table 5-30. Species tracked in the NHIS database, as described in Section 5.3.5, that have been documented within one mile of the proposed routes and variations in the Central Section are summarized in Appendix F.

According to the NHIS database, there are 10 MnDNR-designated colonial waterbird nesting sites in the Central Section, most of which are located in the southern portion of the section. Colonial waterbird nesting sites are documented locations of large groups of nesting waterbirds; these locations are generally found in association with trees and emergent wetland vegetation.

5.4.5.3 State Rare Communities in the Central Section

Several rare communities have been identified within or adjacent to the variation areas in the Central Section; these include SNAs, MBS Sites of Biodiversity Significance, MnDNR native plant communities (fens), and MnDNR-designated Ecologically Important Lowland Conifers (Map 5-16). In addition to these rare resources, MBS native plant communities and MnDNR-designated areas of High Conservation Value Forest are also likely present in the Central Section; however, as mentioned in Section 5.3.5, the MnDNR is in the process of mapping these resources for the counties in the Central Section and data are currently unavailable (MnDNR 2014, reference (134)).

Many rare communities present in the Central Section are located within one of the eight state forests in this area (Map 5-12 and Map 5-16). State forests are discussed in Section 5.4.4.2. Other resources that may provide potential habitat for rare species, such as WMAs, Important Bird Areas, and Grassland Bird Conservation Areas, are discussed in Section 5.4.4.3 and shown on Map 5-15.

Scientific and Natural Areas

There are eight SNAs located in the Central Section, including Caldwell Brook Cedar Swamp, Gustafson's Camp, Lost River Peatland, Maurice O'Link Ribbed Fen, Myrtle Lake Peatland, North Black River Peatland, Red Lake Peatland, and South Black River Peatland (Map 5-16). No SNAs are crossed by the proposed routes or variations or occur within their ROWs. However, as discussed below, Red Lake Peatland SNA, Myrtle Lake Peatland SNA, and North Black River SNA are located within close proximity (less than 1,500 feet) to a proposed route or variation (Map 5-16). See Section 5.3.5 for additional information on SNAs.

MBS Sites of Biodiversity Significance

Several areas mapped by the MBS as Sites of Biodiversity Significance are located throughout the Central Section (Map 5-16). Mapping of Sites of Biodiversity Significance is only preliminary in Lake of the Woods, Koochiching, Beltrami, and Itasca counties. Because of this, biodiversity significance ranks, as summarized in Section 5.3.5, have not been designated in every location in the Central Section; these areas are designated "rank unknown" and primarily occur in Lake of the Woods and Koochiching counties on Map 5-16. Sites of all levels of biodiversity significance are present in the Central Section. However, for discussion purposes in Section 6.3, biodiversity significance ranks are not distinguished from one another because of the preliminary status and/or unknown ranks. All SNAs in the Central Section are also MBS Sites of Biodiversity Significance, ranked outstanding or high.

The MBS Sites of Biodiversity Significance ranked outstanding and high likely contain several native plant communities and areas designated as areas of High Conservation Value Forest; however, as mentioned above, these resources have not yet been mapped and are currently unavailable. See Section 5.3.5 for additional information on MBS Sites of Biodiversity Significance.

Ecologically Important Lowland Conifers

The MnDNR Division of Forestry manages vegetation on Wildlife and Forestry units through the Subsection Forest Resource Management Plan, which uses ECS subsections to define planning units. Within the Central Section, the MnDNR has identified several Ecologically Important Lowland Conifer stands specifically targeted for protection. These stands serve as placeholders for Lowland Conifer Old Growth forests. Management in old growth forests is prohibited and the MnDNR is responsible for treating these Ecologically Important Lowland Conifer stands as if they are old growth. The MnDNR is currently in the process of assessing Ecologically Important Lowland Conifers and designating Lowland Conifer Old Growth stands. Because final Lowland Conifer Old Growth data are not currently available, all data presented here are referred to as Ecologically Important Lowland Conifer stands, some of which may ultimately be designated Lowland Conifer Old Growth.

MBS Native Plant Communities

The MnDNR has mapped three calcareous fens within the Central Section (Map 5-16). Calcareous fen data is mapped as centroid points by the MnDNR and the boundaries of the fen are not

delineated. Because of this nuance, the calcareous fen centroid points that are located within one mile of the proposed routes and variations in the Central Section were used to evaluate potential impacts on calcareous fens. See Section 5.3.5 for additional information on fens.

The MnDNR has established WPAs for Peatland SNAs; these WPAs are intended to provide protective buffers to protect the hydrology of peatlands and calcareous fens in particular. Section 5.4.4.1 provides additional discussion on calcareous fen hydrology.

5.4.5.4 General Impacts

Potential construction and operation-related short-term and long-term impacts on rare and unique natural resources in the Central Section are similar to those summarized for the West Section in Section 5.3.5. The potential impacts of the proposed routes and variations on rare and unique natural resources in the Central Section are discussed further in Section 6.3.

Section 5.4.4.1 and 6.3 (Water Resources) discuss potential hydrological impacts on calcareous fens and associated SNA WPAs.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on rare and unique natural resources. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on rare and unique natural resources in the Central Section are similar to those summarized for the West Section in Section 5.3.5 with the exception of potential impacts on critical habitat designated for gray wolf.

Removal of forested land in the ROW during construction would result in habitat fragmentation, which could reduce the quality of critical habitat designated for gray wolf in the Central Section. The effects of fragmentation on gray wolves would generally be greatest where new corridors are created, rather than where the transmission line would parallel an existing corridor, where the forest has already been fragmented.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on rare and unique natural resources in the Central Section are similar to those summarized for the West Section in Section 5.3.5.

Operation, maintenance, and emergency repairs are not likely to result in additional impacts to critical habitat designated for gray wolf beyond the impacts that would likely result from construction, as described above.

5.4.6 Corridor Sharing

This section describes corridor sharing opportunities within the Central Section and the potential impacts from the proposed Project. Corridor sharing is one of the factors the MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subparts H and J). See Section 5.3.6 for more information regarding corridor sharing.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.6.1) and includes infrastructure corridors within approximately 0.25 miles of the proposed routes and variations.

5.4.6.1 Corridor Sharing in the Central Section

The corridor sharing opportunities in the Central Section are shown on Map 5-17. These opportunities are located where the ROW for the proposed routes and variations would parallel the corridor of an existing transmission line, field or section line, roadway, or other infrastructure. Where a new transmission line parallels an existing corridor, it generally reduces the amount of additional impacts land under private, corporate, state, or federal ownership. In addition, it may reduce visual impacts as described in Section 5.4.1.1.

In the Central Section, the proposed route and variations parallel corridors including existing 230 kV and 500 kV transmission lines, roads, field lines, trails, PLSS, combinations of these corridors, or no corridor. Additional details related to corridor sharing in the Central Section for the proposed Project are discussed further in Chapter 6 of this EIS.

5.4.6.2 General Impacts

As discussed in Section 5.3.6.1, corridor sharing would minimize potential impacts to the affected environment by minimizing the proliferation of new utility ROW and, where ROW sharing is possible, reducing the overall ROW footprint of impact. Section 5.3.6.1 provides additional discussion of ROW sharing and associated approvals. See Section 5.3.7 for reliability issues associated with corridor sharing.

As discussed in Section 5.3.6.1, by following existing corridors, and reducing the need to create new transmission line corridors for the proposed Project, potential impacts to human settlements, land-based economies, and the natural environment would be minimized.

Since corridor sharing is considered to be a measure to reduce impacts on resources, no additional adverse impacts are anticipated due to corridor sharing.

Impacts from Construction

As discussed in Section 5.3.6.1 sharing or paralleling existing infrastructure would likely require coordination during construction and acquiring necessary approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW (like MnDOT).

Impacts from Operation, Maintenance, and Emergency Repairs

As discussed in Section 5.3.6.1, sharing or paralleling existing infrastructure may require coordination for maintenance or emergency repair and may require approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW.

5.4.7 Electrical System Reliability

This section describes the electrical system reliability within the Central Section and the potential impacts on those resources from the proposed Project. Electrical system reliability is one of the factors MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subpart K). See Section 5.3.7 for more information regarding electrical system reliability.

NERC has established mandatory reliability standards for American utilities. In addition, the Applicant has stated their purpose and need as related to electrical reliability. For a more detailed discussion of concepts related to electrical reliability, see Section 5.3.7.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.7.2) and is the corridors for the existing transmission lines.

5.4.7.1 Electrical System Reliability in the Central Section

The existing 500 kV transmission line (Riel-Forbes) and 230 kV transmission line cross the Central Section (Map 5-11). The transmission lines enter into the north-central portion of the Central Section.

The proposed route and variations would parallel portions of either the 500 kV or 230 kV transmission lines in the Central Section. There would be a maximum of two transmission lines co-located in a corridor. The proposed transmission line would be adjacent to, but not within, the existing transmission line ROW. The Proposed Orange Route and variations would not cross the existing transmission lines, but the Proposed Blue Route would cross both existing transmission lines once.

There would be only two transmission lines co-located within a corridor in the Central Section. Based on information provided by the Applicant, the likelihood of an actual event severely impacting both transmission lines can be reduced by incorporating appropriate transmission line design considerations into the engineering of the proposed Project. No impacts are expected as a result of construction of the proposed Project, regardless of the route or variation considered in the West Section.

5.4.7.2 General Impacts

Construction, operation, maintenance, or emergency repairs of the proposed Project could interfere with the operation of existing transmission lines as it may be difficult to maintain the appropriate separation distance required for clearance and safety issues and are similar to the described within the West Section (Section 5.3.7.2). Mitigation in the Central Section is similar to mitigation described for the West Section and is described in Section 5.3.7.2.

Impacts from Construction

Impacts associated with construction of the proposed Project in the Central Section are similar to those described for the West Section and are described in Section 5.3.7.2. Since impacts related to electrical system reliability are not expected from construction and operation of the proposed Project for any proposed route or variation considered in the Central Section, electrical system reliability for the Central Section is not discussed further in Chapter 6 of the EIS.

Operation, Maintenance, and Emergency Repairs

Impacts associated with operation, maintenance, or emergency repairs of the proposed Project in the Central Section are similar to those described for the West Section and are described in Section 5.3.7.2. No impacts are expected as a result of construction of the proposed Project, regardless of the route or variation considered. Since potential impacts related to electrical system reliability are not expected from the operation, maintenance, or emergency repairs

Table 5-31 Construction Costs for Proposed Routes and Variations in the Central Section

Variation Area	Variation Names in the EIS	Cost (Total)	Average Cost (per mile)	Length (mi)
Pine Island	Proposed Blue Route	**$118,876,237**	**$1,082,662**	109.8
	Proposed Orange Route	$113,672,041	**$1,078,482**	105.4
Beltrami South Central	Proposed Orange Route	**$1,214,573**	**$995,551**	1.2
	Beltrami South Central Variation	**$3,440,123**	**$1,977,082**	1.7
Beltrami South	Proposed Orange Route	**$5,805,518**	**$1,038,554**	5.6
	Beltrami South Variation	**$9,925,396**	**$1,318,114**	7.5
North Black River	Proposed Blue Route	$9,893,560	$1,179,209	8.4
	North Black River Variation	**$10,552,560**	**$1,147,017**	9.2
C2 Segment Option	Proposed Blue Route	**$35,769,239**	$1,087,211	32.8
	C2 Segment Option Variation	$54,466,435	$1,184,053	46.0
J2 Segment Option	Proposed Orange Route	$48,706,641	$1,154,186	42.2
	J2 Segment Option Variation	$52,128,879	$1,153,294	45.2
Northome	J2 Segment Option Variation	$4,192,942	$1,121,108	3.7
	Northome Variation	$6,385,615	$1,596,404	4.0
Cutfoot	Proposed Orange Route	$5,640,538	$1,336,620	4.2
	Cutfoot Variation	$6,222,257	$1,309,949	4.8

Source: Minnesota Power 2014, reference (9)

of the proposed Project for any proposed route or variation considered in the Central Section, electrical system reliability in the Central Section is not discussed further in Chapter 6 of this EIS.

5.4.8 Costs of Constructing, Operating, and Maintaining the Facility which are Dependent on Design and Route

This section of the EIS summarizes the costs of constructing, operating, and maintaining the facility which are dependent on design and route of the Proposed Project. Cost evaluation is one of the factors the MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4100, subpart L). A summary of the costs associated with constructing the proposed routes and variations in the West Section is provided in Table 5-31.

The Applicant developed these cost estimates based on an estimated cost per mile for the general structure type planned for each proposed route or variation. The cost estimates have a range of plus or minus 30 percent. Since there is a lack of certainty regarding property acquisition, access costs, or segment-specific design criteria (i.e. increased return period where the proposed route or variation parallels existing corridors) these are not full construction estimates and were developed for comparative purposes only and a contingency has not been built into these numbers because it would require further engineering and analysis.

The cost for routine maintenance would depend on the topology and the type of maintenance required, but typically runs from $1,100 to $1,600 per mile annually (Minnesota Power 2013, reference (135)). Using the $1,600 per mile for operation and maintenance, the estimated cost would range from $2,000 to $176,000 annually for these alternatives in the Central Section.

5.5 Route Specific Impacts to East Section

The East Section contains seven alternatives, which are as follows: the Proposed Blue Route, the Proposed Orange, one variation in the Effie Variation Area, one variation within the East Bear Lake Variation area, one variation within the Balsam Variation Area, one variation in the Dead Man's Pond Variation Area, and one variation within the Blackberry Variation Area. Section 5.5 describes unique impacts to these alternatives.

5.5.1 Human Settlement

5.5.1.1 Aesthetics

This section describes the aesthetic, or visual, resources within the East Section and the potential impacts from the proposed Project.

Aesthetic, or visual resources, are generally defined as the natural and built features of a landscape that may be viewed by the public and contribute to the visual quality and character of an area. Aesthetic resources form the overall impression that an observer has of an area or its landscape character. Visual quality is generally defined as the visual significance or appeal of a landscape based on cultural values and the landscape's intrinsic physical elements (Smardon, R.C. et al 1988, reference (87)). Visual sensitivity refers generally to viewer interest and concern for the visual quality of the landscape and potential changes to it. Section 5.3.1.1 provides a detailed discussion of terms and concepts related to aesthetics.

The ROI for the East Section is the same as described for the West Section (see Section 5.3.1.1) which is 1,500 feet from the anticipated alignment of the transmission line and within 1,500 feet from the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

Visual Character of East Section

The existing landscape character provides the context for assessing the effects of changes to the landscape. Major components of landscape character that define the appearance of the landscape include landform, water, vegetation, and human or cultural modifications. The landscape character of the East Section is described below based on ecological subsections developed by the MnDNR (2015, reference (92)) in combination with observations of human or cultural modifications to the landscape. Ecological subsections are shown on Map 5-2 and described in more detail in Section 5.5.4.2.

The East Section is comprised primarily of three ecological subsections, the Littlefork-Vermillion Uplands, the St. Louis Moraines, and the Nashwauk Uplands. A fourth ecological subsection, the Tamarack Lowlands, barely protrudes into the extreme southern portion of the East Section.

The Littlefork-Vermillion Uplands ecological subsection occurs in the northern portion of the East Section. Its landform is generally flat to gently rolling. Rivers and streams are not common in this southern portion of the subsection; however, short segments of the upper reaches of the Little Fork, Big Fork, Bear, and Valley rivers, which all flow north, meander through the area. The area contains extensive wetlands and peatlands as well as scattered small ponds. Vegetation is a mosaic of prairie, brushland, woodland, and peatlands, and forests are common. Quaking aspen forests are extensive throughout the upland areas.

The St. Louis Moraines ecological subsection occurs in much of the western, central, and southern portions of the East Section. The topography in this portion of the East Section is gently rolling to rolling with dominant end moraines and many steep slopes in the southern portion of this subsection. The entire subsection is pocked with numerous ponds and lakes, as well as a few larger lakes such as Deer Lake and Larson Lake. The area contains very few streams and the south-flowing Prairie River in the south portion of the subsection is the only notable river. Much of the area is forested with aspen, pine, birch, and northern hardwoods, with aspen the most common.

The Nashwauk Uplands ecological subsection occurs in much of the eastern portion of the East Section. The topography in this portion of the East Section is mostly flat to rolling except for a high, narrow ridge, called the Giants Range, which extends diagonally across the southern portion of this subsection in a northeast to southwest direction. The subsection contains a few streams, including segments of the East and Swan rivers, and a number of small and larger lakes, including Grass, Trestle, and Big Diamond lakes. Much of the subsection is forested with aspen, pine, birch, and northern hardwoods, with aspen the most common.

The Tamarack Lowlands ecological subsection occupies a very small area in the extreme southern part of the subsection south of the proposed Project terminus. The topography in this area is flat to gently rolling and there are no notable streams or lakes in this small area. Much of the area contains sedge meadows or is forested with aspen, pine, birch, and northern hardwoods, with aspen the most common.

Much of the northern portion of the East Section is forested or covered in peatlands or wetlands and much of the southern portion is covered with wetlands, ponds, or lakes. State forests in the section include George Washington and Koochiching in the northern portion of the East Section. State parks include Scenic State Park in the west-central area and Hill-Annex Mine State Park in the southeastern portion of the East Section (Map 5-19). Numerous

lakes and ponds occur throughout the section, with the highest concentration of lakes and ponds in the western and central portions of the East Section. The largest streams in the section include the Little Fork, Big Fork, Bear, and Valley rivers in the north and the Prairie, East, and Swan rivers in the central and south. A variety of smaller tributaries to these streams and rivers meander through the section as well. Due largely to the extensive forests, wetlands, lakes, and ponds, there is very little agriculture in the East Section. Where it does occur, mostly in the southern portion of the section, agriculture is in small, scattered concentrations and consists mostly of row crops, pastures, and hay fields.

Human settlement is sparse throughout the northern portion of the East Section but is much more prevalent in the southern portion of the section where there are a number of communities. These communities tend to be associated with the Giants Range, a high, narrow ridge extending diagonally from northeast to southwest across the southern part of this area where much of the iron mining in Minnesota occurs. This area includes the communities of Cohasset, Grand Rapids, La Prairie, Coleraine, Bovey, Taconite, Marble, Calumet, and Nashwauk. Other areas of human settlement in the East Section are most often associated with recreation or forestry activities. Human settlement in the northern, sparsely populated area consists primarily of scattered rural residences and farmsteads. In the southern more populous area, human settlement is mostly concentrated in and near the towns. A number of residences throughout the section appear to be located around lakes. Transmission lines are not common in most of the East Section. One large transmission line runs through the northeastern part of the section and a number of large transmission lines run through the southern portion of the East Section and are concentrated along its south boundary and in the vicinity of the **existing** Blackberry Substation. Several tall communication towers also are scattered through the East Section (Map 5-18). Views in non-forested areas of the section can be expansive but are often limited in distance by tall stands of trees. Views in forested areas of the section tend to be enclosed and limited due to screening by the dense trees.

No state parks, state forest campgrounds, national forests, scenic byways, water trails, or national parks were found within 1,500 feet of the anticipated alignment of the proposed routes and variations in the East Section. However, residences, historic architectural sites, state trails, state forests, county parks, snowmobile trails, water access points, were identified within the ROW and/or within 1,500 feet of the anticipated alignment for one or more of the proposed routes and variations as discussed in Sections 5.2.1.1 and 6.2.

General Impacts

General impacts on existing aesthetic resources in the East Section are similar to those in the West Section and are discussed in Section 5.3.1.1. Impacts may be caused by construction and operation of the proposed Project and could include short-term and long-term impacts. Impacts on aesthetics are assessed based on the extent of changes to landscape character and scenic quality, the level of contrast introduced by the proposed Project, its proximity to viewers, and the visual sensitivity related to views of the proposed Project. For a more detailed discussion of short- and long-term aesthetic impacts of transmission line projects, please see Section 5.3.1.1. The potential impacts of the proposed route and variations on aesthetic resources in the East Section are discussed in Section 6.4. Applicant proposed measures to avoid, minimize, or mitigate impacts on aesthetic resources are summarized in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

To further characterize the potential impacts in the East Section, photographs were taken and simulations created for the location where the proposed Orange Route is located near a Reserve with recreation facilities located along the east side of Scenic Highway near Balsam Memorial Hall in the East Section (Viewpoint 03 in Appendix N). Further discussion of the potential aesthetic impacts of the proposed Project on that aesthetic resource is discussed in Section 6.4.

Construction Impacts

Short-term aesthetic impacts could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations for transmission line construction. Construction related impacts to aesthetics are discussed in Section 5.3.1.1.

Operation, Maintenance, and Emergency Repair Impacts

Long-term impacts on aesthetic resources are most likely to occur during operation of the transmission line and would occur over the life of the proposed Project. Operation, maintenance, and emergency repair impacts to aesthetics are discussed in Section 5.3.1.1.

5.5.1.2 Land Use Compatibility

This section describes existing land uses and applicable land use policies and zoning within the East Section of the proposed Project and the potential impacts to that resource from the proposed Project. Land use categories and the ROI were similarly identified for the East Section as for the West and Central sections and discussed in Section 5.3.1.2.

The ROI for the East Section is the same as described for the West Section (Section 5.3.1.2) which is 1,500 feet from the anticipated alignment of the transmission line and within 1,500 feet from the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

Land Use Compatibility in the East Section

The East Section is located in Koochiching and Itasca counties in areas that are primarily rural, but near to several population centers and areas with lake homes. The proposed Project would pass through the city of Taconite and near the adjacent cites of Grand Rapids, Colerain, Bovey, Marble, Calumet, and Nashwauk. The land uses in the northern half of the East Section largely state forests and state fee land including Koochiching State Forest and the George Washington State Forest. Land cover in the state forests is predominately forested and wetlands. Some agriculture and developed land is located in the northwest corner of the East Section near the border of Koochiching County. South of the state forests and fee lands, undeveloped forest and wetlands continues are predominate land uses. Agriculture and developed land is sparsely scattered though this area. The southern portion of the East Section is predominantly undeveloped forest land but includes some agriculture and significant urban and developed land concentrated in the incorporated cities. A large number of medium and small-sized lakes are scattered throughout the East Section. A number of airstrips and airports are also located throughout the section, as described in Section 5.2.1.6. The various land uses present along the proposed routes and variations are shown in Map 5-19.

The proposed routes and variations would be located primarily in rural communities and would only pass through one incorporated city (Taconite). Relevant elements of county and city comprehensive plans and ordinances are described below. As discussed, Minnesota Statues indicate that a MN PUC Route Permit would supersede all local zoning, building, or land use regulations; including local, county and regional (Minnesota Statutes, section 216E.03).

The **Koochiching County Development Ordinance** and the **Itasca County Zoning Ordinance**, as described in Section 5.4.1.2, are also applicable to the East Section of the proposed Project.

The **Taconite Comprehensive Plan** does not include any direct policies regarding transmission lines. The plan identifies one and two family Residential as the primary land use in the city; though much of the land along the proposed Project is vacant or undeveloped. The Project would pass through land zoned as Farm Residential and Heavy Industrial (Arrowhead Regional Planning Division 2007, reference (143)). Zoning code for the city was not available, but based on zoning codes for similar communities; it is assumed that these zoning designations would not preclude the construction of a transmission line. The city of Taconite is currently in the process of updating their comprehensive plan.

The **Minnesota Forest Resource Strategies** as discussed previously in Section 5.3.1.2, are also applicable to the East Section of the proposed Project.

General Impacts

Construction, operation, maintenance, and emergency repairs of the proposed Project in the East Section would result in similar impacts as are expected and described for the West Section in Section 5.3.1.2.

Section 6.4 summarizes the potential impacts of the proposed routes and variations on land use in the East Section. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on land use. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Construction of the proposed Project in the East Section would result in similar impacts as are expected and described for the West Section in Section 5.3.1.2.

Operation, Maintenance, and Emergency Repair Impacts

Operation, maintenance, and emergency repairs of the proposed Project would result in long-term impacts on land use within the East Section, similar to those described for the West Section in Section 5.3.1.2.

5.5.1.3 Cultural Values

This section describes the cultural values within the East Section and the potential impacts to cultural values from the proposed Project.

Cultural values are shared beliefs or attitudes that define what is acceptable or unacceptable, important or unimportant, right or wrong, workable or unworkable and provide a framework for unity and sense of identity for a community, region, or people. Section 5.3.1.3 provides a more detailed discussion of cultural values.

The ROI for the East Section is the same as described for the West Section (Section 5.3.1.3) which includes Itasca, Koochiching, and St. Louis counties crossed by the proposed routes and variations.

Cultural Values in the East Section

Cultural values in the East Section are in many ways similar to the cultural values described for the West and Central Sections. Cultural values unique to the East Section are largely tied to the transition to lake and cabin country and, at the south end of the East Section, intersection with the western portion of the Mesabi Iron Range.

From north to south, the East Section transitions from the "Emptying Nest" type community of Koochiching County (Section 5.4.1.3) to a "Service Worker" type community in Itasca County. "Service Worker" counties are characterized by midsize and small towns with economies fueled by hotels, stores, and restaurants and with lower-than-average median household income by county (Chinni and Gimpel 2010, reference (100)). Themes mentioned on the websites of regional cities and business communities stress hard work, optimism, and appreciation of the natural world. The major values within the region include pragmatism, appreciation, and use of natural resources, individualism, political and social conservatism, community pride, and economic well-being. The majority of public comments provided during the EIS scoping meetings in the East Section raised concerns primarily related to possible visual and environmental impacts, implying cultural values of visual aesthetics of the landscape and sustained environmental conditions. In addition, commenters identified the importance of avoiding impacts to homes and the communities in Balsam and Lawrence townships and agricultural activities associated with wild rice cultivation, an indication of the value placed on preservation of the agricultural activities unique to this region (DOE and DOC-EERA 2014, reference (102)).

Euro-American cultural values unique to the East Section are largely tied to the transition to more populated areas with many lakes and cabins and to the area of the Mesabi Iron Range.

Tribal Values in the East Section

Tribal cultural values are similar to those described in Section 5.4.1.3 and include preserving the natural environment, retaining traditional cultural gathering, hunting and fishing rights, and preserving their independence.

General Impacts

General impacts to cultural values are detailed in Section 5.3.1.3. In the East Section, the communities in Balsam and Lawrence tend to strongly value the aesthetics of their communities as well the small town, rural atmosphere, which may be linked to an absence of major infrastructure, including vertical intrusions from transmission infrastructure within the viewshed of these areas. Citizens and local government officials have expressed concern that the Proposed Orange Route would fundamentally undermine the values of these communities (DOE and DOC-EERA 2014, reference (102)).

Many of the communities at the southern end of the Eastern Section grew out of the iron and taconite mining industry on the Mesabi Iron Range. The Iron Range is characterized by a more industrial, blue collar population whose political culture and value for social and cultural organizations were significantly shaped by the struggles of immigrant workers in the mines during the late 1800s and early 1900s. Impacts to the mining industry are unlikely to affect these long-established values. Potential for impacts to mining and mineral resources from the proposed Project are discussed further in Sections 5.3.2.3 and 6.4.

Impacts to cultural values can be minimized primarily through corridor sharing with existing transmission infrastructure. Where existing infrastructure is present, impacts to the values addressed in Section 5.5.1.3 are likely to be marginal.

Although some permanent impacts to cultural values may be felt on a local basis, particularly where transmission lines run close to communities with values that are at odds with the presence of new, large infrastructure projects, at a county-wide or regional level no conflict with cultural values is are anticipated. Since potential impacts related to cultural values at the community or regional scale from the proposed Project are not expected for any route and variation considered, cultural values are not analyzed or discussed further in Chapter 6 of this EIS.

Construction Impacts

General impacts to cultural values from the proposed Project are discussed above. The construction phase of the proposed Project is not expected to result in any unique impacts to cultural values held by Euro-Americans or American Indian tribes.

Operation, Maintenance, and Emergency Repair

General impacts to cultural values from the proposed Project are discussed above. Operation, maintenance, and emergency repair are not expected to result in any unique impacts to cultural values held by Euro-American or American Indian tribes.

5.5.2 Land-Based Economies

Constructing and operating the proposed Project could potentially affect land-based economies in the proposed Project area. Transmission lines and associated structures are a physical, long-term presence on the landscape, which could prevent or otherwise limit use of the land for other purposes. When placed in an agricultural field, transmission line structures have a relatively small footprint, yet they could potentially interfere with farming operations. In addition, tall trees are not allowed in transmission line ROWs, a restriction that could affect forestry operations along the ROW, and transmission line structures could affect access to mineral resources and **EMFs associated with transmission lines may mask or prevent geophysical detection of mineral resources.**

5.5.2.1 Agriculture

This section describes the agricultural resources within the East Section and the potential impacts on those resources from construction and operation of the proposed Project. The definition and regulations for agriculture are described in Section 5.3.2.1. The ROI for the East Section is the same as described for the West Section (Section 5.3.2.1) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

Agriculture in the East Section

Agriculture is one of the land-based economic resources in the East Section. In 2010, cash receipts for agricultural operations were approximately $7 million in Koochiching County, and $10 million in Itasca County (MDA 2012, reference (104)). Principal crops in Koochiching County and Itasca counties include corn and oats (USDA 2012, reference (106)). Farmers in the East Section raise livestock, including pigs, broiler or other meat-type chickens, cattle, and sheep (USDA 2012, reference (106)). **Bee keeping is an important agriculture practice within the East Section. Potential impacts to bees from the proposed Project are discussed in Section 5.3.2.1.** The following sections describe potential route-specific impacts to farmland, organic farms, livestock, aerial spraying, irrigation systems and precision farming practices.

Potential impacts related to prime farmland, prime farmland if drained, and farmland of statewide importance from the proposed Project are discussed further in Chapter 6 of this EIS. Mitigation strategies for potential impacts to these types of farmlands are similar to those described below for all agricultural lands.

Farmland

Agricultural land in the East Section includes lands designated as prime farmland, prime farmland if drained, and farmland of statewide importance. The FPPA defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides and labor" (CFR, title 7, section 657.5 (a) (1)). Farmland of statewide importance includes other land that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops.

Potential impacts to prime farmland, prime farmland if drained, and farmland of statewide importance from the proposed Project are discussed in Chapter 6 of this EIS. Mitigation strategies for potential impacts to these types of farmlands are similar to those described below for all agricultural lands.

Organic Farms

As noted in Section 5.3.2.1, since potential impacts related to organic farms are expected to occur if special construction and maintenance procedures are followed and do not vary by proposed route or variation considered, organic farms are not discussed further in Chapter 6 of this EIS.

Livestock

Hog, poultry, cattle, and sheep farms are located in the East Section. Livestock operations could be temporarily affected during construction of the proposed Project. Construction activities could temporarily disrupt livestock access to pasture

lands and disturb livestock with construction noise. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils. Measures to minimize impacts to livestock during construction could include erecting temporary fences, temporarily relocating livestock from construction areas, restoring vegetative cover using landowner-approved seed mixes suitable for livestock grazing, and washing equipment prior to entering poultry farms.

Though no stray voltage impacts are anticipated as a result of the proposed Project, stray voltage could be of concern to livestock farmers, particularly on dairy farms, due to its potential impacts to milk production and quality. Stray voltage is discussed further in Section 5.2.2.3. Induced voltage also may be of concern to livestock farmers, for farms with buildings near a transmission line that would require grounding of the metal components of the building. No impacts due to induced voltage are anticipated from the proposed Project if effective grounding is implemented. Induced voltage is discussed further in Section 5.2.2.4. Since potential impacts related to livestock are expected to be limited and do not vary by proposed route or variation considered, livestock are not discussed further in Chapter 6 of this EIS.

Aerial Spraying

Transmission line structures could potentially affect the coverage and effectiveness of aerial spraying. Structures could limit the ability of aerial applicators to reach specific areas of fields, by limiting those areas where applicators could safely fly. Adverse effects on aerial spraying and to crops could be mitigated by aligning the proposed Project in a configuration that is consistent with current aerial spraying patterns or by using land-based herbicides or pesticides in the areas near the transmission line. Since potential impacts related to aerial spraying are expected to be limited and do not vary by proposed route or variation considered, aerial spraying is not discussed further in Chapter 6 of this EIS.

Irrigation Systems

Transmission line structures in agricultural fields could potentially impede the use of irrigation systems, either by necessitating reconfiguration of an irrigation system to accommodate structures or by reducing crop revenue because all or a portion of a field could not be irrigated. No known center-pivot or other irrigation systems have been identified in the East Section; therefore, impacts to irrigation systems are not anticipated and mitigation would not be required. If an irrigation system is encountered during construction of the proposed Project, procedures specified in the AIMP would be implemented to minimize disruption of the system. Further discussion of the AIMP can be found in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions. Since potential impacts related to irrigation systems are not expected from the proposed Project and do not vary by proposed route or variation considered, irrigation systems are not discussed further in Chapter 6 of this EIS.

Precision Farming Systems

Precision farming involves the use of GPS and, more recently, RTK GPS in farm machinery, allowing the machinery to be directed more accurately and maximize a farm's efficiency. Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming. Further discussion on interference can be located in Section 5.2.1.5. If interference with electronic devices, including precision farming systems, does occur and is caused by the presence or operation of the transmission line, Route Permits issued by the Commission require permittees to take those actions which are feasible to restore electronic reception to pre-project quality (Appendix B). Since potential impacts related to precision farming systems are expected to be limited and do not vary by proposed route or variation considered, precision farming systems are not discussed further in Chapter 6 of this EIS.

General Impacts

Potential impacts to agriculture associated with projects of this nature could be either short-term or long-term and are discussed generally below. Chapter 6 of this EIS assesses impacts on agriculture using USDA NRCS, SSURGO Farmland Classification mapping to identify areas of prime farmland, prime farmland if drained, and farmland of statewide importance within the ROW.

Agricultural land uses would continue to be allowed in the ROW, but the presence of transmission structures may prevent some farm equipment from accessing land. Impacts to agricultural operations could be mitigated by prudent routing (i.e., by selecting routes that avoid agricultural fields by following existing infrastructure ROWs, field lines and property lines). Where structures are placed in fields, impacts could be mitigated by not placing structures diagonally across fields, but rather parallel to existing field lines or spanning fields if diagonal crossings are necessary.

Impacts to agricultural lands could also be minimized by limiting the removal of crops to only that necessary for construction and on-going safe

operation of the line. Additionally, the Applicant, in collaboration with the MDA would prepare an AIMP for the proposed Project. The AIMP identifies measures that the Applicant would take to avoid, mitigate, or provide compensation for agricultural impacts that could result from constructing and operating the project. The AIMP specifies procedures for repairing damaged drain tile, alleviating compaction, and removing construction debris. Compliance with the AIMP is not a permit condition in the MN PUC's generic route permit template, but has been included as a permit condition for other high voltage transmission line projects (Appendix B). Further discussion on the AIMP can be found in Section 2.13.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. These activities could limit the use of fields or could affect crops and soil by compaction soil, generating dust, damaging crops or drain tile or causing erosion. Project construction activities would typically be limited to the transmission line ROW. Short-term impacts in agricultural lands are estimated as 0.92 acres per structure location.

Construction activities would cause long-term impacts to agriculture by the physical presence of transmission line structures and associated facilities in crop, pasture, or other agricultural lands. For the transmission line itself, the footprint of the structure proposed for the project is **1,936** square feet. The impact of such structures, however, could be greater than their footprint since they could impede the use of farm equipment and irrigation systems and interfere with aerial spraying. These physical impacts could result in lost farming income or decreased property values (Section 5.2.1.4). In addition, stray voltage could affect livestock if not properly mitigated (Section 5.2.2.3).

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on farmlands from the removal of crops, localized physical disturbance, and compaction caused by equipment. Maintenance and emergency repair-related impacts on farmland would be short-term and more localized than construction-related impacts.

5.5.2.2 Forestry

This section describes the forestry resources within the East Section and the potential impacts on those resources from construction and operation of the proposed Project.

Forestry resources are defined as forest lands and their associated harvestable products, including but not limited to, trees, saplings, seedlings, logs, brush, and slashing.

For the purposes of this analysis, the ROI for forestry resources is defined as 100 feet on each side of the transmission line alignment. This ROI was selected based on an expectation that, given the construction activities proposed, the majority of impacts on forestry would likely occur within this area.

Forestry in the East Section

The East Section includes predominantly forested lands. State-owned forest lands, including the Koochiching, George Washington, and Bowstring state forests, are managed by the MnDNR. The MnDNR Forestry Timber Sales Program manages timber harvesting on state-owned forest lands, which provides a source of funding for public services in Minnesota. Itasca and Koochiching counties are among Minnesota's top five timber harvest counties, with Itasca County producing more than 300,000 cords annually and Koochiching County producing more than 200,000 cords annually (MnDNR 2011), reference (100). The East Section also includes other forested areas with private or corporate ownership.

The ROI for the East Section is the same as described for the West Section (Section 5.3.2.2) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

General Impacts

Potential impacts to forestry resources associated with projects of this nature could be either short-term or long-term. The EIS assesses impacts on forestry resources using MnDNR Division of Forestry, State Forest Boundaries and USFWS Interest mapping to identify areas of state forests and USFS national forest lands within the ROW.

Impacts to timber harvesting operations could be mitigated by prudent routing (i.e., by selecting routes that avoid forest lands by following

existing infrastructure ROWs, access road ROWs, and property lines). ROW maintenance could be managed to reduce impacts on forestry resources. For example, leaving small fruiting trees and shrubs and using mechanical versus chemical vegetation management could help mitigate the loss of forestry resources. In addition, increasing the time between line maintenance in forested areas could result in harvestable products. Finally, elevated spanning, in areas with high elevations, could reduce forest clearing.

Due to the possibility of permanent tree removal in forest lands, potentially significant impacts to forestry resources are expected as a result of construction and operation of the proposed Project, depending on the route or variation considered. Adverse, long-term, and regional impacts to forestry resources are expected and are considered significant by the MnDNR; however, the estimated loss in public revenue from timber harvesting is unknown. Potential impacts related to forestry from the proposed Project are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. Construction activities could limit timber harvesting efforts, affect timber stands and soil by compaction, damage trees, or cause erosion. Project construction activities would typically be limited to the transmission line ROW. As mentioned above, short-term impacts are estimated as 0.92 acres per structure location. Long-term impacts to forestry resources are caused by the clearing of trees and physical presence of transmission line structures and associated facilities in forest lands. As mentioned above, for the transmission line itself, the footprint of the structure proposed for the project is **1,936** square feet.

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on forest lands from the removal of vegetation, localized physical disturbance, and compaction caused by equipment. Maintenance and emergency repair-related impacts on forestry resources would be short-term and more localized than construction-related impacts.

5.5.2.3 Mining and Mineral Resources

This section describes mining and mineral resources within the East Section and the potential impacts from the proposed Project as required by MN PUC decision making for the Route Permit.

Mining and mineral resources are defined as areas with a concentration or occurrence of natural, solid, inorganic, or fossilized organic material in such form, quantity, grade, and quality that it has reasonable prospects for commercial extraction. The ROI for the East Section is the same as described for the West Section (Section 5.3.2.3) and includes the anticipated 200-foot ROW of the transmission line and the permanent footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

Mining and Mineral Resources in the East Section

Mining contributes more than 15 percent of the economy's total output in this region (Tuck, 2014, reference (141)). There are state mining leases identified in the East Section. Several active and abandoned metallic mineral, iron ore, and taconite mining sites are found along the proposed routes and variations in the East Section. These sites include expired/terminated and active leases for the mining of iron ore and metallic minerals, and to a lesser extent taconite. Potential impacts related to mining and mineral resources from the proposed Project are discussed further in Chapter 6 of this EIS.

In the northwestern portion of the East Section, the Proposed Blue Route diverges from the existing co-located 230 kV and 500 kV transmission lines and transects an area of recent and historic metallic mineral occurrence, leasing, and exploration (Map 5-19). The Effie Variation also crosses areas of mineral occurrence, but follows these co-located 230 kV and 500 kV transmission lines. The proposed routes and variations in the East Section cross active state metallic mineral leases in zones having high potential for metallic mineral resources. A volcanic belt with known metallic mineral occurrences (gold, copper-zinc-lead, iron) is located in the vicinity of Effie and in an area extending approximately 25 miles southeast of Effie. This zone of high mineral potential extends southwest into the Chippewa National Forest and northeast into the Lake Vermilion area. The MnDNR provided comments during the scoping process with concerns regarding the proposed routes and variations that cross these mineral resources as described in Section 5.4.2.3.

The Mesabi Iron Range is located in the southern portion of the East Section. It is an area of known iron resources, along a trend of enriched iron formation which has been developed into economic resources in various locations along the Mesabi Iron Range. While mineral resources are identified in the area (Map 5-19), the MnDNR has stated that the proposed routes do not encumber known state mineral resources (MnDNR 2014, reference (110)).

In the East Section, there are no aggregate sources located within 100 feet from proposed routes and variations; however, there are several sources located within 1,500 feet (Map 5-18). The MnDNR has identified their concern regarding the potential encumbrance of state-owned surface estate mineral resources (peat, sand and gravel aggregate, crushed stone, clay, etc.), which is described in Section 5.3.2.3.

General Impacts

Potential impacts to mining and mineral resources associated with projects of this nature could be either short-term or long-term. The EIS assesses impacts on mining and mineral resources using the MnDNR Division of Lands and Minerals, All State Mineral Leases (2014) mapping to identify areas with mineral leases within the ROW.

Impacts can be mitigated by prudent routing and structure placement and placement of the alignment within the route to avoid any planned mineral mining sites. Potential impacts related to mining and mineral resources are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. The construction of transmission lines could affect future mining operations if the structures interfere with access to mineable resources or the ability to remove mineral resources. If there are potentially recoverable mineral reserves in the East Section, construction of the proposed Project could limit the ability to successfully mine these reserves, depending on the route variation and the location of any mineable reserves.

Impacts from Operations, Maintenance, and Emergency Repairs

Maintenance and emergency repair activities would have minimal to no impact on mining and mineral resources from localized physical disturbance caused by the use of maintenance equipment.

Impacts to Future Mining Activity

At a July 15, 2014 tribal consultation meeting at the Seven Clans Red Lake Casino on Red Lake Reservation in Minnesota, the Tribal Historic Preservation Officer of the Bad River Band of Lake Superior Tribe of Chippewa Indians, Wisconsin asked whether the proposed Project is primarily needed to meet increased electricity demand from new or expanded taconite mines in northern Minnesota (located in the East Section) and northern Wisconsin. The underlying concern was that, by enabling more taconite or other mining in the area, the proposed Project could indirectly contribute to cumulative, indirect deleterious impacts on water quality and other regional resources often utilized in mining processes.

Based on the Applicant's testimony at the MN PUC certificate of need proceeding, the proposed Project is needed in part to meet increased industrial and mining electricity demand. For example, the Applicant's analyst stated that the proposed Project "will strengthen the transmission system in an area poised for significant economic growth, with attendant electric load growth. The bulk of this load growth is associated with planned mining and industrial expansion on the Iron Range."[78] The proposed Project would also facilitate recent contracts for firm power sales from Manitoba-Hydro to the Wisconsin Public Service Corporation. However, while some of the electricity needed for mining projects in Wisconsin may be supplied by the proposed Project, the proposed Project is not a dedicated project to service increased mining activity.

As summarized in Chapter 3 (No Action alternative), however, if the proposed Project is not constructed, the projected increased industrial demand in the Applicant's service area would still have to be met by other generation sources. Any increased electricity demand in Minnesota would likely be met from many other potential generation sources, including new base-load natural gas generation. In general, the air emissions associated with natural gas turbines would be greater than from importing hydroelectric power through the proposed Project. As to Wisconsin, is not possible to directly connect Wisconsin Public Service electricity contracts with Manitoba Hydro to any particular future mining project in Wisconsin or its potential impacts.

78 Available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={BDF0C5DC-FE91-4CB7-B725-F3C4E8175F49} p. 23.

5.5.3 Archaeology and Historic Architectural Resources

This section describes the setting for archaeological, historic architectural, and Native American resources, collectively referred to as cultural resources, within the East Section and the potential impacts from the proposed Project.

5.5.3.1 Archaeology and Historic Architectural Resources Regulations

A summary of the applicable regulatory requirements and Executive Orders relevant to cultural resources and historic properties are provided in Section 5.3.3.

The ROI for the East Section is the same as described for the West Section (see Section 5.3.3) and includes the direct APE which is the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1 (the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites). It also includes the indirect APE, which includes the direct APE plus a one mile radius on each side of the anticipated alignment of the proposed transmission line or the center of the footprint of the other elements of the proposed Project.

5.5.3.2 Cultural Resources in the East Section

The East Section is comprised primarily of three ecological subsections, the Littlefork-Vermillion Uplands, the St. Louis Moraines, and the Nashwauk Uplands. A fourth ecological subsection, the Tamarack Lowlands, barely protrudes into the extreme southern part of the East Section. The ecological subsections for the East Section are shown on Map 5-2 and are described in more detail in Section 5.5.4.2 and Section 5.5.1.1.

The East Section is composed of two archaeological regions, the Central Lakes Coniferous North and Central Lakes Coniferous Central, which are sub-regions of the greater Central Lakes Coniferous Archaeological Region, as described in Section 5.4.3.2. Prehistoric period settlement patterns and site distribution patterns in the Central Lakes Coniferous North and Central Lakes Coniferous Central sub-regions of the East Section are similar to those described for the Section 5.4.3.2. Additional details from the Paleoindian, Archaic, and Woodland periods is presented in Section 5.3.3.

Historic period archaeological sites and historic architectural or built resources in both the Central Lakes Coniferous North and Central Lakes Coniferous Central archaeological regions are expected to be distributed in the same pattern as was described for the West Section in Section 5.3.3.

Archaeological and historic architectural resources data are shown on Map 5-20 by the number of records found by inventory type (archaeological sites and historic buildings and structures). Detailed data is provided in Appendix P. A more detailed description of the cultural resources present and the impacts within the East Section are provided in Section 6.4.

Additionally, as described in Section 5.3.3.2 for the West Section, the Bois Forte Band of Minnesota Chippewa Tribe, Minnesota, has provided background information for natural and cultural resources that have previously been identified as being of traditional religious and cultural significance to the tribe. These resources are also applicable to the East Section of the proposed Project.

5.5.3.3 General Impacts

Impacts to archaeological sites and historic architectural **sites and/or Native American resources** could result from the proposed Project both directly and indirectly and are similar to those discussed for the West Section 5.3.3.

Section 6.4 summarizes the potential impacts of the proposed routes and variations on archaeological **sites, historic architectural sites, and/or Native American resources** in the East Section, including those **sites or** resources that are historic properties. As stated above, DOE is consulting with federally recognized Indian tribes to identify Native American resources and historic properties **in the East Section.** Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on archaeological and historic architectural resources. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Construction impacts to archaeological sites and historic architectural or built resources in the East Section could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations for transmission line construction. A full description

of the **potential** construction-related impacts to archaeological sites, historic architectural sites, **and/or Native American resources is presented** in Section 5.3.3.3. Measures to avoid, minimize, and mitigate construction impacts on cultural resources and adverse effects on historic architectural properties are the same as those identified in Section 5.3.3.3.

Operation, Maintenance, and Emergency Repair Impacts

Impacts to archaeological sites and historic architectural **resources and/or Native American resources** in the East Section could also result from operation, maintenance, and emergency repairs and would be similar to those described in Section 5.3.3.3. Measures to avoid, minimize, and mitigate operation, maintenance, and emergency repair impacts on cultural resources and adverse effects on historic architectural properties are the same as those identified in Section 5.3.3.3.

5.5.4 Natural Environment

This section describes water resources, vegetation, and wildlife, which are present within the East Section and the potential impacts on those resources from construction and operation of the proposed Project.

5.5.4.1 Water Resources

This section describes water resources, including rivers and streams (i.e. watercourses), lakes and ponds (i.e. waterbodies), wetlands, floodplains, and groundwater resources, that occur in the East Section, as shown on Map 5-21, and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning water resources can be found in Section 5.3.4.1.

The ROI for the East Section is the same as described for the West Section (Section 5.3.4.1) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

Watercourses and Waterbodies in the East Section

The East Section is located in the Rainy River and Mississippi Headwaters regional watersheds, which are separated by the Laurentian Divide. As such, watercourses on the Rainy River side of the divide flow north and watercourses on the Mississippi Headwaters side of the divide flow to the south. Major watersheds include the Big Fork River, Little Fork River, Prairie-Willow River, and Mississippi Headwaters. Several rivers, streams, and creeks (collectively referred to as watercourses) and drainage ditches traverse the area, including MnDNR PWI watercourses and waterbodies. Watercourses are relatively sparse in the East Section compared to the West and Central sections and their flow paths are generally restricted by the variable topography in the section. Major watercourses include the Bear River, Big Fork River, Little Fork River, Prairie River, Swan River, Valley River, Clearwater Creek, and Day Brook. Due to areas of lower elevation, there are more named waterbodies in the East Section than in the West and Central Sections.

The MPCA monitors and assesses Minnesota waters to determine if they meet water quality standards for designated uses. Waters that do not meet their designated uses due to water quality standard exceedances are listed as impaired waters. Table 5-32 lists the impaired waters found in the East Section and summarizes the impairments (stressors) and affected designated uses for each of these impaired waters.

Designated trout streams and lakes in the East Section include the Valley River, Venning Creek, tributaries to the Bear River, Bee Cee Lake, Erskine Lake, Larson Lake, Lucky Lake, Moonshine Lake, Nickel Lake, and the Tioga Mine Pit Lake.

Floodplains in the East Section

Due to the topographic variability, floodplains in the East Section tend to be narrower than in the West or Central sections. FEMA has designated Zone A floodplains along the Big Fork River, Prairie River, and Swan River.

Wetlands in the East Section

Extensive peatlands and large wetland complexes are generally absent in the East Section, though small areas of the Myrtle Lake Peatlands and the Koochiching Peatlands can be found along the northern border of the East Section. As a result of the variable terrain, the East Section has a poorly developed drainage network and small- to medium-sized wetlands are abundant throughout it. The following wetland types are present throughout the East Section: palustrine emergent wetland (PEM), palustrine shrub wetland (PSS), palustrine forested wetland (PFO), and palustrine unconsolidated bottom pond (PUB). No calcareous fens have been identified in the East Section.

Table 5-32 Summary of Impaired Waters in the East Section

Watercourse/Waterbody	Impairment (Stressor)	Affected Designated Use
Big Fork River	Mercury in fish tissue	Aquatic consumption
Little Fork River	Mercury in fish tissue, turbidity	Aquatic consumption, aquatic life
Mississippi River	Mercury in fish tissue	Aquatic consumption
Swan River	Mercury in fish tissue	Aquatic consumption
Gale Brook	Aquatic macroinvertebrate bioassessments	Aquatic life
Balsam Lake	Mercury in fish tissue	Aquatic consumption
Bass Lake	Mercury in fish tissue	Aquatic consumption
Blandin Lake	Mercury in fish tissue	Aquatic consumption
Buck Lake	Mercury in fish tissue	Aquatic consumption
Crooked Lake	Mercury in fish tissue	Aquatic consumption
Cutaway Lake	Mercury in fish tissue	Aquatic consumption
Deer Lake	Mercury in fish tissue	Aquatic consumption
Forsythe Lake	Mercury in fish tissue	Aquatic consumption
Little Bass Lake	Mercury in fish tissue	Aquatic consumption
Lawrence Lake	Mercury in fish tissue	Aquatic consumption
Prairie Lake	Mercury in fish tissue, nutrient/ eutrophication biological indicators	Aquatic consumption, aquatic recreation
Little Bear Lake	Mercury in fish tissue	Aquatic consumption
O'Brien Lake	Mercury in fish tissue	Aquatic consumption
Ox Hide Lake	Mercury in fish tissue	Aquatic consumption
Panasa Lake (Lower)	Mercury in fish tissue	Aquatic consumption
Panasa Lake (Upper)	Mercury in fish tissue	Aquatic consumption
Plantation Lake	Mercury in fish tissue	Aquatic consumption
Pokegama Lake	Mercury in fish tissue	Aquatic consumption
Swan Lake (Main)	Mercury in fish tissue	Aquatic consumption
Swan Lake (West Bay)	Mercury in fish tissue	Aquatic consumption
Ruby Lake	Mercury in fish tissue	Aquatic consumption
Snowball Lake	Mercury in fish tissue	Aquatic consumption
Thistledew Lake	Mercury in fish tissue	Aquatic consumption
Trout Lake	Mercury in fish tissue	Aquatic consumption
Wabana Lake	Mercury in fish tissue	Aquatic consumption
Wolf Lake	Mercury in fish tissue	Aquatic consumption

Source: MPCA 2014, reference (118); MPCA 2014, reference (119)

General Impacts

Potential construction and operational impacts on water resources that may be caused by construction and operation of the proposed Project are similar to those summarized for the West Section in Section 5.3.4.1.

The potential impacts of the proposed routes and variations on water resources in the East Section are discussed in Section 6.4.

Impacts from Construction

Potential construction impacts on water resources are similar to those summarized for the West Section in Section 5.3.4.1.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on water resources are similar to those summarized for the West Section in Section 5.3.4.1.

5.5.4.2 Vegetation

This section describes the vegetation resources within the East Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning vegetation resources can be found in Section 5.3.4.2.

The ROI for the East Section is the same as described for the West Section (Section 5.3.4.2) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

Vegetation in the East Section

According to the ECS, the East Section is primarily located in three subsections of the Laurentian Mixed Forest Province (MnDNR 2015, reference (92)). The Littlefork-Vermillion Uplands subsection, which is in the Northern Minnesota and Ontario Peatlands section, is located across the northern portion of the East Section (Map 5-2). The St. Louis Moraines subsection, which is in the Northern Minnesota Drift and Lake Plains section, covers the majority of the East Section (Map 5-2). The Nashwauk Uplands subsection, which is in Northern Superior Uplands section, covers the eastern portion of the East Section (Map 5-2). In addition, small portions of the Chippewa Plains and Tamarack Lowlands subsections, both of which are in the Northern Minnesota Drift and Lake Plains section, are present in the west and south of the East Section, respectively (Map 5-2). However, because neither of these subsections is crossed by a proposed route or variation, they are not discussed here.

The Littlefork-Vermillion Uplands subsection is a transition zone between the vast peatlands to the west and the shallow bedrock controlled, clayey soils to the east. This subsection contains a rich variety of vegetation types, much of it occupied by aspen-birch forest trending toward white pine, white spruce, and balsam fir. The eastern portion of the subsection is dominated by white pine, red pine, and jack pine dominated forest. Poor and rich fens, black spruce bog, and cedar-black ash swamp are typical in lowlands (MnDNR 2015, reference (92)).

The St. Louis Moraines subsection is dominated by steep slopes on end moraine settings. White and red pine forests historically dominated the northern portions of the subsection, whereas northern hardwood and aspen forest dominated moraines to the south. Mixed deciduous and coniferous forests were common on moraines. Quaking aspen is currently the most dominant tree species in the subsection (MnDNR 2015, reference (92)).

The Nashwauk Uplands subsection is dominated by Giant's Ridge, a narrow 200- to 400-foot-high bedrock feature extending northeast to southwest through the subsection. Glacial outwash plains, rolling till plains, and moraines of the Rainy Lobe glacier are the predominant landforms. Quaking aspen is currently the most dominant tree species in the subsection (MnDNR 2015, reference (92)).

Based on USGS GAP data, the variation areas in the East Section are primarily comprised of upland forests and lowland swamps. Additional land cover types present in the East Section include herbaceous agricultural, open water, developed/urban land, and disturbed or modified land (Map 5-19; Appendix E).

Several state Forests are present in the East Section, including the Koochiching State Forest in the northern portion of the East Section, the George Washington State Forest in the central portion of the East Section, and a small part of the Bowstring State Forest in the western portion of the East Section (Map 5-19). The Chippewa National Forest is also located in the western part of the East Section; however none of the proposed routes or variations would come within a mile of it (Map 5-19). In addition, sensitive ecological resources, such as WMAs, Important Bird Areas, and MBS Sites of Biodiversity Significance (see Sections 5.5.4.3 and 5.5.5) are located within or adjacent to variation areas in the East Section.

General Impacts

Potential construction and operation-related short-term and long-term impacts on existing vegetation in the East Section are similar to those summarized for the West Section in Section 5.3.4.2.

Section 6.4 summarizes the potential impacts of the proposed routes and variations on vegetation in the East Section.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on vegetation. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on existing vegetation in the East Section are similar to those summarized for the West Section in Section 5.3.4.2.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on existing vegetation in the East Section are similar to those summarized for the West Section in Section 5.3.4.2.

5.5.4.3 Wildlife

This section describes the wildlife resources that occur within the East Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning wildlife resources can be found in Section 5.3.4.3.

The ROI for the East Section is the same as described for the West Section (Section 5.3.4.3) and includes the anticipated 200-foot ROW and the footprint of the other elements of the proposed Project, including the proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

Wildlife in the East Section

The landscape types and vegetation communities throughout the East Section of the proposed Project provide forage, shelter, nesting, overwintering, and stopover habitat for a wide range of resident and migratory wildlife species. Habitat types in the East Section primarily consist of various forested communities.

As discussed in Section 5.5.4.2, the East Section is located within three ECS subsections classified by the MnDNR and USFS (MnDNR 2015, reference (92)); the Littlefork-Vermillion Uplands, the St. Louis Moraines, and the Nashwauk Uplands subsections (Map 5-2). The MnDNR's comprehensive wildlife plan, *Tomorrow's Habitat for the Wild and Rare an Action Plan for Minnesota Wildlife* (MnDNR 2006, reference (125)), which corresponds to the ECS native plant communities, was used to summarize the wildlife likely present in the three ecological subsections in the East Section of the proposed Project. Each ECS subsection identifies SGCN, which are those species whose populations are rare, declining, or vulnerable in Minnesota. Approximately half of the SGCN are also Minnesota state-listed species (MnDNR 2006, reference (125)).

Native community types located within the Littlefork-Vermillion Uplands subsection provide habitat for species associated with lowland and upland conifer and mixed conifer deciduous forest vegetation communities. Forested community types within this subsection provide habitat for bald eagle, Canada lynx, great gray owl, boreal owl, and numerous game species such as ruffed grouse and white-tailed deer. Wetlands provide habitat for yellow rail, trumpeter swan, red-necked grebe, and a variety of waterfowl. Approximately 67 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

Native community types within the St. Louis Moraines subsection provide habitat for bald eagle, Canada lynx, northern goshawk, red-shouldered hawk, wood thrush, Canada warbler, four-toed salamander, and numerous game species such as ruffed grouse and white-tailed deer. Approximately 74 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

Native community types within the Nashwauk Uplands subsection provide habitat for bald eagle, gray wolf, northern goshawk, gray jay, Connecticut warbler, veery, black-billed cuckoo, Canada warbler, white-throated sparrow, osprey, Nabakov's blue, brook lamprey, and numerous game species such as ruffed grouse and white-tailed deer. Approximately 60 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

In addition to the natural wildlife habitat present throughout the East Section, areas of managed wildlife habitat are also present within the vicinity of the variation areas, including WMAs, none of which are in close proximity to the proposed routes or variations; the Chippewa Plains Important Bird Area, along the western part of the East Section; and a few MnDNR-designated shallow lakes in the Balsam and Blackberry variation areas (Map 5-22) Section 5.3.4.3 provides additional information on each of these wildlife resources.

The northern portion of the East Section is USFWS-designated critical habitat for gray wolf (Map 5-22); Section 5.3.5 provides further discussion of gray wolf critical habitat. The East Section also contains several State Forests (discussed in Section 5.5.4.2), and sensitive ecological resources (discussed in Section 5.5.5), all of which provide habitat for common and rare wildlife species.

General Impacts

Potential construction and operation-related short-term and long-term impacts on wildlife in the East

Section are similar to those summarized for the West Section in Section 5.3.4.3.

Section 6.4 summarizes the potential impacts of the proposed routes and variations on wildlife in the East Section. Sections 5.5.4.2 and 6.4 (Vegetation) discuss potential impacts on vegetation, Sections 5.5.4.1 and 6.4 (Water Resources) discuss potential impacts on wetland habitat, and Sections 5.5.5 and 6.4 (Rare and Unique Natural Resources) discuss potential impacts on sensitive ecological resources used by wildlife.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on wildlife. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on wildlife in the East Section are similar to those summarized for the West Section in Section 5.3.4.3.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on wildlife in the East Section are similar to those summarized for the West Section in Section 5.3.4.3.

5.5.5 Rare and Unique Natural Resources

This section describes the rare and unique natural resources, including federal and state protected species and rare communities, which are present within the East Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning rare and unique natural resources can be found in Section 5.3.5.

The ROI for an analysis of impacts to federally and state-listed species includes a one-mile buffer surrounding the proposed routes and variations in order to obtain a broad view of species that may be present across the proposed Project, since no formal surveys have been conducted for the proposed Project. The ROI for the analysis of impacts to rare communities includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed **Iron Range** 500 kV Substation, 500 kV Series Compensation Station, and regeneration stations.

Table 5-33 Federally listed Species Known to Occur in Koochiching and Itasca Counties

Scientific Name	Common Name	Federal Status	State Status
Canis lupus	Gray wolf	Threatened	Special Concern
Lynx canadensis	Canada lynx	Threatened	Special Concern
Myotis septentrionalis	Northern long-eared bat	Threatened	Special Concern

Source: USFWS 2015, reference (127)

5.5.5.1 Federally listed Species in the East Section

The USFWS technical assistance website was reviewed to determine if any federally listed species or designated critical habitats are known to be present within Koochiching and Itasca counties, where the East Section is located (USFWS 2015, reference (127)). The USFWS lists three species as occurring in Koochiching and Itasca counties, including the federally threatened gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*), and northern long-eared bat (*Myotis septentrionalis*) (USFWS 2015, reference (127)); Table 5-33).

Designated-critical habitat associated with federally listed species consists of "the specific areas within the geographical area occupied by the species, at the time it is listed…on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection" (50 CFR 1533[b][2]).

Gray wolf. The gray wolf was federally listed as an endangered species in 1974 and was reclassified as threatened in 1977 (42 Federal Register 29527-29532). In 2011, the wolf was delisted by the USFWS (76 Federal Register 57943-57944). However, in 2014, a federal court reversed the USFWS decision to delist the gray wolf, restoring federal threatened status and designated critical habitat in Minnesota. Gray wolves occupy a diversity of habitats, including forests, prairies, and swamps (USFWS 2012, reference (127)). Designated critical habitat for gray wolf is present in the northern portion of the East Section (Map 5-22).

Canada lynx. The Canada lynx was listed as a federally threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies in 2000 (65 Federal Register 16052-16086). Canada lynx inhabit boreal and mixed coniferous and deciduous forests, where snowshoe hare, their preferred diet, are

present (USFWS 2013, reference (127)). The nearest designated critical habitat for lynx is at least 17 miles east of the proposed routes or any variation in the East Section.

Northern long-eared bat. The northern long-eared bat was proposed for listing as a federally endangered species in 2013 (78 Federal Register 61046-61080). In April of 2015, the USFWS listed the northern long-eared bat as federally threatened (80 Federal Register 18023-18028). The northern long-eared bat inhabits caves and mines in winter; in summer northern long-eared bats roost in live and dead trees with loose, flakey, or shaggy bark, crevices, or hollows (USFWS 2015, reference (129)). The USFWS has not identified designated critical habitat for the northern long-eared bat at this time.

Additional information on federally listed species is available in the Biological Assessment was prepared to assist in determining the potential impacts of the proposed Project on federally listed species and to facilitate ESA Section 7 consultation (Appendix R).

5.5.5.2 State Listed Species in the East Section

The MnDNR NHIS database was queried in **September** of 2015 to obtain the locations of rare species documented within the East Section (MnDNR **2015**, reference (132)). Additional information on the NHIS database is provided in Section 5.3.5.

Because no formal surveys for rare species have been conducted for the proposed Project, a one-mile buffer surrounding the proposed routes and variations in the East Section was used to obtain a broad view of the rare species that may be present across this portion of the proposed Project. The NHIS database documents the following three state-threatened species within one-mile of the proposed routes and variations in the East Section: state-threatened robbins' spikerush (*Eleocharis robbinsii*), tubercled rein-orchid (*Platanthera flava var. herbiola*), and Cases's ladies' tresses (*Spiranthes casei var. casei*) (Table 5-34). In addition to these state-threatened species, several state-special concern species have been documented within one-mile of the proposed routes and variations in the East Section; these include three vascular plants, one bird, and two mussels. State-threatened and special concern species and their associated habitats are summarized below in Table 5-34. Species tracked in the NHIS database, as described in Section 5.3.5, that have been documented within one mile of the proposed routes and variations in the East Section are summarized in Appendix F.

Table 5-34 State-Threatened and Special Concern Species Documented within One Mile of the Proposed Routes and Variations in the East Section

Scientific Name	Common Name	Federal Status	State Status	Type	Associated Habitat
Eleocharis robbinsii	Robbin's Spike-rush	None	Threatened	Vascular Plant	Shallow soft-water ponds and lakes.
Platanthera flava var. herbiola	Tubercled Rein-orchid	None	Threatened	Vascular Plant	Wet prairies and meadows, swales in mesic prairies, or the sandy or peaty habitats along the edges of marshes, swamps, or lake shores.
Spiranthes casei var. casei	Cases's Ladies'-tresses	None	Threatened	Vascular Plant	Disturbance related habitats including drained tailing basins within early successional forest.
Carex ormostachya	Necklace Spike Sedge	None	Special Concern	Vascular Plant	Sporadically in the moderate shade of upland hardwood and hardwood- conifer forests.
Najas gracillima	Thread-like Naiad	None	Special Concern	Vascular Plant	Clear, healthy softwater lakes.
Najas guadalupensis ssp. olivacea	Guadalupe waternymph	None	Special Concern	Vascular Plant	Lakes, ponds, rivers, and streams.
Accipiter gentilis	Northern Goshawk	None	Special Concern	Bird	Large tracts of mature, closed canopy, deciduous, coniferous, and mixed forests with an open understory
Lasmigona compressa	Creek Heelsplitter	None	Special Concern	Mussel	Creeks, small rivers, and the upstream portions of large rivers.
Ligumia recta	Black Sandshell	None	Special Concern	Mussel	Riffle and run areas of medium to large rivers.

Source: MnDNR 2015, reference (132)

According to the NHIS database, there are eight MnDNR-designated colonial waterbird nesting sites in the East Section. Colonial waterbird nesting sites are documented locations of large groups of nesting waterbirds; these locations are generally found in association with trees and emergent wetland vegetation.

5.5.5.3 State Rare Communities in the East Section

Several rare communities have been identified within or adjacent to the variation areas in the East Section; these include SNAs, MBS Sites of Biodiversity Significance, and MnDNR-designated Ecologically Important Lowland Conifer stands (Map 5-23). In addition to these rare resources, MBS native plant communities and MnDNR-designated areas of High Conservation Value Forest are also likely present in the East Section; however, as mentioned in Section 5.3.5, the MnDNR is in the process of mapping these resources for the counties in the East Section and data are currently unavailable (MnDNR 2014, reference (134)).

Many rare communities present in the East Section are located within the George Washington State Forest or Koochiching State Forest (Map 5-19 and Map 5-23). State forests are discussed in Section 5.5.4.2. Other resources that may provide potential habitat for rare species, such as Important Bird Areas, are discussed in Section 5.5.4.3 and shown on Map 5-22.

Scientific and Natural Areas

There are six SNAs located in the East Section, including Myrtle Lake Peatland, Botany Bog, Chisholm Point Island, Ladies Tresses Swamp, Potato Lake, and Wabu Woods (Map 5-23). No SNAs are located within 1,500 feet of any proposed routes or variations in the East Section (Map 5-23). See Section 5.3.5 for additional information on SNAs.

MBS Sites of Biodiversity Significance

Several areas mapped by the MBS as Sites of Biodiversity Significance are located throughout the East Section (Map 5-23). Mapping of Sites of Biodiversity Significance is only preliminary in Koochiching and Itasca counties. Because of this, biodiversity significance ranks, as summarized in See Section 5.3.5, have not been designated in every location in the East Section; these areas are designated "rank unknown" and primarily occur in Koochiching County on Map 5-23. Sites of all levels of biodiversity significance are present in the East Section. However, for discussion purposes in Section 6.4, biodiversity significance ranks are not distinguished from one another because of the preliminary status and/or unknown ranks. All SNAs in the East Section are also MBS Sites of Biodiversity Significance.

The MBS Sites of Biodiversity Significance ranked outstanding and high likely contain several native plant communities and areas designated as areas of High Conservation Value Forest; however, as mentioned above, these resources have not yet been mapped and are currently unavailable. See Section 5.3.5 for additional information on MBS Sites of Biodiversity Significance.

Ecologically Important Lowland Conifers

The MnDNR has identified several Ecologically Important Lowland Conifer stands specifically targeted for protection in the East Section. No Ecologically Important Lowland Conifer stands have been identified within the ROW of the proposed routes or variations in the East Section. See Section 5.4.5 for additional information on Ecologically Important Lowland Conifer stands.

5.5.5.4 General Impacts

Potential construction and operation-related short-term and long-term impacts on rare and unique natural resources in the East Section are similar to those summarized for the West Section in Section 5.3.5. The potential impacts of the proposed routes and variations on rare and unique natural resources in the West Section are discussed further in Section 6.4.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on rare and unique natural resources. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on rare and unique natural resources in the East Section are similar to those summarized for the West Section in Section 5.3.5 with the exception of potential impacts on critical habitat designated for gray wolf.

Removal of forested land in the ROW during construction would result in habitat fragmentation, which could reduce the quality of critical habitat designated for gray wolf in the Central Section. The effects of fragmentation on gray wolves would generally be greatest where new corridors are created, rather than where the transmission line would parallel an existing corridor, where the forest has already been fragmented.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on rare and unique natural resources in the East Section are similar to those summarized for the West Section in Section 5.3.5.

Operation, maintenance, and emergency repairs are not likely to result in additional impacts to critical habitat designated for gray wolf beyond the impacts that would likely result from construction, as described above.

5.5.6 Corridor Sharing

This section describes corridor sharing opportunities within the East Section and the potential impacts from the proposed Project. Corridor sharing is one of the factors the MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subparts H and J). See Section 5.3.6 for more information regarding corridor sharing.

The ROI for the East Section is the same as described for the West Section (Section 5.3.6.1) and includes infrastructure corridors within approximately 0.25 miles of the proposed routes and variations.

5.5.6.1 Corridor Sharing in the East Section

The corridor sharing opportunities in the East Section are shown on Map 5-24. These opportunities are located where the ROW for the proposed routes and variations would parallel the corridor of an existing transmission line, field or section line, roadway, or other infrastructure. Where a new transmission line parallels an existing corridor, it generally reduces the amount of additional impacts land under private, corporate, state, or federal ownership. In addition, it may reduce visual impacts as described in Section 5.3.1.1.

In the West Section, the proposed route and variations parallel corridors including existing 230 kV and 500 kV transmission lines, roads, field lines, trails, PLSS, combinations of these corridors, or no corridor. Additional details related to corridor sharing in the East Section for the proposed Project are discussed further in Chapter 6 of this EIS.

5.5.6.2 Associated Facilities

Routing options would be coupled with associated facilities, which would create additional ROW sharing considerations where local lines would need to be reconfigured to extend to the proposed **Iron Range 500 kV** Substation. In the southern portion of the East Section, just before the Proposed Blue Route and the Proposed Orange Route enter the proposed **Iron Range** 500 kV Substation, the Proposed Blue Route would share a corridor with an existing 230 kV transmission line and the Proposed Orange Route would share a corridor with an existing transmission line. Additional details related to corridor sharing in the East Section for the proposed Project are discussed further in Chapter 6 and Chapter 7 of this EIS.

5.5.6.3 General Impacts

As discussed in Section 5.3.6.2, corridor sharing would minimize potential impacts to the affected environment by minimizing the proliferation of new utility ROW and, where ROW sharing is possible, reducing the overall ROW footprint of impact. Section 5.3.6.1 provides additional discussion of ROW sharing and associated approvals. See Section 5.3.7 for reliability issues associated with corridor sharing.

As discussed in Section 5.3.6, by following existing corridors, and reducing the need to create new transmission line corridors for the proposed Project, potential impacts to human settlements, land-based economies, and the natural environment would be minimized.

Since corridor sharing is considered to be a measure to reduce impacts on resources, no additional adverse impacts are anticipated due to corridor sharing.

Impacts from Construction

As discussed in Section 5.3.6.2 sharing or paralleling existing infrastructure would likely require coordination during construction and acquiring necessary approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW (like MnDOT).

Impacts from Operation, Maintenance, and Emergency Repairs

As discussed in Section 5.3.6.2, sharing or paralleling existing infrastructure may require coordination for maintenance or emergency repair and may require approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW.

5.5.7 Electric System Reliability

This section describes the electrical system reliability within the East Section and the potential impacts on those resources from the proposed Project. Electrical system reliability is one of the factors MN PUC is

required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subpart K). See Section 5.3.7 for more information regarding electrical system reliability.

NERC has established mandatory reliability standards for American utilities. In addition, the Applicant has stated their purpose and need as related to electrical reliability. For a more detailed discussion of concepts related to electrical reliability, please see Section 5.3.7.

The ROI for the East Section is the same as described for the West Section (Section 5.3.7) and includes the corridors for the existing transmission lines.

5.5.7.1 Electrical System Reliability in the East Section

The same existing 500 kV transmission line (Riel-Forbes) and 230 kV transmission lines that cross the West and Central Sections also cross the East Section (Map 5-18). The transmission lines enter separately into the north-central portion of the East Section and are co-located within a corridor after a few miles. The Proposed Orange Route is not co-located with an existing transmission line where it enters the East Section. The Proposed Blue Route is co-located with the existing 230 kV transmission line until it converges with the existing 500 kV transmission line.

The Effie Variation in the Effie Variation Area would require the proposed 500 kV transmission line to parallel the co-located 500 kV and 230 kV transmission lines; resulting in three high voltage lines running in adjacent ROWs. The proposed transmission line would be adjacent to, but not within, the existing transmission line ROWs. The Proposed Orange Route and Effie Variation would not cross the existing transmission lines, but the Proposed Blue Route would cross the existing 500 kV transmission line once.

The Proposed Blue Route and the Proposed Orange Route in the Balsam Variation Area would require the proposed 500 kV transmission line to parallel co-located existing 115 kV transmission lines; resulting in three high voltage lines running in adjacent ROWs. The proposed transmission line would be adjacent to, but not within, the existing transmission line ROWs. The Proposed Blue Route and Proposed Orange Route would cross one of the existing 115 kV transmission lines once and the other existing 115 kV transmission line twice. The Balsam Variation would cross one of the existing 115 kV transmission lines once.

The Proposed Orange Route in the Blackberry Variation Area would require the proposed 500 kV transmission line to parallel two co-located existing 115 kV transmission lines and the Proposed Blue Route would parallel co-located existing 115 kV and 230 kV transmission lines; resulting in three high voltage lines running in adjacent ROWs. The proposed transmission line would be adjacent to, but not within, the existing transmission line ROWs. The Proposed Orange Route and Proposed Blue Route would cross two co-located existing 115 kV transmission lines prior to entering the proposed **Iron Range 500 kV** Substation.

As a result, in the northern portion of the East Section, there would be two transmission lines co-located within a corridor. Based on information provided by the Applicant, the likelihood of an actual event severely impacting two paralleling transmission lines can be reduced by incorporating appropriate transmission line design considerations into the engineering of the proposed Project. As summarized in Section 5.3.7.2, the Applicant has proposed a design and operation modifications to reduce the risk of simultaneous outages where the proposed Project would be constructed in parallel with another high-voltage transmission line. Therefore, no impacts are expected on electrical reliability by constructing two paralleling transmission lines.

However, in the Effie, Balsam, and Blackberry variation areas, there would be three transmission lines co-located within the same corridor. The configuration may decrease the reliability of the proposed Project. When facilities are located in close proximity, there is a greater risk that a single event can take out multiple lines. Additionally, the close proximity of the lines can make repairing the lines more difficult. These difficulties could increase outage times, should an outage occur. Potential adverse impacts may be possible for three variation areas in the East Section resulting from the construction and operation of three high voltage transmission lines.

5.5.7.2 General Impacts

Construction, operation, maintenance, or emergency repairs of the proposed Project could interfere with the operation of existing transmission lines as it may be difficult to maintain the appropriate separation distance required for clearance and safety issues and are similar to the described within the West Section (Section 5.3.7.2). Mitigation in the East Section is similar to mitigation described for the West Section and is described in Section 5.3.7.2.

Impacts from Construction

Construction of the proposed Project could interfere with the operation of existing transmission lines as it may be difficult to maintain the appropriate separation distance required for clearance and safety issues. Potential impacts related to electrical system reliability from construction and operation of the proposed Project in the East Section are discussed further in Chapter 6 of this EIS.

Impacts from Operation, Maintenance, and Emergency Repairs

Operation, maintenance, or emergency repairs of the proposed Project may interfere with the operation of existing transmission lines as it may be difficult to maintain the appropriate separation distance required for clearance and safety issues. Potential impacts related to electrical system reliability from operation, maintenance, or emergency repairs of the proposed Project for alternative routes in the East Section are discussed further in Chapter 6 of this EIS.

5.5.8 Costs of Constructing, Operating, and Maintaining the Facility which are Dependent on Design and Route

This section of the EIS summarizes the costs of constructing, operating, and maintaining the facility which are dependent on design and route of the Proposed Project. Cost evaluation is one of the factors the MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4100, subpart L). A summary of the costs associated with constructing the proposed routes and variations in the West Section is provided in Table 5-35.

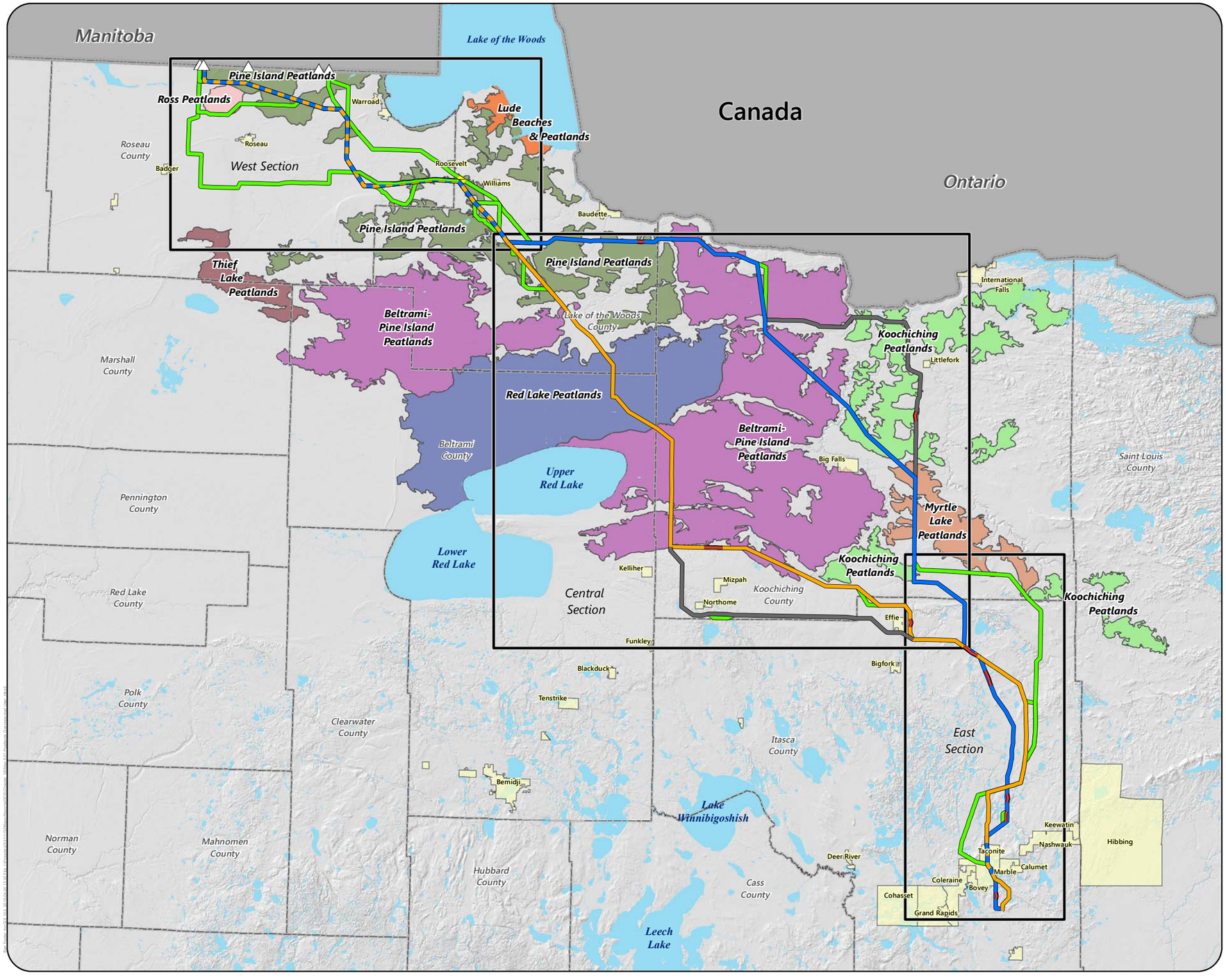
The Applicant developed these cost estimates based on an estimated cost per mile for the general structure type planned for each proposed route or variation. The cost estimates have a range of plus or minus 30 percent. Since there is a lack of certainty regarding property acquisition, access costs, or segment-specific design criteria (i.e. increased return period where the proposed route or variation parallels existing corridors) these are not full construction estimates and were developed for comparative purposes only and a contingency has not been built into these numbers because it would require further engineering and analysis.

The cost for routine maintenance would depend on the topology and the type of maintenance required, but typically runs from $1,100 to $1,600 per mile annually (Minnesota Power 2013, reference (135)). Using the $1,600 per mile for operation and maintenance, the estimated cost would range from $4,000 to $80,000 annually for these alternatives in the East Section.

Table 5-35 Construction Costs for Proposed Routes and Variations in the East Section

Variation Area	Variation Names in the EIS	Cost (Total)	Average Cost (per mile)	Length (mi)
Effie	Proposed Blue Route	$46,649,600	$1,135,027	41.1
	Proposed Orange Route	$49,488,323	$1,109,604	44.6
	Effie Variation	$57,353,305	$1,149,365	49.8
East Bear Lake	Proposed Orange Route	$9,736,790	$1,090,346	8.9
	East Bear Lake Variation	$13,279,079	$1,264,674	10.5
Balsam	Proposed Blue Route	$15,121,621	$1,172,219	12.9
	Proposed Orange Route	$16,018,490	$1,169,233	13.7
	Balsam Variation	$19,502,472	$1,095,644	17.8
Dead Man's Pond	Proposed Blue Route	$2,873,223	$1,306,011	2.2
	Dead Man's Pond Variation	$4,409,841	$1,934,141	2.3
Blackberry	Proposed Blue Route	$8,380,680	$1,540,566	5.4
	Proposed Orange Route	$10,148,060	$1,663,616	6.1

Source: Minnesota Power 2014, reference (9)



- Border Crossing Point

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

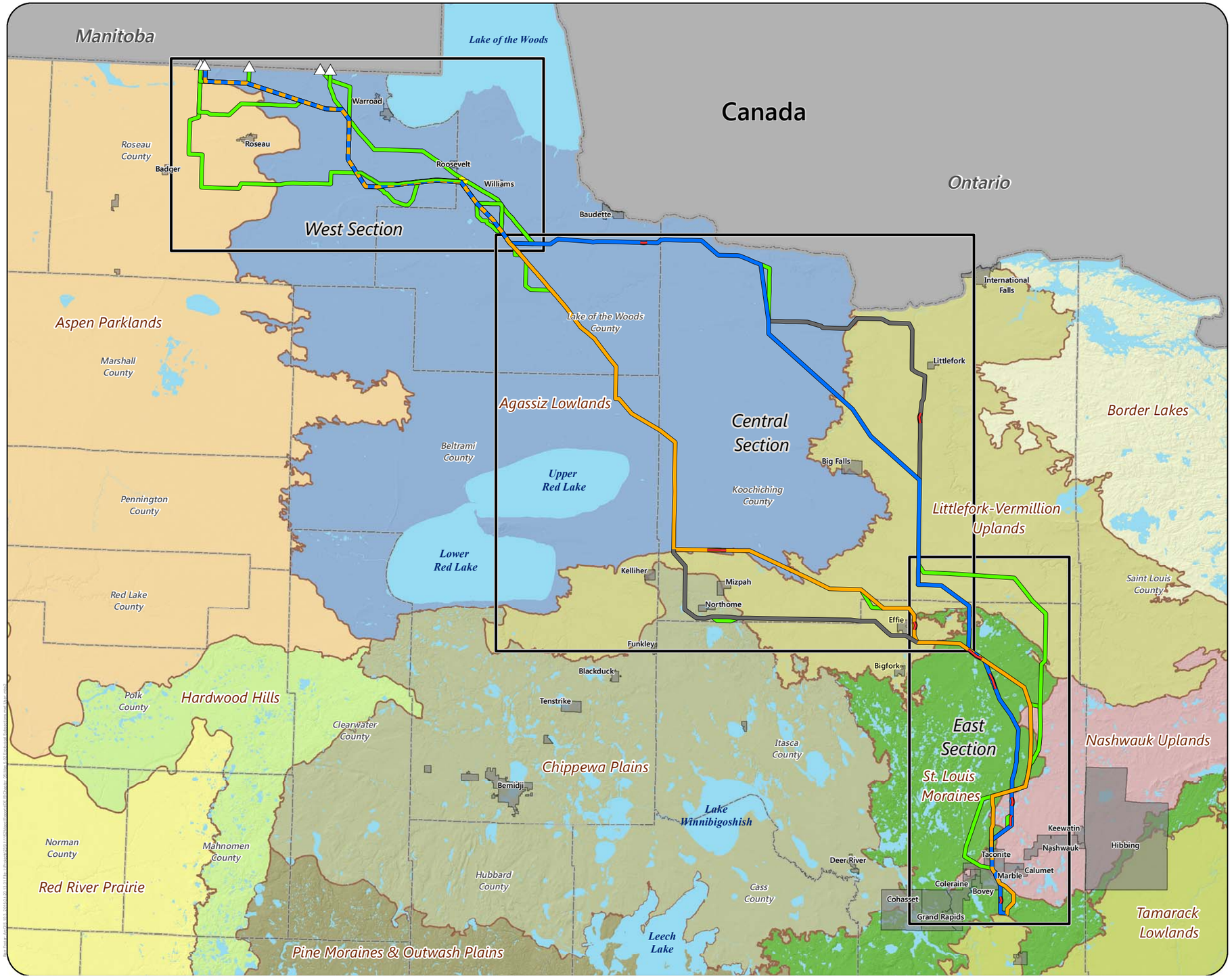
Alternatives
- Route Variation
- Route Variation Hop
- Alignment Modification
- Project Section
- Municipal Boundary
- County Boundary
- International Boundary

Peatland Ecological Land Type Associations
- Beltrami-Pine Island Peatlands
- Koochiching Peatlands
- Lude Beaches & Peatlands
- Myrtle Lake Peatlands
- Pine Island Peatlands
- Red Lake Peatlands
- Ross Peatlands
- Thief Lake Peatlands

Miles
14 7 0 14

Map 5-1

PEATLANDS OVERVIEW
Great Northern Transmission Line
Final Environmental Impact Statement



- Border Crossing Point

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

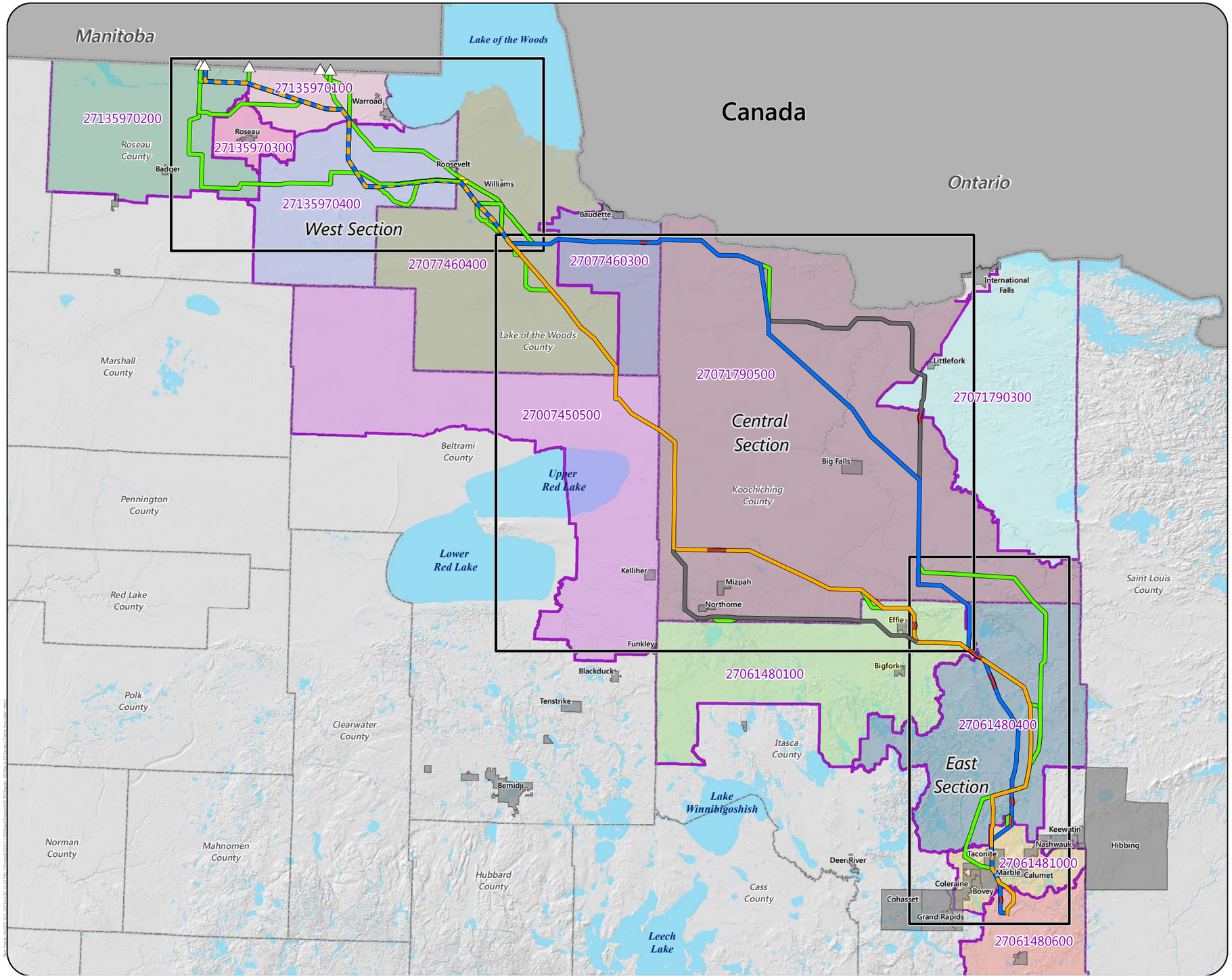
Alternatives
- Route Variation
- Route Variation Hop
- Alignment Modification
- Project Section
- Municipal Boundary
- County Boundary
- International Boundary

Ecological Subsections
- Agassiz Lowlands
- Aspen Parklands
- Border Lakes
- Chippewa Plains
- Hardwood Hills
- Littlefork-Vermillion Uplands
- Nashwauk Uplands
- Pine Moraines & Outwash Plains
- Red River Prairie
- St. Louis Moraines
- Tamarack Lowlands

Miles
14 7 0 14

Map 5-2

ECOLOGICAL SUBSECTIONS
Great Northern Transmission Line
Final Environmental Impact Statement



- Border Crossing Point

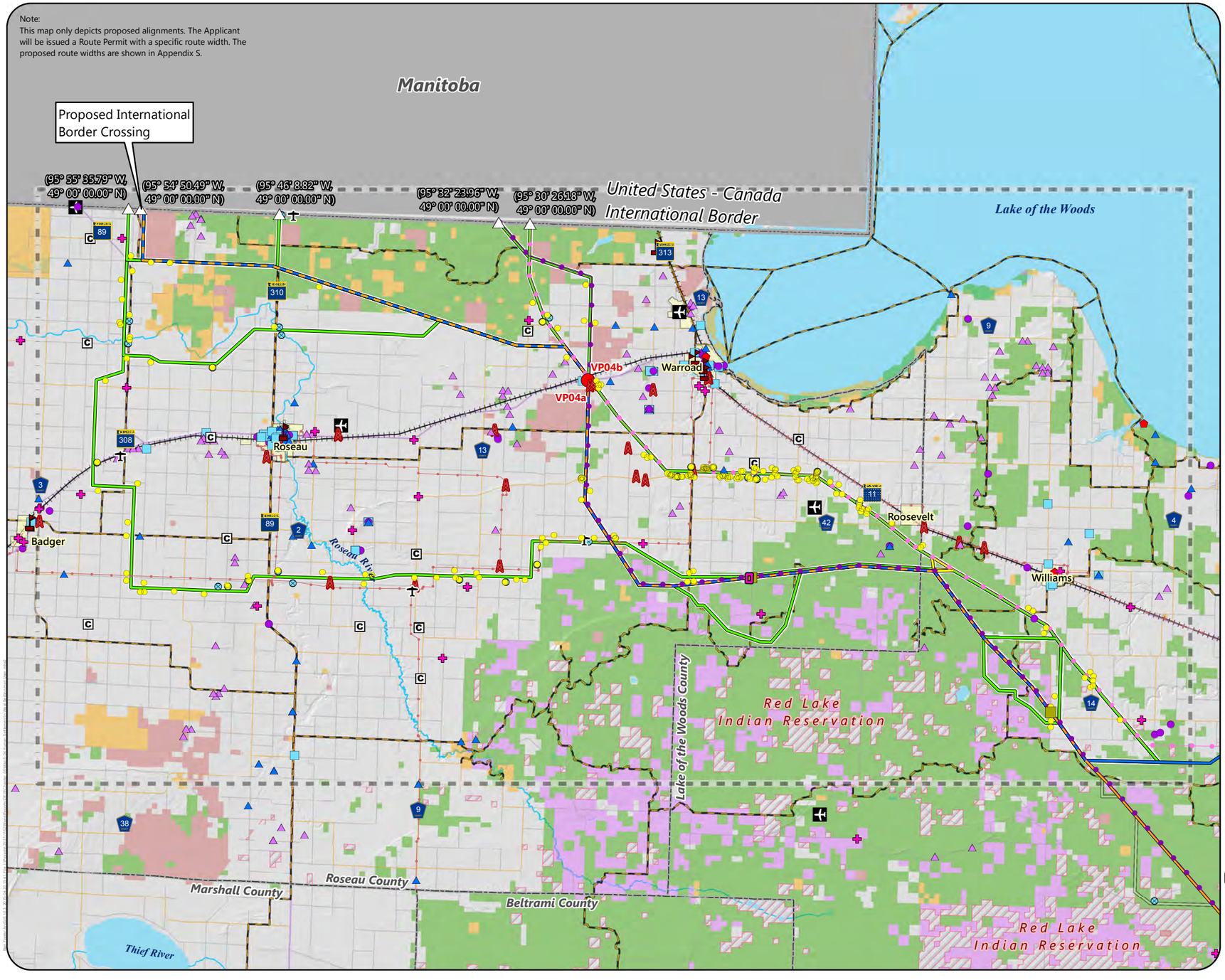
Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Route Variation Hop
- Alignment Modification
- Project Section
- Municipal Boundary
- Census Tract
- County Boundary
- International Boundary

Miles
14 7 0 14

Map 5-3

CENSUS TRACTS
Great Northern Transmission Line
Final Environmental Impact Statement



- Border Crossing Point
- Proposed Regeneration Site
- Visual Simulation Viewpoint

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives
- Route Variation
- Route Variation Hop
- Proposed Series Compensation Station

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Residences Within 1500 Feet of Anticipated Alignment
- Church
- Cemetery
- Airport
- Airstrip
- Aggregate Source Location
- Communication Tower
- County Well Index Within 1,500 Feet of Anticipated Alignment

MPCA Database
- Hazardous Waste
- Investigation and Cleanup
- Tanks and Leaks
- Multiple Activities
- Snowmobile Trail
- Railroad
- Indian Reservation Land

State Fee Lands by Type
- Consolidated Conservation
- Federal - State Lease
- Other - Aquired, Tax Forfeit, Volstead
- Trust Fund
- Project Section

Miles
4.5 0 4.5

Map 5-4

HUMAN SETTLEMENT IN WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement

Note:
This map only depicts proposed alignments. The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Manitoba

Proposed International Border Crossing

(95° 55' 35.79" W, 49° 00' 00.00" N)
(95° 54' 50.49" W, 49° 00' 00.00" N)
(95° 46' 8.82" W, 49° 00' 00.00" N)
(95° 32' 23.96" W, 49° 00' 00.00" N)
(95° 30' 26.18" W, 49° 00' 00.00" N)

United States - Canada International Border

Lake of the Woods

Lost River State Forest

Warroad

Waters of the Dancing Sky

Roseau

Zippel Bay State Park

Lake of the Woods State Forest

Roosevelt

Williams

Badger

Roseau River

Hayes Lake State Park

Beltrami Island State Forest

Lake of the Woods County

Marshall County

Roseau County

Beltrami County

Thief River

- Border Crossing Point
- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives
- Route Variation
- Route Variation Hop
- Proposed Series Compensation Station

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Mineral Exploration/Engineering Drillhole
- State Forest Campground
- Scenic Byway
- Snowmobile Trail
- State Park
- State Forest Boundary
- USFWS Interest Lands
- NAWCA* Federal Aid Parcels
- State Fee Lands

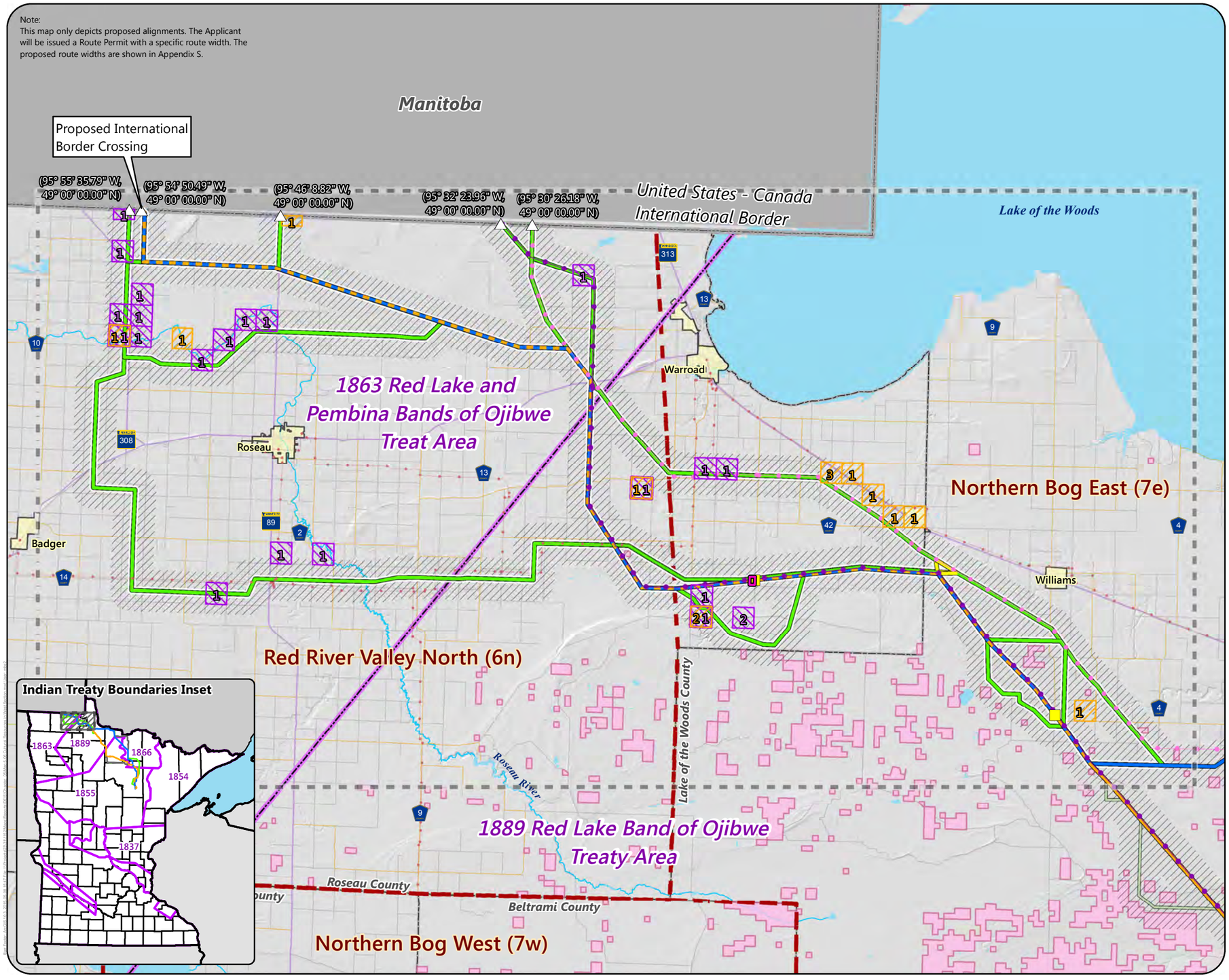
Land Use/Land Cover
- Developed or Disturbed Land
- Forested and/or Swamp Land
- Great Plains Grassland & Shrubland
- Agricultural Land
- Introduced & Semi Natural Vegetation
- Mineral Lease Location
- Project Section

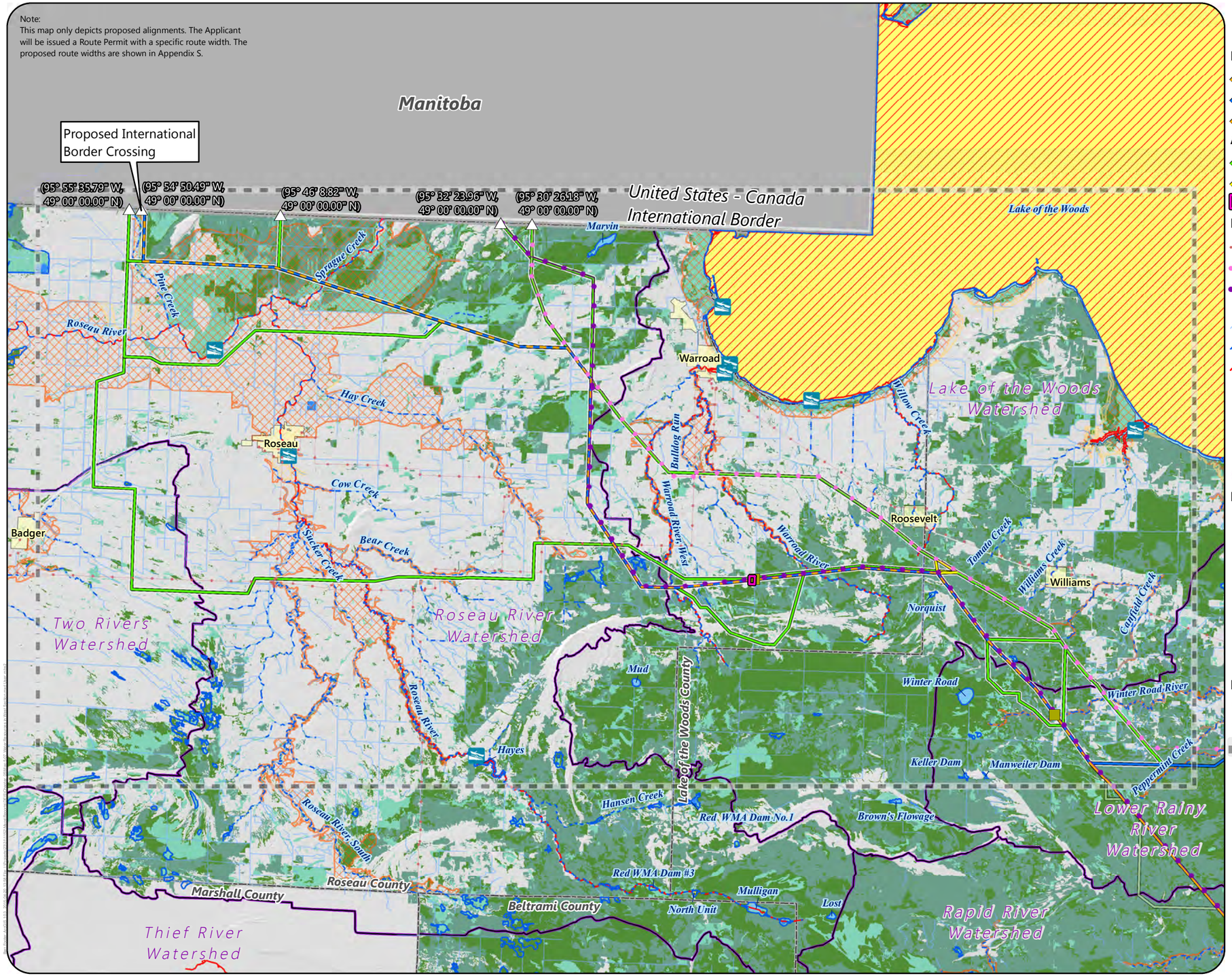
* North American Wetland Conservation Act

Miles
4.5 0 4.5

Map 5-5

LAND USE IN WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement


Note:
This map only depicts proposed alignments. The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.
Manitoba
Proposed International Border Crossing
(95° 55' 35.79" W, 49° 00' 00.00" N)
(95° 54' 50.49" W, 49° 00' 00.00" N)
(95° 46' 8.82" W, 49° 00' 00.00" N)
(95° 32' 23.96" W, 49° 00' 00.00" N)
(95° 30' 26.18" W, 49° 00' 00.00" N)
United States - Canada International Border
Lake of the Woods
1863 Red Lake and Pembina Bands of Ojibwe Treat Area
Roseau
Warroad
Badger
Williams
Northern Bog East (7e)
Red River Valley North (6n)
1889 Red Lake Band of Ojibwe Treaty Area
Roseau River
Lake of the Woods County
Roseau County
Beltrami County
Northern Bog West (7w)
Indian Treaty Boundaries Inset
1863
1889
1866
1854
1855
1837
Border Crossing Point
Proposed Regeneration Site
Proposed Routes
Blue/Orange Route
Blue Route
Orange Route
Alternatives
Route Variation
Route Variation Hop
Proposed Series Compensation Station
Existing Transmission Lines
69 or 115 kV
230 kV
500 kV
Cultural Resources Search Area
Section Containing Cultural Resource*
Historic Architectural Sites
Archaeological Sites
Historic Architectural and Archaeological Sites
Archaeological Resource Area
Approximate Indian Treaty Boundaries
Indian Reservation Land
County Boundary
Project Section
*Note: Labeled with number of records found by inventory type.
Miles
4.5
0
4.5
Map 5-6
CULTURAL RESOURCES IN WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement
U.S. DEPARTMENT OF ENERGY
MINNESOTA DEPARTMENT OF COMMERCE



Map 5-7

WATER RESOURCES IN WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement

Note:
This map only depicts proposed alignments. The Applicant will be issued a Route Permit with a specific route width. The proposed route widths are shown in Appendix S.

Manitoba

Proposed International Border Crossing

(95° 55' 35.79" W, 49° 00' 00.00" N)
(95° 54' 50.49" W, 49° 00' 00.00" N)
(95° 46' 8.82" W, 49° 00' 00.00" N)
(95° 32' 23.96" W, 49° 00' 00.00" N)
(95° 30' 26.18" W, 49° 00' 00.00" N)

United States - Canada International Border

Lake of the Woods IBA
Lake of the Woods
Piping Plover Critical Habitat
Roseau River WMA
Great Grey Owl Reserve
Marvin Lake
Marvin Lake Waterfowl Refuge
Border WMA
Roseau Lake WMA
R.C. #3 WMA
Rosver WMA
Warroad
Enstrom WMA
Roseau
Cedar Bend WMA
East Branch WMA
Badger
Roosevelt
Clear River WMA
Tomato Creek
Graceton WMA
Williams
Unnamed Shallow Lakes
Bemis Hill Creek
Bear Creek WMA
Unnamed Shallow Lakes
Mud Lake
Lake of the Woods County
Winter Road Lake
Unnamed Shallow Lake
Hayes WMA
Wannaska WMA
Brown's Flowage
Big Bog IBA
Thief Lake IBA
Roseau County
Marshall County
Beltrami County
Red Lake WMA
Thief Lake WMA
Wapiti WMA
Gray Wolf Critical Habitat

- Border Crossing Point
- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives
- Route Variation
- Route Variation Hop
- Proposed Series Compensation Station

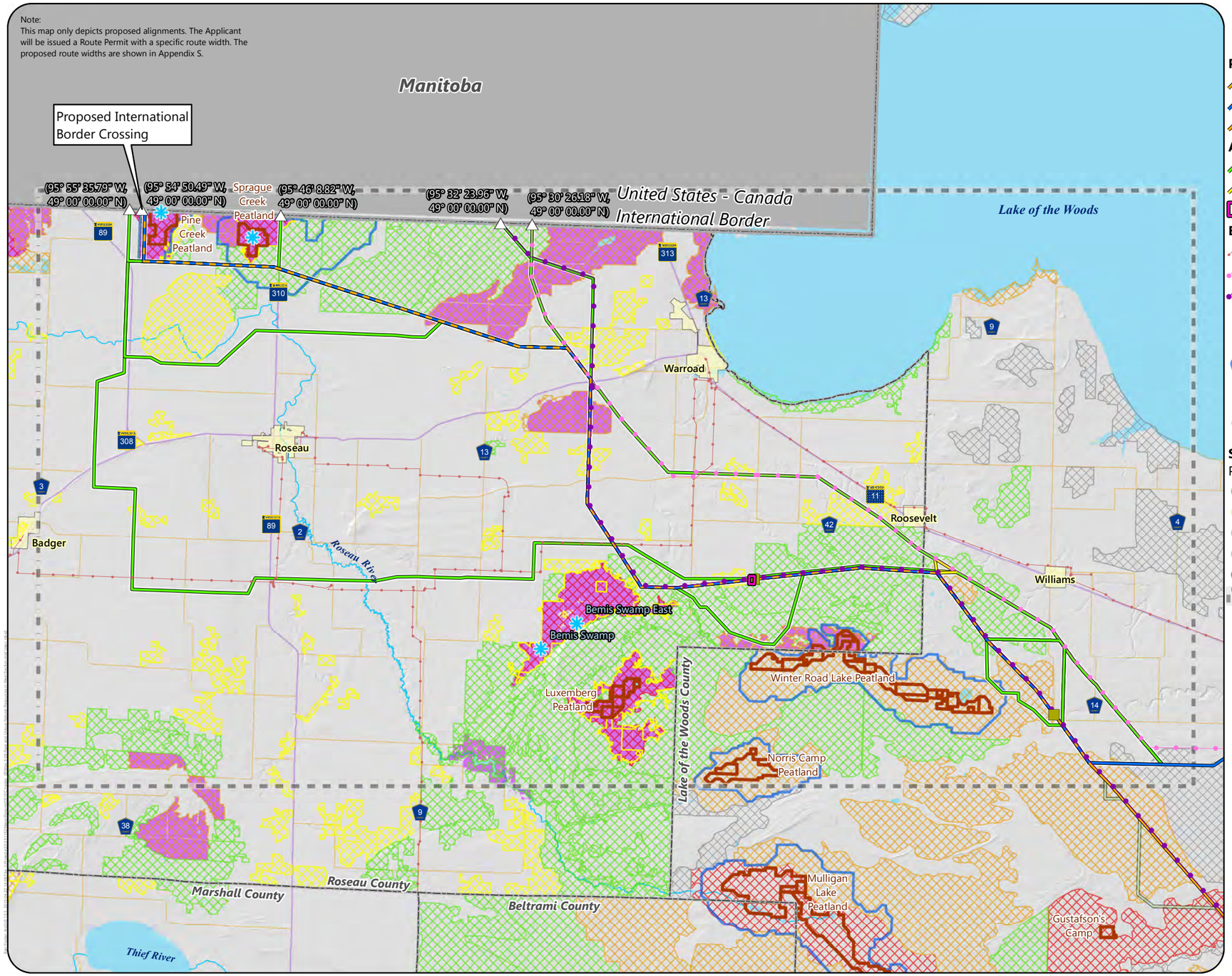
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Trout Stream
- Shallow Lake
- Great Grey Owl Reserve
- State Game Refuge
- Wildlife Management Area (WMA)
- Audubon Society Important Bird Areas
- Grassland Bird Conservation Core Areas

Critical Habitat Extents
- Gray Wolf Critical Habitat
- Piping Plover Critical Habitat
- Project Section

Miles
4.5 0 4.5

Map 5-8

WILDLIFE RESOURCES IN WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



- Border Crossing Point
- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives
- Route Variation
- Route Variation Hop
- Proposed Series Compensation Station

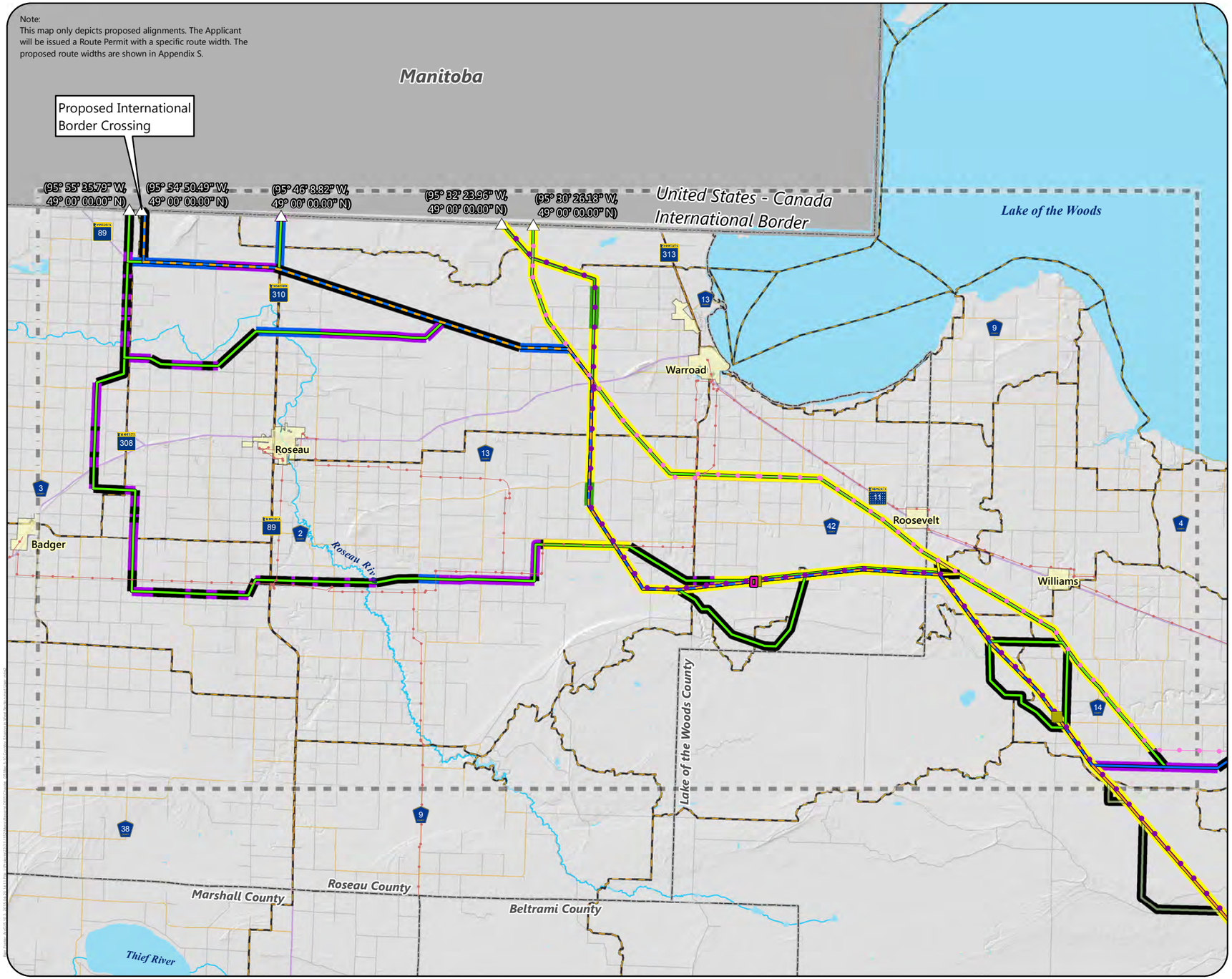
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Approximate Calcareous Fen Location
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- High Conservation Value Forest
- Native Plant Community (Data only available for Roseau County)

Site of Biodiversity Significance (Ranks Preliminary Except for Roseau County)
- Rank Unknown
- Below Minimum Significance
- Moderate Significance
- High Significance
- Outstanding Significance
- Project Section

Miles
4.5 0 4.5

Map 5-9

RARE AND UNIQUE NATURAL RESOURCES IN WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



- Border Crossing Point
- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives
- Route Variation
- Route Variation Hop
- Proposed Series Compensation Station

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Snowmobile Trail

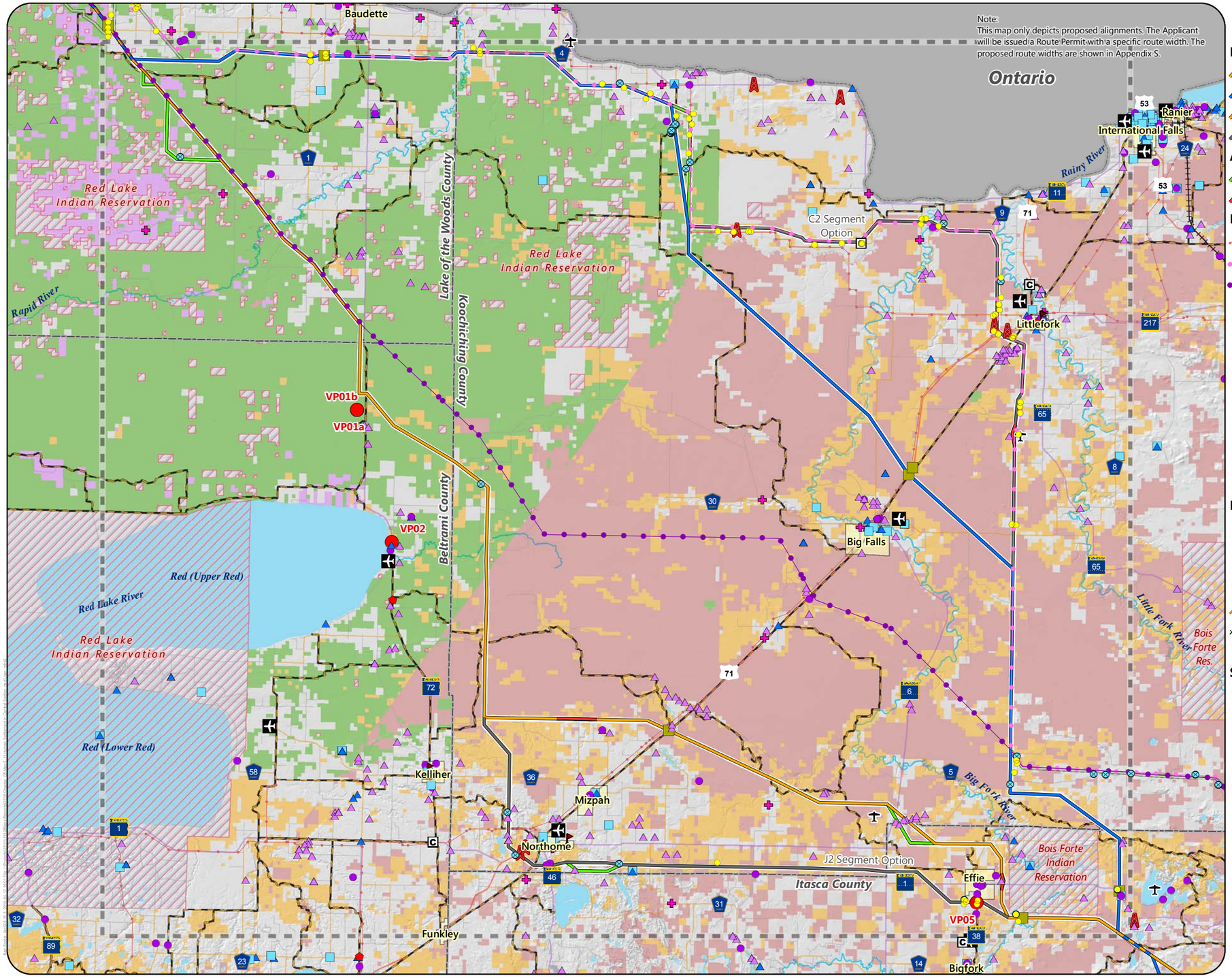
Corridor Sharing by Category*
- Existing Transmission Line
- Road
- Existing Transmission Line & Road
- Field Line, Section Line, or Trail
- None
- Project Section

*Note: Not all corridor sharing combinations shown

Miles
4.5 0 4.5

Map 5-10

CORRIDOR SHARING IN WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site
- Visual Simulation Viewpoint

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Residences Within 1,500 Feet of Anticipated Alignment
- Church
- Cemetery
- Airstrip
- Airport
- Aggregate Source Location
- Communication Tower
- County Well Index Within 1,500 Feet of Anticipated Alignment

MPCA Database
- Hazardous Waste
- Investigation and Cleanup
- Tanks and Leaks
- Multiple Activities
- Snowmobile Trail
- Railroad
- Indian Reservation Land

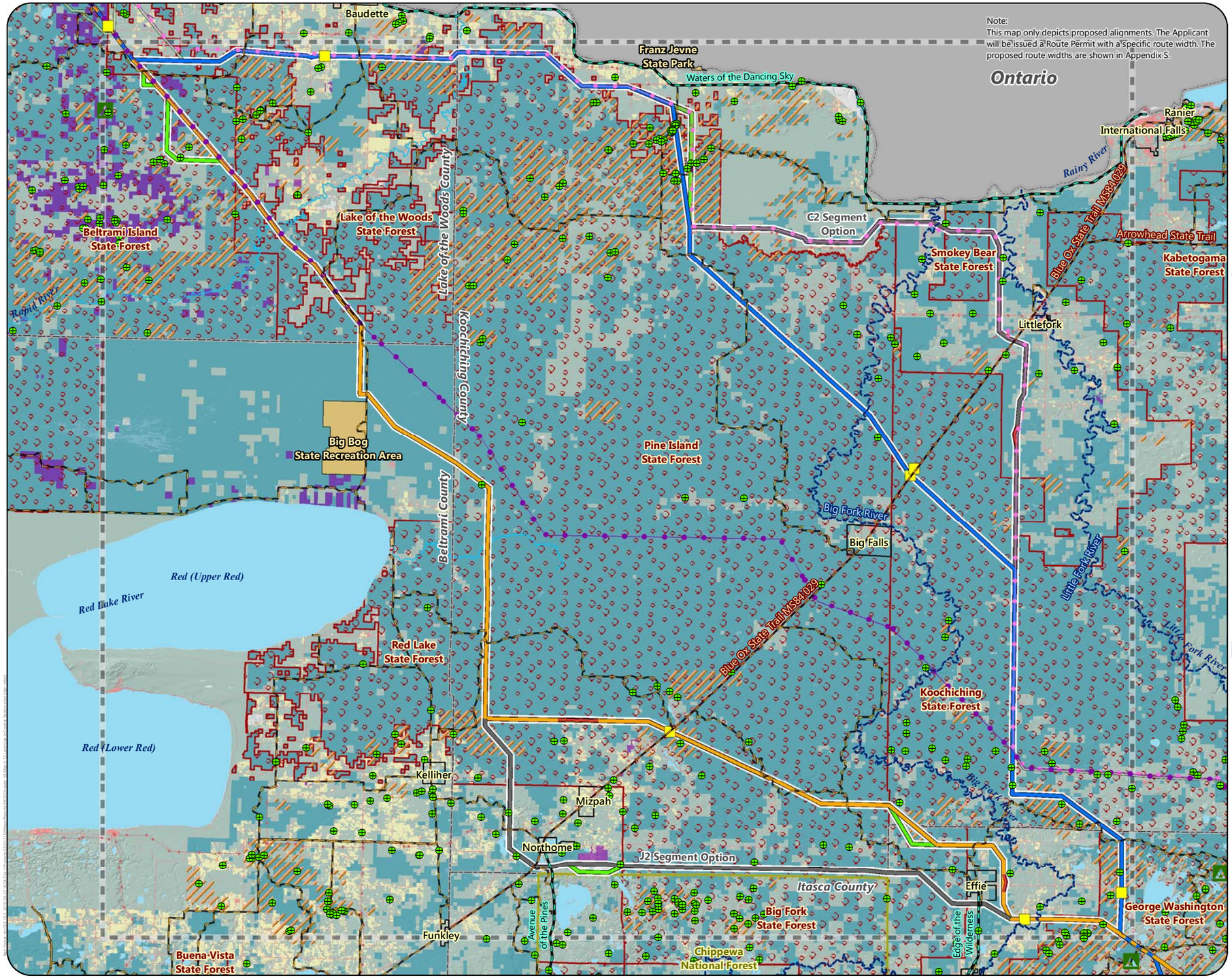
State Fee Lands by Type
- Consolidated Conservation
- Federal - State Lease
- Other - Aquired, Tax Forfeit, Volstead
- Trust Fund

Miles
6.5 0 6.5

Map 5-11

HUMAN SETTLEMENT IN CENTRAL SECTION

Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

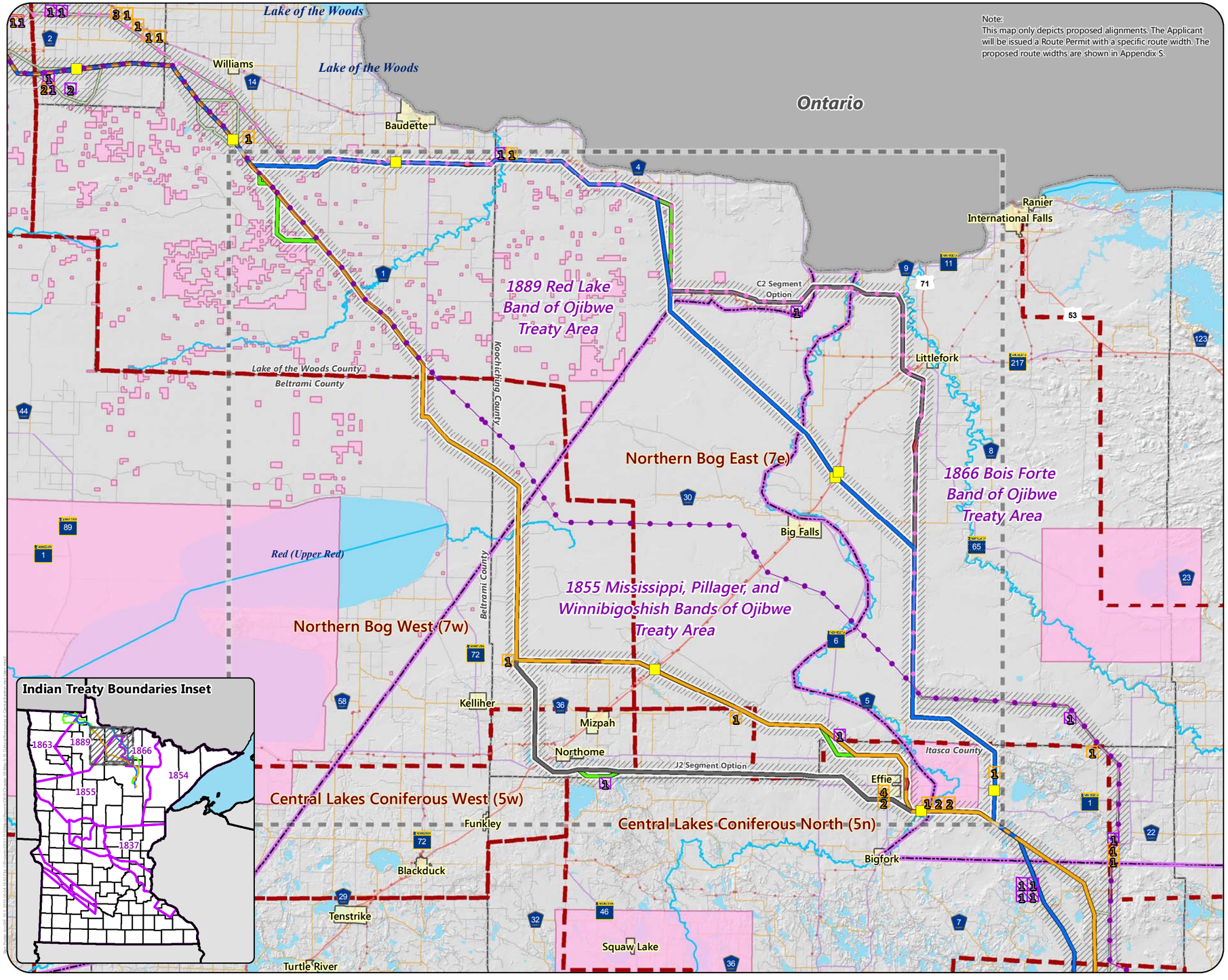
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Mineral Exploration/Engineering Drillhole
- State Forest Campground
- Scenic Byway
- Snowmobile Trail
- State Trail
- State Water Trail Selection
- State Park
- State Forest Boundary
- National Forest Boundary
- USFWS Interest Lands
- State Fee Lands

Land Use/Land Cover
- Developed or Disturbed Land
- Forested and/or Swamp Land
- Agricultural Land
- Introduced & Semi Natural Vegetation
- Mineral Lease Location
- Project Section

Miles
6.5 0 6.5

Map 5-12

LAND USE IN CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Cultural Resources Search Area

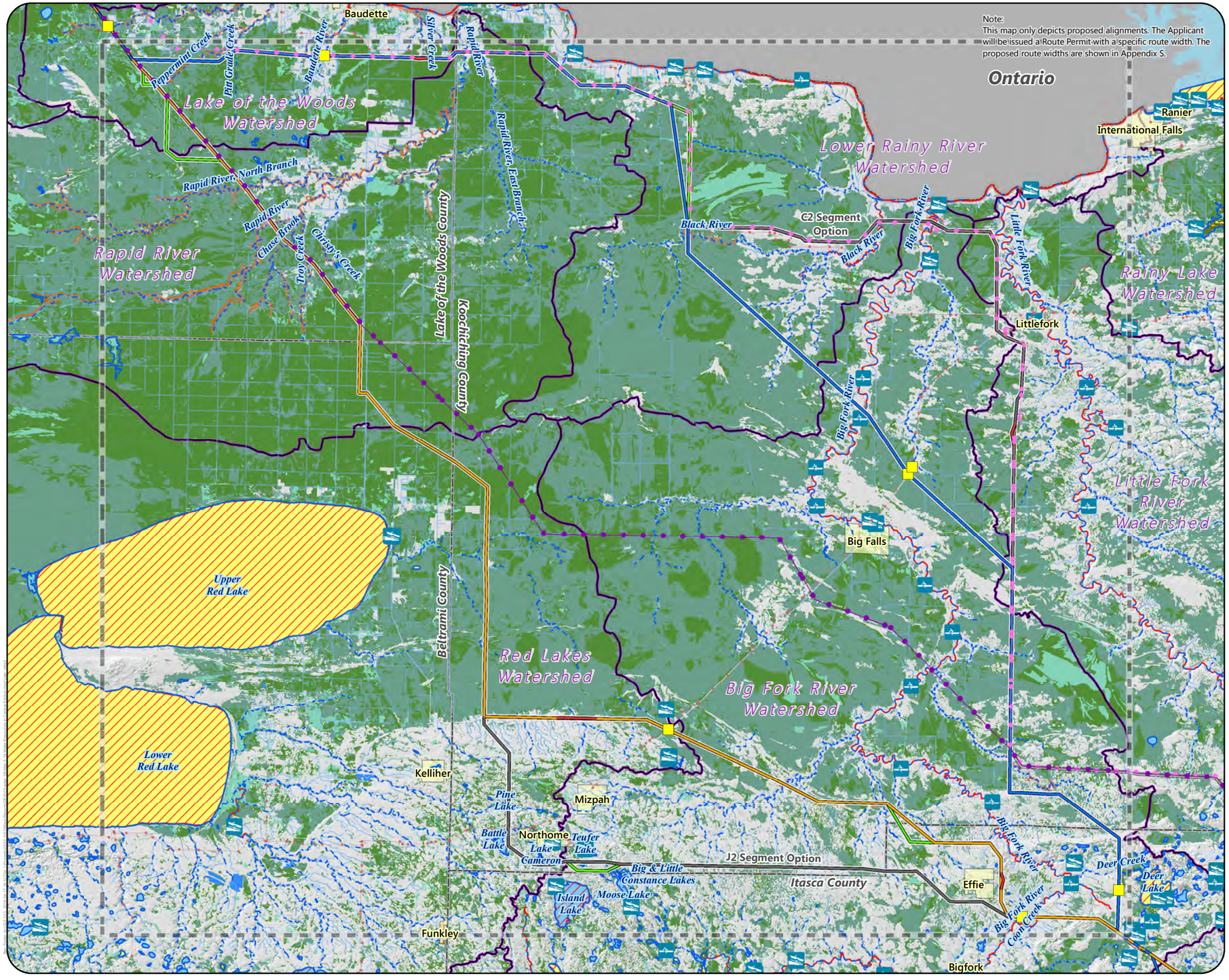
Section Containing Cultural Resource*
- Historic Architectural Sites
- Archaeological Sites
- Historic Architectural and Archaeological Sites
- Archaeological Resource Area
- Approximate Indian Treaty Boundaries
- Indian Reservation Land
- County Boundary
- Project Section

*Note: Labeled with number of records found by inventory type.

Miles
6.5 0 6.5

Map 5-13

CULTURAL RESOURCES IN CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Carry-In Water Access
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Wild Rice Lake
- Watershed Boundary (HUC-8)

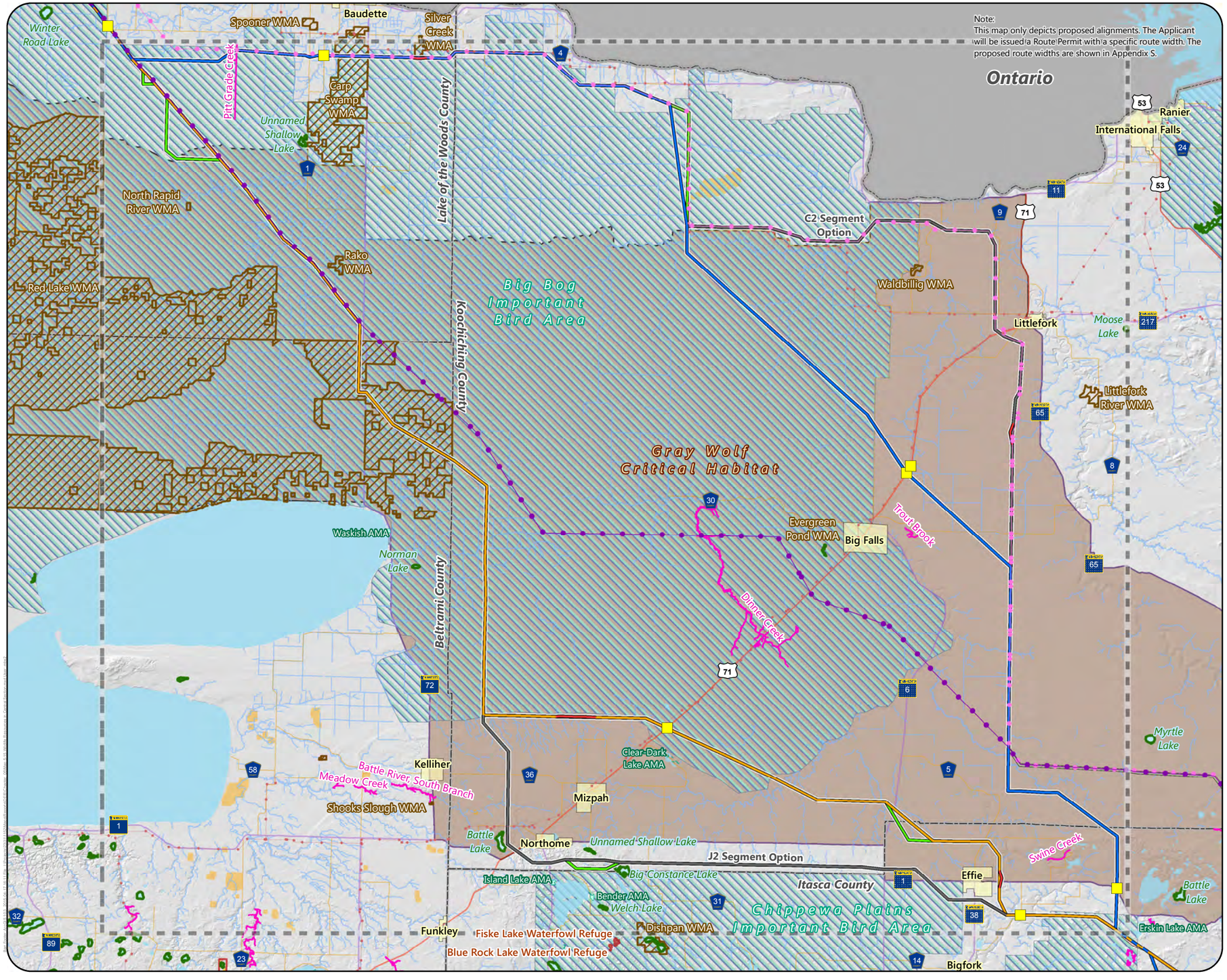
FEMA Floodplain Data
- 100-Year Floodplain

National Wetland Inventory
- PAB, Freshwater Pond
- PUB, Freshwater Pond & Other
- PUS, Other
- PEM, Freshwater Emergent Wetland
- PFO, Freshwater Forested/Shrub Wetland
- PSS, Freshwater Forested/Shrub Wetland
- Lake
- Riverine

Miles
6.5 0 6.5

Map 5-14

WATER RESOURCES IN CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

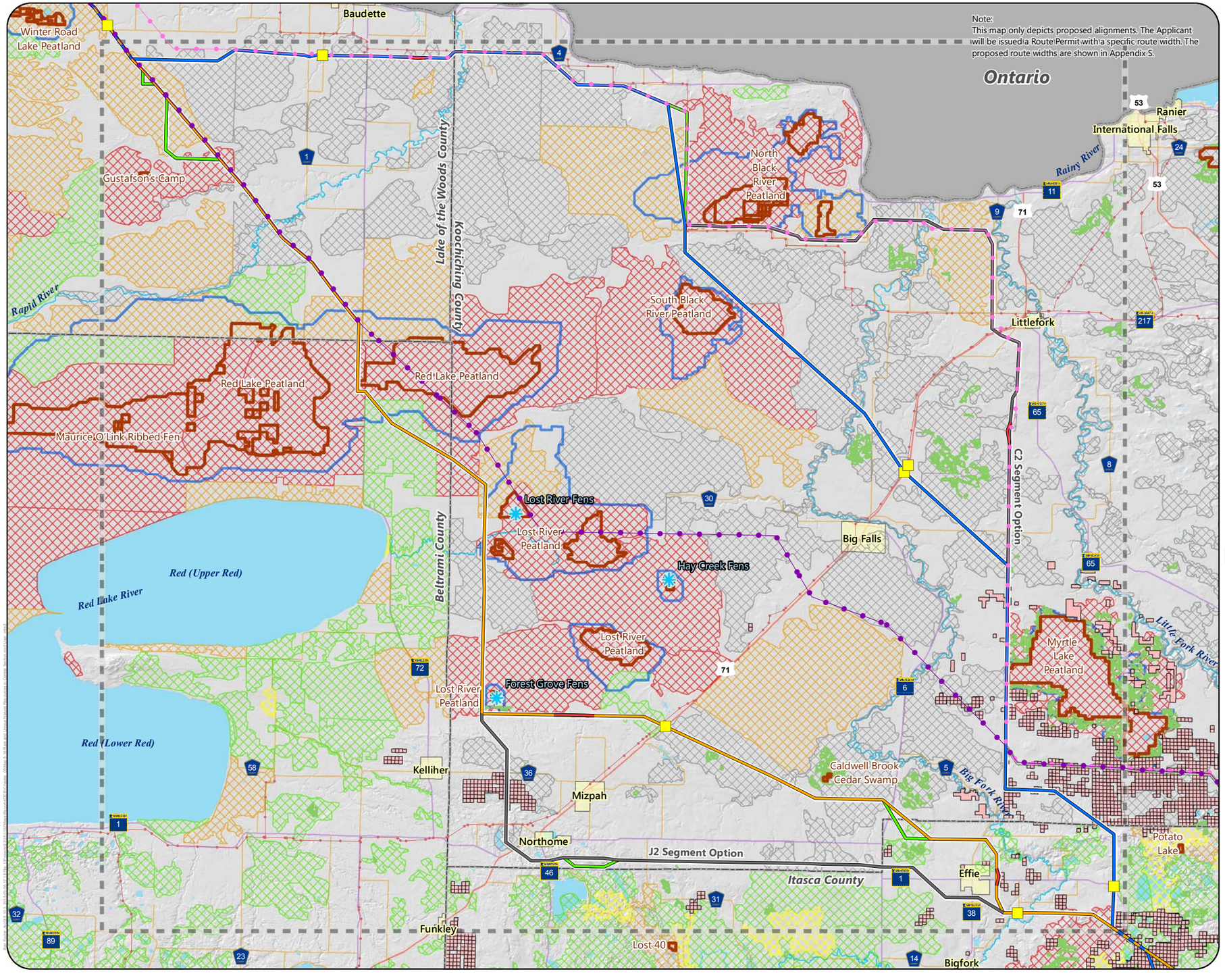
- Trout Stream
- Trout Lake
- Shallow Lake
- Aquatic Management Area (AMA)
- State Game Refuge
- Wildlife Management Area (WMA)
- Audubon Society Important Bird Areas
- Grassland Bird Conservation Core Areas

Critical Habitat Extents
- Gray Wolf Critical Habitat
- Project Section

Miles
6.5 0 6.5

Map 5-15

WILDLIFE RESOURCES IN CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

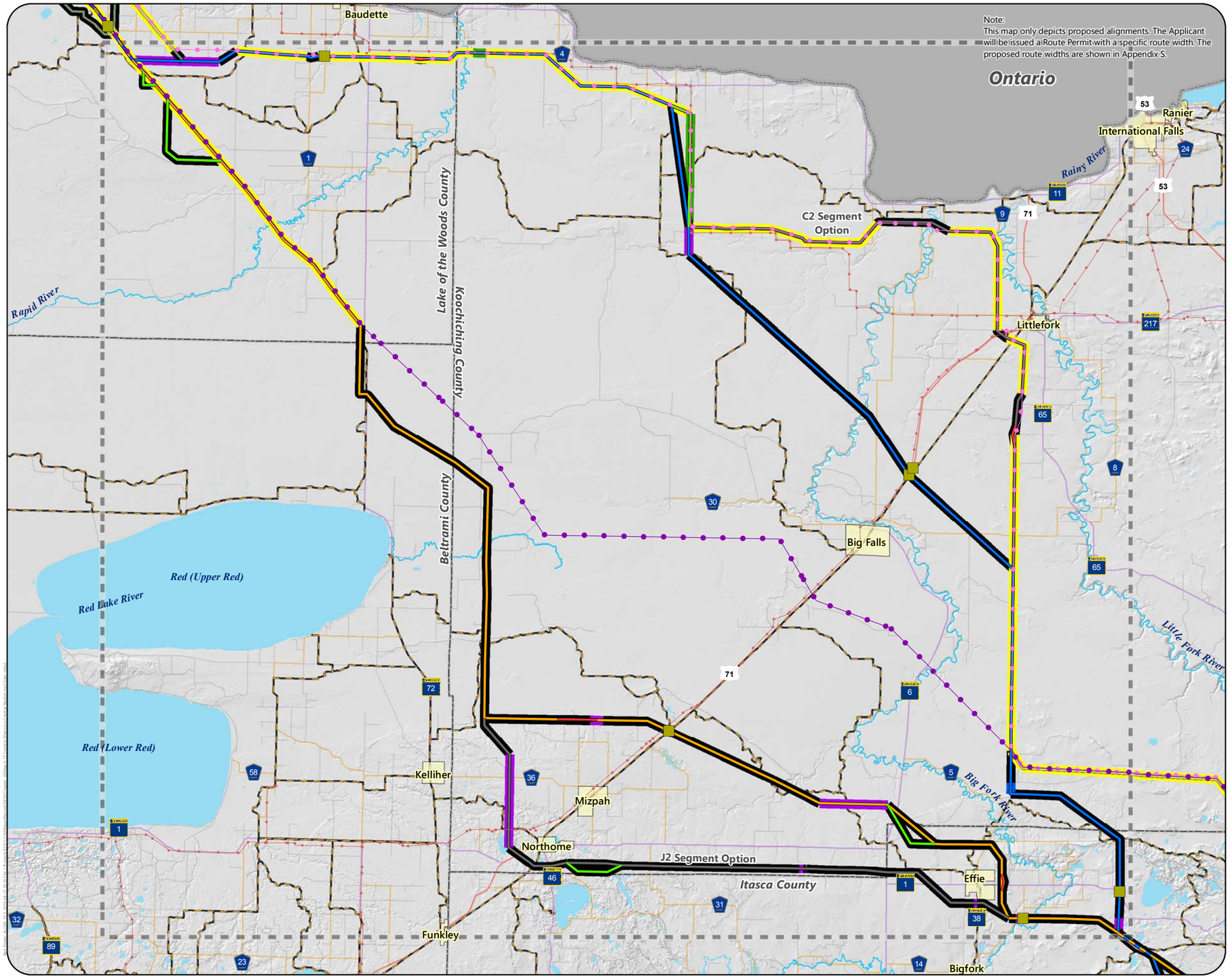
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Approximate Calcareous Fen Location
- Ecologically Important Lowland Conifers
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- State Conservation Easement

Site of Biodiversity Significance (All Ranks Preliminary)
- Rank Unknown
- Below Minimum Significance
- Moderate Significance
- High Significance
- Outstanding Significance
- Project Section

Miles
6.5 0 6.5

Map 5-16

RAREANDUNIQUENATURALRESOURCESINCENTRALSECTION
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Proposed Routes
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Snowmobile Trail

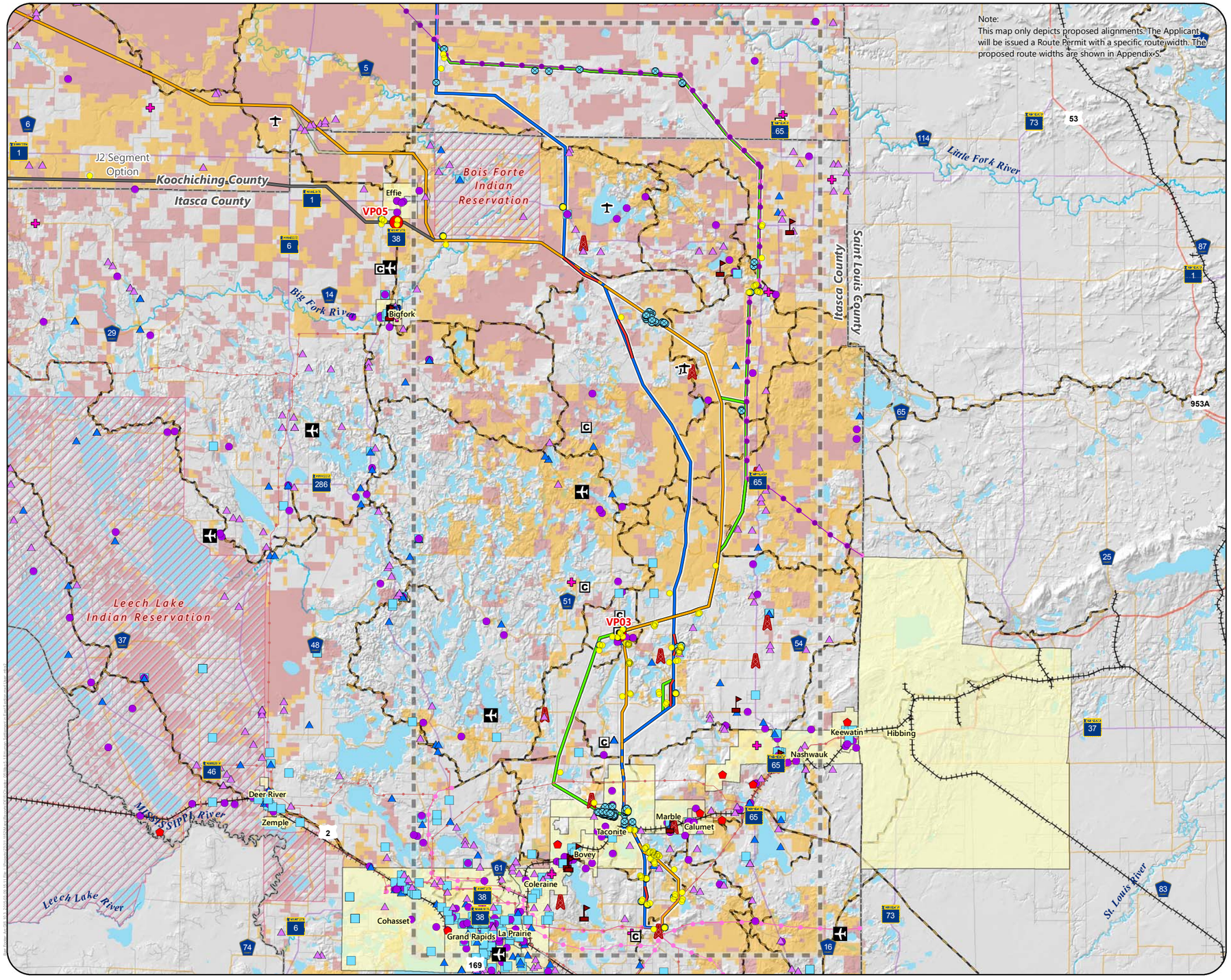
Corridor Sharing by Category*
- Existing Transmission Line
- Road
- Existing Transmission Line & Road
- Field Line, Section Line, or Trail
- None
- Project Section

*Note: Not all corridor sharing combinations shown

Miles
6.5 0 6.5

Map 5-17

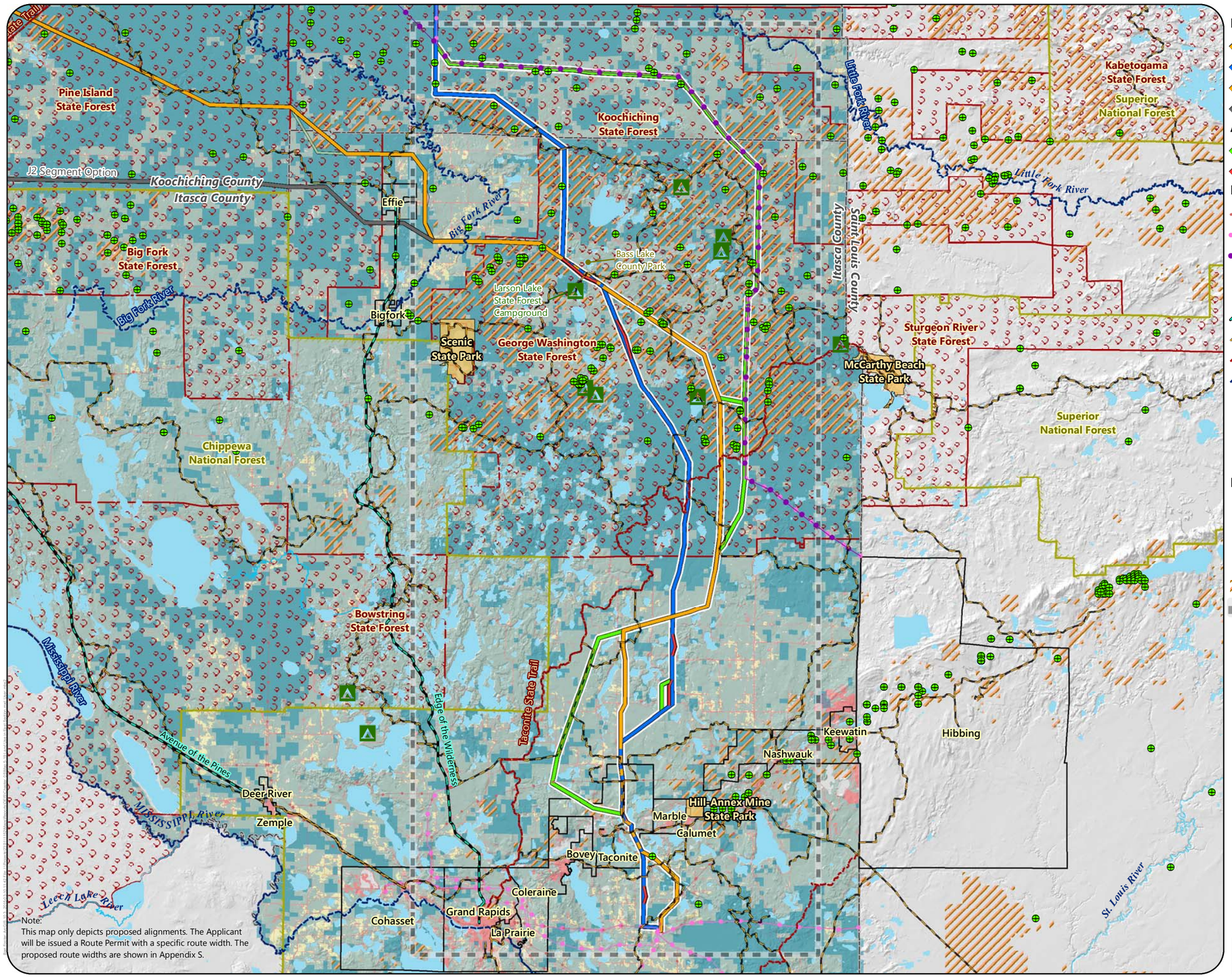
CORRIDOR SHARING IN CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Map 5-18

HUMAN SETTLEMENT IN EAST SECTION

Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

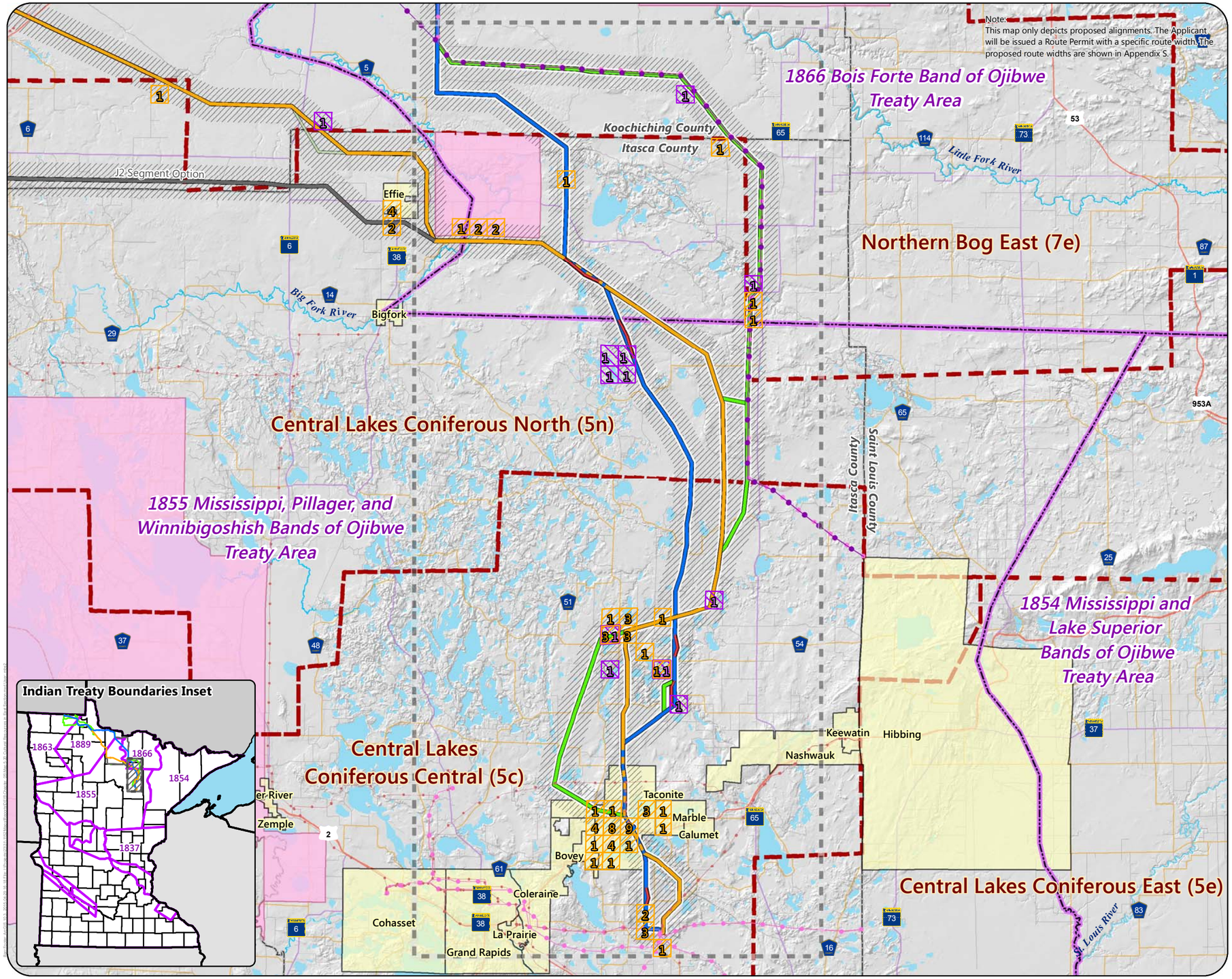
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Mineral Exploration/Engineering Drillhole
- State Forest Campground
- Scenic Byway
- Snowmobile Trail
- State Trail
- State Water Trail Selection
- State Park
- State Forest Boundary
- National Forest Boundary
- State Fee Lands

Land Use/Land Cover
- Developed or Disturbed Land
- Forested and/or Swamp Land
- Agricultural Land
- Introduced & Semi Natural Vegetation
- Mineral Lease Location
- Project Section

Miles
5.5 0 5.5

Map 5-19

LAND USE IN EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Cultural Resources Search Area

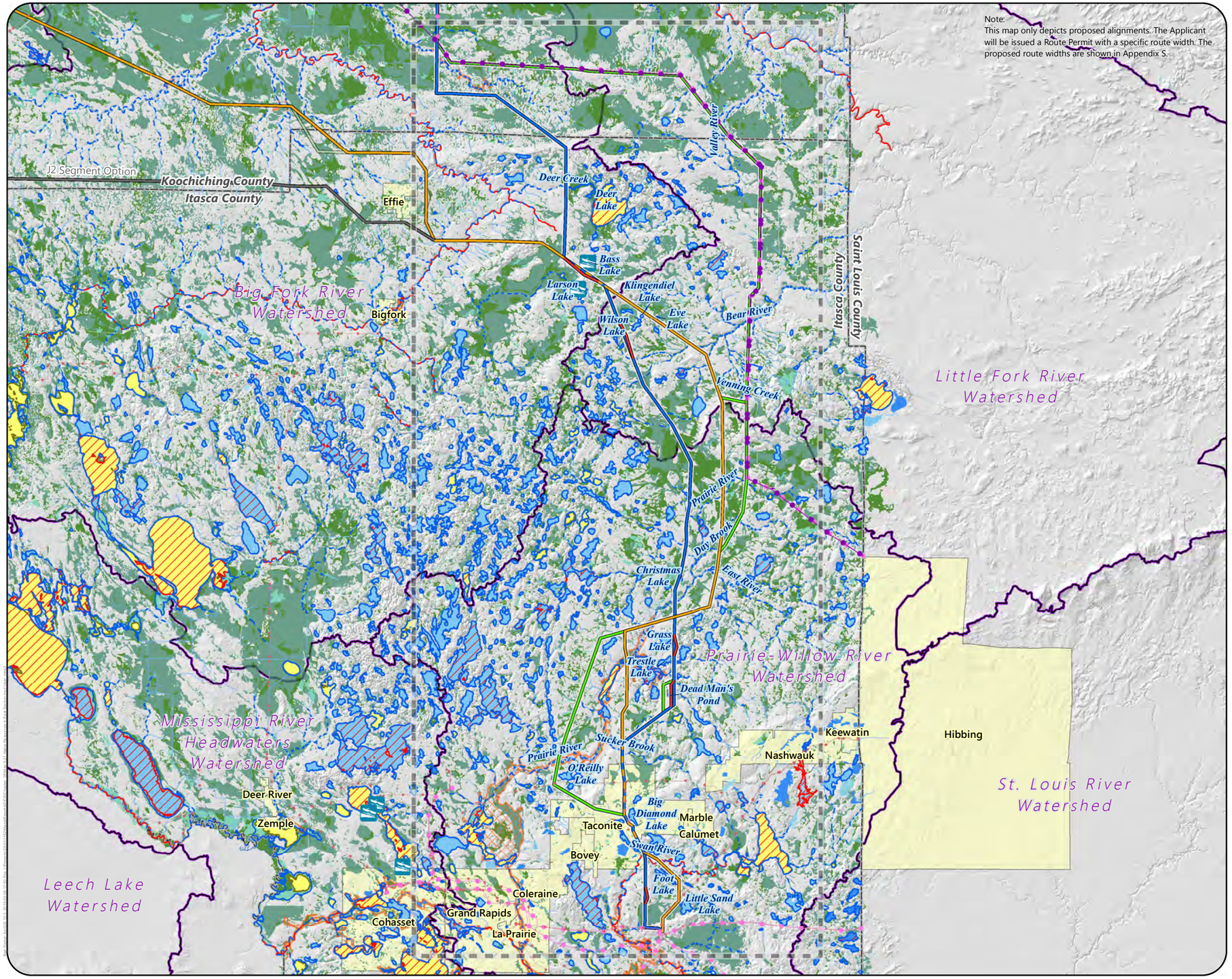
Section Containing Cultural Resource*
- Historic Architectural Sites
- Archaeological Sites
- Historic Architectural and Archaeological Sites
- Archaeological Resource Area
- Approximate Indian Treaty Boundaries
- Indian Reservation Land
- County Boundary
- Project Section

*Note: Labeled with number of records found by inventory type.

Miles
5.5 0 5.5

Map 5-20

CULTURAL RESOURCES IN EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Wild Rice Lake
- Watershed Boundary (HUC-8)

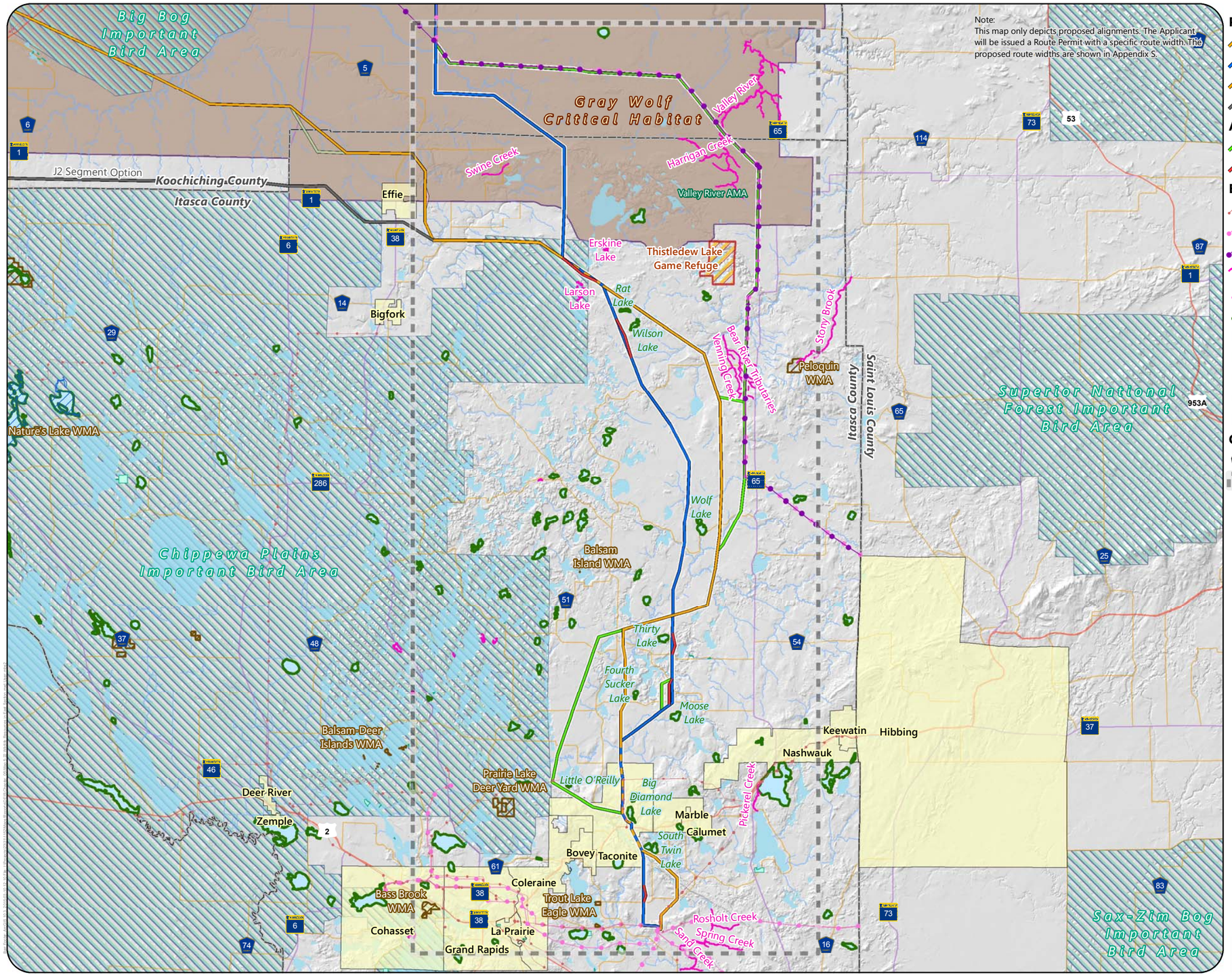
National Wetland Inventory
- PAB, Freshwater Pond
- PUB, Freshwater Pond & Other
- PEM, Freshwater Emergent Wetland
- PFO, Freshwater Forested/Shrub Wetland
- PSS, Freshwater Forested/Shrub Wetland
- Lake
- Riverine

FEMA Floodplain Data
- 100-Year Floodplain
- 500-Year Floodplain
- Project Section

Miles
5.5 0 5.5

Map 5-21

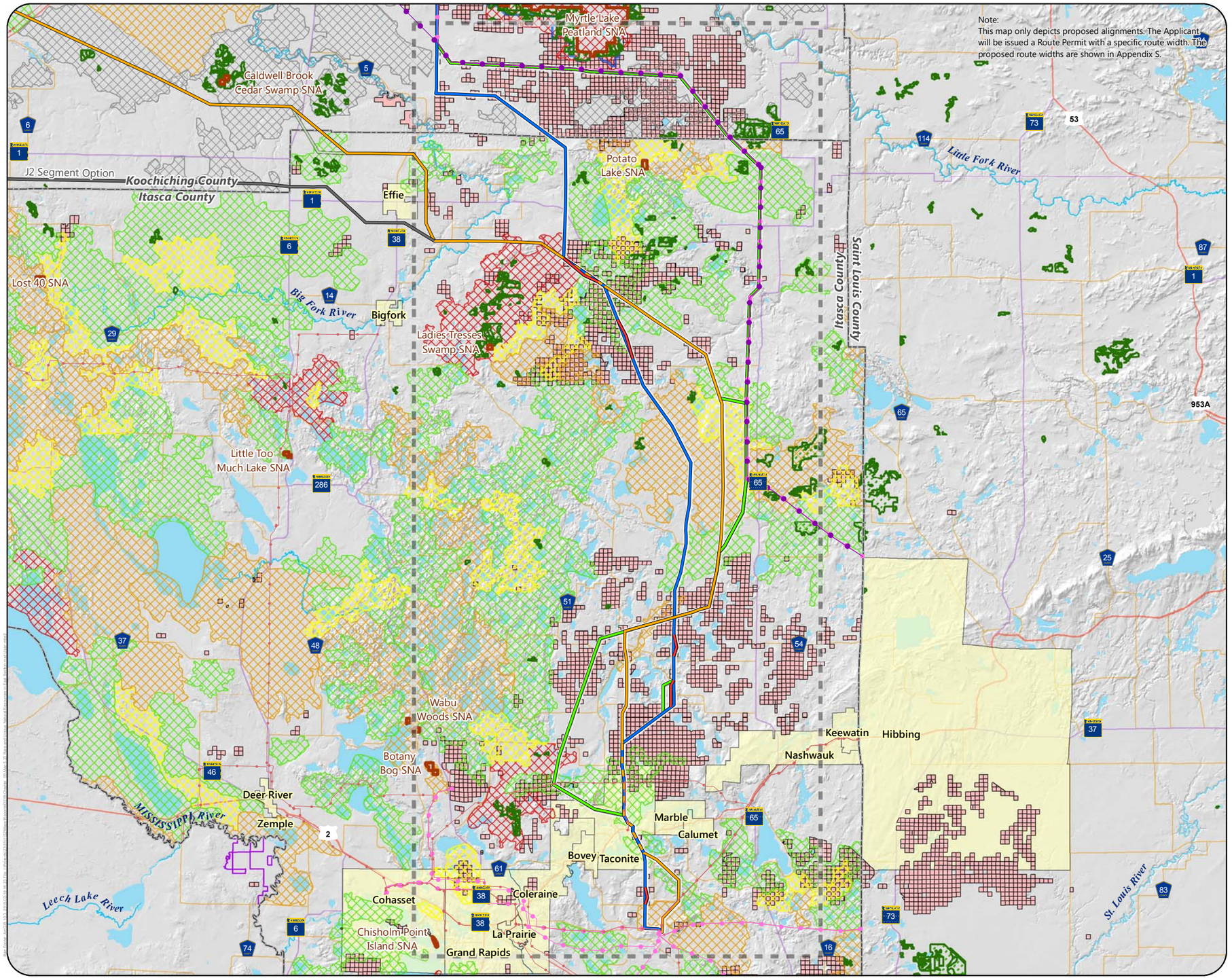
WATER RESOURCES IN EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Map 5-22

WILDLIFE RESOURCES IN EAST SECTION

Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

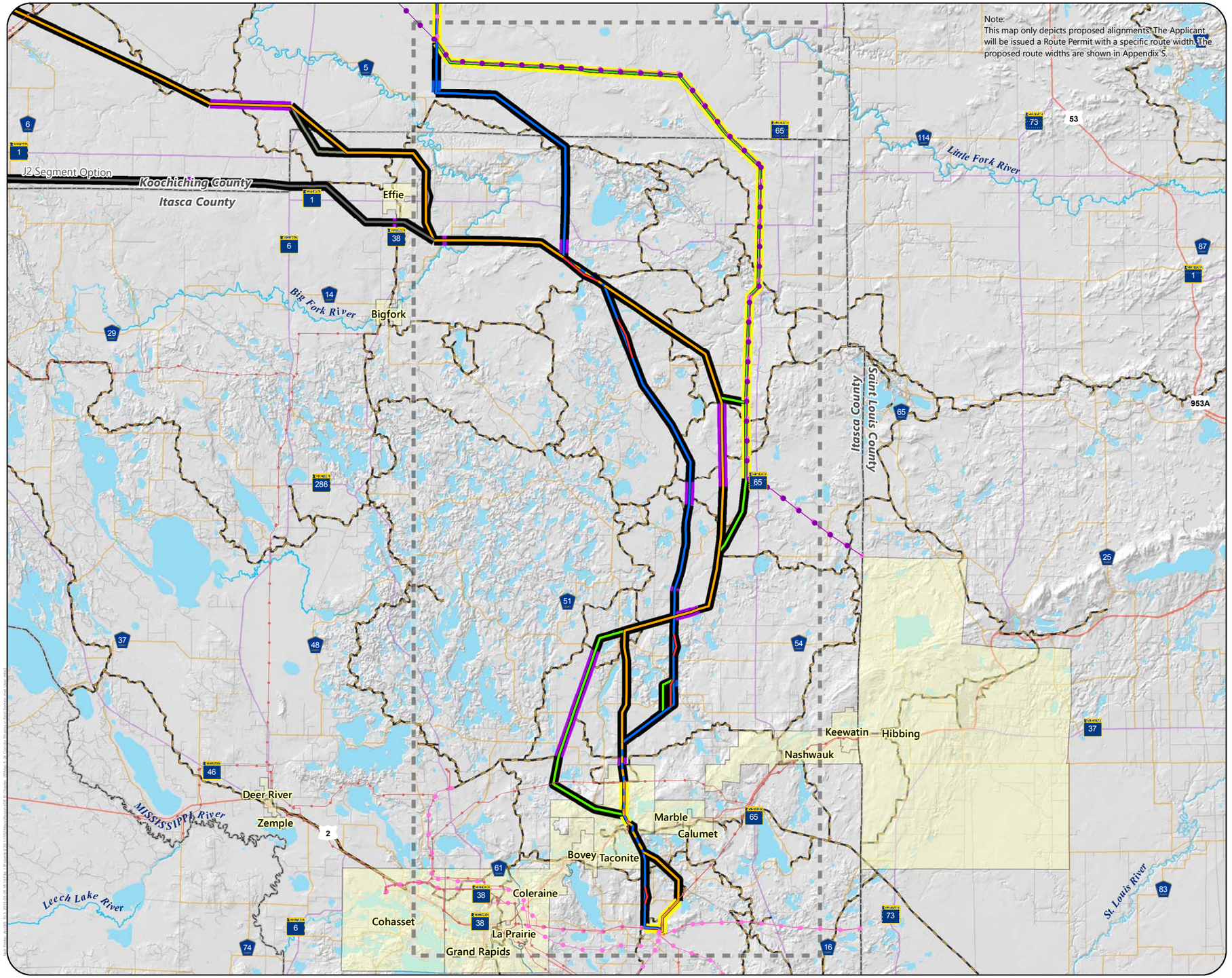
- Ecologically Important Lowland Conifers
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- High Conservation Value Forest
- State Conservation Easement

Site of Biodiversity Significance (All Ranks Preliminary)
- Rank Unknown
- Below Minimum Significance
- Moderate Significance
- High Significance
- Outstanding Significance
- Project Section

Miles
5.5 0 5.5

Map 5-23

RAND AND UNIQUE NATURAL RESOURCES IN EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Map 5-24

CORRIDOR SHARING IN EAST SECTION

Great Northern Transmission Line
Final Environmental Impact Statement