1 Introduction

This environmental assessment (EA) has been prepared for the Northland Reliability Project (the project), a 345 kilovolt (kV) double-circuit transmission line proposed by Minnesota Power and Great River Energy (GRE) (together, the applicants). This EA evaluates the potential human and environmental impacts of the project and possible mitigation measures, including route and alignment alternatives.

This EA is not a decision-making document, but rather a guide for decision-makers. The EA is intended to facilitate informed decisions by state agencies, particularly with respect to the goals of the Minnesota Environmental Policy Act "to create and maintain conditions under which human beings and nature can exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations of the state's people" (Minn. Statute 116D.02).

1.1 Purpose and Need

The project is needed to address transmission system reliability concerns in northern and central Minnesota related to the region's transition away from coal-fired generation. During the transition from coal-fired to renewable generation, the project would increase transmission capabilities and access to renewable generation in the Upper Midwest. Reliability issues have been analyzed for a decade and include regional voltage and transient stability issues identified by the applicants and the Midcontinent Independent System Operator (MISO). The project addresses the region's reliability issues and would provide voltage support, improve system strength, and provide local sources of power delivery. The project also increases the ability to move power between regions, which helps ensure Minnesota has access to resources during extreme weather events.

The project was studied, reviewed, and approved as part of the Long-Range Transmission Plan (LRTP) Tranche 1 Portfolio by MISO's Board of Directors in July 2022 in its annual MISO Transmission Expansion Plan 2021 (MTEP21) report (reference (2)). The applicants considered several alternatives to the project, including: (1) new generation; (2) various transmission solutions, including upgrading other existing facilities, different conductors, different voltage levels and different endpoints; and (3) a no-build alternative. Alternatives to the project are discussed further in Chapter 4.

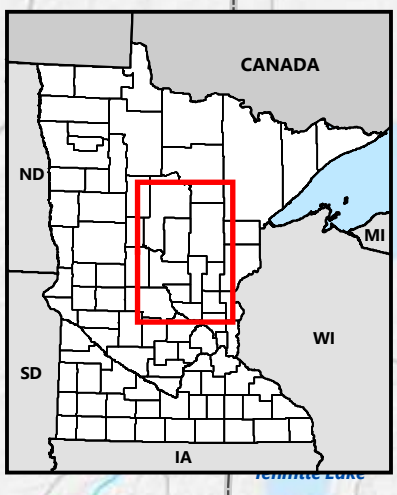
1.2 Project Description

The project includes the construction of approximately 180 miles of double-circuit 345 kV transmission line across Aitkin, Benton, Cass, Crow Wing, Itasca, Morrison, and Sherburne Counties (Map 1-1). The project consists of two major segments and makes use of existing high-voltage transmission lines and other right-of-way (ROW). The two major segments include:

- Segment 1: construct a new, approximately 140-mile-long, double-circuit 345 kV transmission line connecting Minnesota Power's existing Iron Range Substation, a new Cuyuna Series Compensation Station, and GRE's existing Benton County Substation. The proposed double-circuit 345 kV transmission line in Segment 1 would generally be located near and utilize existing high-voltage transmission line and other ROW where feasible.
- Segment 2: replace existing high-voltage transmission lines.
    - Replace GRE's existing, approximately 20-mile, 230 kV transmission line with a new, approximately 24-mile, double-circuit 345 kV transmission line from GRE's existing

Benton County Substation to the new Xcel Energy Big Oaks Substation, generally within existing ROW.

- Replace GRE's existing, approximately 20-mile, 345 kV transmission line with a new, approximately 18-mile, double-circuit 345 kV transmission line structures from GRE's existing Benton County Substation to Xcel Energy's existing Sherco Substation, generally within existing ROW. This transmission line will be constructed as a single-circuit 345 kV transmission line on double-circuit structures built to accommodate a second 345 kV circuit in the future.



Iron Range Substation

Iron Range Substation Region (IRSR)

Hill City to Little Pine Region (HCLPR)

Cole Lake/Riverton Region (CLRR)

Cuyuna Series Compensation Station

Long Lake Region (LLR)

Morrison County Region (MCR)

Benton County Elk River Region (BCERR)

Benton County Substation

Sherburne County Region (SCR)

Sherco Substation

Mud Lake
Grand Rapids
Pokegama Lake
Leech Lake
Boy Lake
Itasca County
Saint Louis County
Cass County
Woman Lake
St. Louis River
Sandy Lake Reservoir
Upper/Lower Whitefish
Mississippi River
Aitkin County
Crow Wing County
Wadena County
Pelican Lake
Carlton County
Rice Lake
Gull Lake
North Long Lake
Brainerd
Crow Wing River
Snake River
Mille Lacs Lake
Mille Lacs County
Todd County
Long Prairie River
Little Falls
Morrison County
Kanabec County
Pine County
Benton County
Isanti County
Chisago County
Cambridge
St. Croix River
Sauk River
Sauk Rapids
Waite Park
Saint Cloud
Stearns County
Sherburne County
Wright County
Rum River
Anoka County
East Bethel
Monticello
Elk River
Meeker County
Crow River

Applicants' Proposed Route
Regions of Analysis
Existing Transmission Line
Benton County Substation
Iron Range Substation
Sherco Substation
Cuyuna Series Compensation Station

0 5 10 15
Miles

Map 1-1

PROJECT OVERVIEW MAP
Northland Reliability Project

The project will also involve the following improvements to the power grid:

- Expansion of the existing Iron Range Substation, near Grand Rapids, expansion of the existing Benton County Substation, near St. Cloud, and rerouting existing transmission lines at the Iron Range and Benton County substations.

- Construction of a new Cuyuna Series Compensation Station near the existing Riverton Substation and rerouting an existing transmission line in the Riverton area.

The applicants will co-own the new double-circuit 345 kV line between the Iron Range Substation, the Cuyuna Series Compensation Station, and the Benton County Substation. Minnesota Power will own the Iron Range Substation expansion and the Cuyuna Series Compensation Station. GRE will own the Benton County Substation expansion and the two transmission lines to be replaced between the Benton County Substation and the Big Oaks and Sherco substations.

The applicants' proposed route is located along existing high-voltage transmission lines for more than 85 percent of its length. By locating the project next to existing high-voltage transmission lines and other existing rights-of-way, the project can leverage existing rights-of-way rather than creating new ones. Locating the project along existing transmission line rights-of-way minimizes the potential impact of the project.

1.3 State of Minnesota's Role

Though MISO is charged with ensuring reliable, low-cost electrical energy throughout the mid-continent of North America, and though it may review and approve projects, it is ultimately the state of Minnesota that determines whether specific transmission lines are needed by the state and, if so, where they should be located. This authority is vested in the Minnesota Public Utilities Commission (Commission). Thus, even though a project may be approved by MISO, it is the Commission that determines whether a project is built, and where it will be constructed.

The project must obtain two approvals from the Commission – a certificate of need (CN) and a route permit. The project also requires approvals (e.g., permits, licenses) from other state agencies and federal agencies with permitting authority for specific resources (e.g., the waters of Minnesota). A route permit supersedes and preempts zoning restrictions, building, and land-use regulations promulgated by local units of government (Minn. Statute 216E.10).

The applicants applied to the Commission for a CN and route permit for the project on August 4, 2023. With this application, the Commission has before it two distinct considerations: (1) whether the proposed project is needed or whether some other project would be more appropriate for the state of Minnesota (e.g., a project of a different type or size, or a project that is not needed until further into the future), and (2) if the proposed project is needed, where it is best located.

The state of Minnesota has established an administrative procedural framework to guide and support Commission decision-making that upholds a fair and rigorous exploration of the issues at hand. This process requires: (1) the development of an EA and (2) public hearings before an administrative law judge. The goal of the EA is to describe the potential human and environmental impacts of the project ("the facts"); the goal of the hearings is to advocate, question, and debate what the Commission should decide about the project ("what the facts mean"). The entire record developed in this process—the EA and the report from the administrative law judge, including all public input and testimony—is considered by the Commission when it makes its decisions on the applicants' CN and route permit applications.

1.4 Organization of Environmental Assessment

This EA is based on the applicants' joint CN and route permit application, public comments received during the scoping comment period for this EA, and input from the Commission. The project has been separated into regions for analysis and discussion purposes (Map 1-1). These regions and the applicants' proposed route are described in more detail in Chapter 3.This EA addresses the matters identified in the project scoping decision (Appendix A) and is organized as follows:

	Summary	Provides a summary of the project – its potential impacts and possible mitigation measures
Chapter 1	Introduction	Provides an overview of the stated project need, the project itself, and the state of Minnesota's role, and discusses the organization of the document.
Chapter 2	Regulatory Framework	Describes the regulatory framework associated with the project, including the state of Minnesota's certificate of need and route permitting processes, the environmental review process, and the permits and approvals that would be required for the project.
Chapter 3	Overview of Project and Routing Alternatives	Describes the project and regions, including possible routes and alignment alternatives. Chapter 3 also describes the engineering, design, and construction of the project.
Chapter 4	Alternatives to the Proposed Project	Discusses the feasibility, availability, and potential impacts of system alternatives (i.e., alternatives other than a double-circuit 345 kV transmission line that may meet the stated need for the project).
Chapter 5	Affected Environment, Potential Impacts, and Mitigation Measures	Discusses the resources in the project area and the potential human and environmental impacts of the project and identifies measures that could be implemented to avoid or mitigate potential impacts. Chapter 5 discusses those impacts and mitigation measures that are common to all of the route and alignment alternatives studied in the EA. Also included is a discussion of the potential cumulative effects of the project.
Chapter 6	Impacts and Mitigation Measures by Region	Analyzes the potential human and environmental impacts of routing alternatives by region and possible mitigation measures.
Chapter 7	Relative Merits of the Project as a Whole	Discusses the merits of the applicants' proposed route, a modified version of the applicants' proposed route, and other example end-to-end routes, relative to the routing factors of Minnesota Rule 7850.4100.
	References	Provides references for resources used in development of the EA.

1.5 Sources of Information

The primary EA information sources are the joint CN and route permit application submitted by the applicants. Additional sources of information are indicated in Chapter 8. Data provided by the applicants and from state agencies during the preparation of the EA is also included.

A number of spatial data sources, which describe the resources in the project area, were used in preparing this EA (Appendix B). Spatial data from these sources can be imported into geographic information system (GIS) software, where the data can be analyzed and potential impacts of the project and routing alternatives quantified (e.g., acres of forested wetlands within the anticipated project ROW).

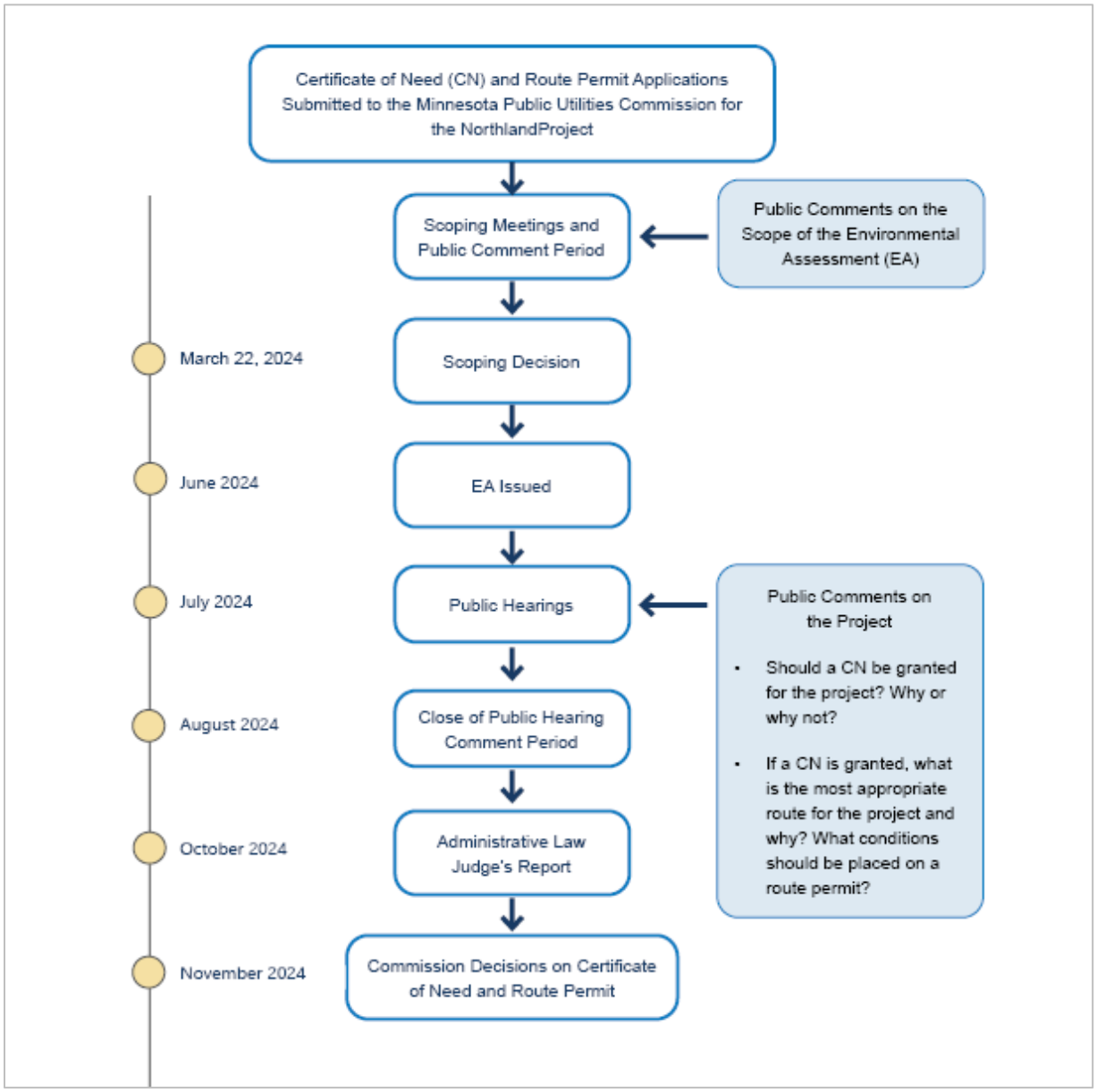
2 Regulatory Framework

The project requires two approvals from the Commission – a CN and a route permit. The Department of Commerce, Energy Environmental Review and Analysis (EERA) is responsible for environmental review of the project. The project will also require approvals from other state and federal agencies with permitting authority over related actions.

2.1 Certificate of Need

Construction of a large energy facility in Minnesota requires a CN from the Commission (Minn. Statute 216B.243). The project, a double-circuit 345 kV transmission line with a proposed length of over 100 miles, meets the definition of a large energy facility and requires a CN. On August 4, 2023, the applicants filed a joint CN and route permit application for the project. On November 15, 2023, the Commission accepted the application as complete and directed that the CN application be reviewed using the Commission's informal review process. The Commission referred the joint application to the Office of Administrative Hearings (OAH) and authorized joint public hearings and combined environmental review of the CN and route proceedings (Figure 2-1).

Figure 2-1 Commission's Environmental Review and Permitting Process for the Project



2.1.1 Certificate of Need Criteria

The Commission must determine whether the project is needed or if another project would be more appropriate for the state of Minnesota. Minn. Rule 7849.0120 provides the criteria that the Commission must use in determining whether to grant a CN:

- The probable result of denial would be an adverse effect on the future adequacy, reliability, or efficiency of energy supply to the applicant, to the applicants' customers, or to the people of Minnesota and neighboring states.
- A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record.
- The proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health.
- The record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments.

If the Commission determines that the applicant has met these criteria, a CN is granted. The CN decision does not determine the route the transmission line would take; the route is determined by the Commission's route permit.

The Commission's CN decision determines the type of project, the size of the project, and the project's termini (its start and end points). The Commission could place conditions on the granting of a CN; likewise, it has discretion to approve the project as proposed or with modifications. If the Commission denies the CN, this indicates that the Commission believes a more reasonable and prudent alternative is to not build the project (the "no-build alternative," see Chapter 4.1).

Within 12 months of the submission of a CN application, the Commission must approve or deny a CN for the project (Minn. Statute 216B.243). The Commission may extend this time if it has good cause and must issue an order explaining the good cause justification for an extension.

2.2 Route Permit

Construction of a high-voltage transmission line in Minnesota requires a route permit from the Commission (Minn. Statute 216E.03). The project, a double-circuit 345 kV transmission line, meets the definition of a high-voltage transmission line and requires a route permit from the Commission. As noted in Chapter 2.1, the applicants filed a joint CN and route permit application on August 4, 2023. The Commission accepted the application as complete on November 15, 2023. The Commission referred the application to the OAH and authorized joint public hearings and combined environmental review of the CN and route proceedings (Figure 2-1).

2.2.1 Route Permit Criteria

The Commission is charged with selecting transmission line routes that minimize adverse human and environmental impacts while ensuring electric power system reliability and integrity. Route permits issued

by the Commission include a permitted route and anticipated alignment, as well as conditions specifying construction and operation standards.

Minn. Statute 216E.03, identifies considerations that the Commission must take into account when designating transmission lines routes, including minimizing environmental impacts and minimizing human settlement and other land-use conflicts. Specifically, the Commission considers the following 14 factors when making a route permit decision (Minn. Rule 7850.4100):

- 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 division lines, and agricultural field boundaries.
- Use of existing large electric power-generating plant sites.
- Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way.
- 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.
- Irreversible and irretrievable commitments of resources.

The Commission must make specific findings that it has considered locating a route for a new transmission line along an existing transmission line ROW or parallel to existing highway ROW and, to the extent these are not used for the route, the Commission must state the reasons why (Minn. Statute 216E.03). The Commission may not issue a route permit for a project that requires a CN until a CN has been approved by the Commission, though these approvals may occur consecutively at the same Commission meeting (Minn. Statute 216B.243, and Minn. Rule 7849.1900).

The Commission is charged with making a final decision on a route permit within one year after finding the route permit application complete. The Commission may extend this time limit for up to three months for just cause or upon agreement of the applicants. Once a CN and route permit are issued by the

Commission, the applicants could exercise the power of eminent domain to acquire land for the project (see Chapter 3.4.1 for additional information regarding ROW acquisition and eminent domain).

2.3 Environmental Review

The Minnesota Environmental Policy Act (MEPA) requires an environmental review to be conducted for major governmental actions with the potential to create significant environmental impacts (Minn. Statute 116D.04). The Commission has determined that an EA will be prepared for the project. Department of Commerce (Department), EERA staff is responsible for preparing the EA on behalf of the Commission.

An EA is intended to facilitate informed decision-making by the Commission and other entities with regulatory authority over a project. It also assists citizens in providing guidance to decision-makers regarding the project. An EA describes and analyzes the potential human and environmental impacts of a project and possible mitigation measures, including alternatives to the project. The EA does not advocate or state a preference for a specific alternative. Instead, it analyzes and compares alternatives so that citizens, agencies, and governments can work from a common set of facts.

When there are two approvals before the Commission for a single transmission line project, the environmental reviews required for each approval may be combined. For this project, the Commission has authorized EERA to combine the environmental reviews required for the CN and route permit. Thus, EERA is developing a combined EA—an EA that addresses the potential human and environmental impacts of issuing a CN and route permit for the project.

The EA must be completed and made available prior to the public hearing for the project.

2.3.1 Scoping

The first step in preparing an EA is scoping. The purpose of scoping is to provide citizens, local governments, tribal governments, and agencies an opportunity to focus the EA on those issues and alternatives that are relevant to the proposed project.

EERA and Commission staff jointly held seven EA scoping and public information meetings in October 2023, to provide information about the permitting process and the project, answer questions, and gather input on topics to study in the EA. The meetings were held in Hill City, Ironton, Brainerd, Pierz, Clear Lake, and Sauk Rapids with an additional virtual meeting held for those who could not attend in person. Approximately 232 people attended these meetings and provided 62 comments (Appendix A).

A written comment period, held from October 5, 2023, to November 21, 2023, provided the public an opportunity to submit comments on potential impacts and mitigation measures for consideration in the scope of the EA. During the written comment period, 65 citizens, one tribal government, two state agencies, the applicants, and seven non-profits submitted comments. Public comments included impacts and mitigation measures suggested for study in the EA, including specific routing alternatives.

EERA staff provided a summary of the scoping process and recommendations to the Commission. The Commission concurred with EERA's recommendations regarding routing alternatives and required EERA to add an additional routing alternative that was provided after the close of the public comment period. The Department issued the scoping decision for the EA on March 22, 2024 (Appendix A). The scoping decision identifies the route and alignment alternatives that are evaluated in this EA and those alternatives that were not carried forward for evaluation. As a result of public scoping comments, 25 route alternatives and 15 alignment alternatives are included for study in this EA. EERA staff provided notice of

the scoping decision to those persons on the project mailing list and to all landowners along alternatives newly proposed during the scoping process.

2.4 Public Hearing

Upon completion of the EA, public hearings will be held in the project area. The hearings will be presided over by an administrative law judge (ALJ) from the OAH. In accordance with the Commission's order in this matter, the hearing on the CN will be held jointly with the hearing for the route permit. At the public hearing, citizens will have the opportunity to submit comments, present evidence, and ask questions. Citizens can advocate for or against the granting of a CN; they can also advocate for what they believe is the most appropriate route for the project and for any conditions to include in a route permit. Members of the public can also comment on the EA regarding any information that might be inaccurate or missing in the document.

After the public hearing, the ALJ will submit a report to the Commission with findings of facts, conclusions of law, and recommendations regarding a CN and a route permit for the project. EERA staff will respond to comments on the EA received during the hearing comment period, but staff is not required to revise or supplement the EA document. Upon completion of the environmental review and hearing process, the record will be presented to the Commission for final decisions.

2.5 Commission Decision

After considering the entire record, including the EA, input received during the public hearings, and the ALJ's findings and recommendations, the Commission will determine whether to grant a CN for the project as proposed, grant a CN contingent upon modifications to the project, or deny the CN. The Commission may also issue a conditional CN.

If a CN is granted, the Commission will also determine the final transmission line route. Route permits include a permitted route and an anticipated alignment, as well as conditions specifying construction and operating standards. Route permits also typically include mitigation plans and project-specific mitigation measures. Decisions by the Commission on the CN and route permit are anticipated in November 2024.

2.6 Other Permits and Approvals

A route permit from the Commission is the only state permit required for the project routing. A route permit supersedes local planning and zoning and binds state agencies (Minn. Statute 216E.10); therefore, state agencies are required to engage in the Commission's permitting process to aid in the Commission's decision-making and to indicate routes that are not permittable.

However, several federal, state, and local permits may be required for construction and operation of the project. All permits subsequent to the issuance of a route permit and necessary for the project must be obtained by the applicants. The information in this EA may be used by the subsequent permitting agencies as part of their environmental resource impact evaluation. Table 2-1, Table 2-2, and Table 2-3 list permits and approvals that could be required for the project, depending on the final design.

Table 2-1 Potential Federal Permits and Approvals Required for the Northland Reliability Project

Unit of Government	Type of Application	Purpose
U.S. Army Corps of Engineers – St. Paul District (USACE)	Section 404 Clean Water Act – Dredge and Fill	Protects water quality through authorized discharges of dredged and fill material into water of the United States
U.S. Army Corps of Engineers – St. Paul District (USACE)	Section 10 – Rivers and Harbor Act	Protects water quality through authorized crossings of navigable waters
U.S. Army Corps of Engineers – St. Paul District (USACE)	Section 106 of the National Historic Preservation Act	Requires federal agencies to avoid, minimize, and/or mitigate project-related effects to historic properties
U.S. Fish and Wildlife Service (USFWS)	Bald and Golden Eagle Protection Act Consultation	Review to prevent take of bald or golden eagles
U.S. Fish and Wildlife Service (USFWS)	Migratory Bird Treaty Act Consultation	Review to prevent take of protected migratory bird species
U.S. Fish and Wildlife Service (USFWS)	Section 7 Endangered Species Act Consultation	Establishes conservation measures for endangered species
Federal Aviation Administration (FAA)	Part 7460 Review	Review to Prevent airspace hazards due to structures taller than 200 feet
Native American Tribes	Coordination in support of Section 106 of the National Historic Preservation Act to determine impacts on traditional cultural properties and/or other resources of tribal significance	Coordination to prevent impacts to traditional cultural properties and/or other resources of tribal significance

Table 2-2 Potential State Permits and Approvals Required for the Northland Reliability Project

Unit of Government	Type of Application	Purpose
Minnesota Department of Natural Resources (DNR)	License to Cross Public Waters	License to prevent impacts associated with crossing public waters
Minnesota Department of Natural Resources (DNR)	License to Cross Public Lands	License to prevent impacts associated with crossing public lands
Minnesota Department of Natural Resources (DNR)	State Lease for Access Roads	Lease to cross state-managed lands on access roads
Minnesota Department of Natural Resources (DNR)	State Threatened and Endangered Species Consultation	Consultation to avoid, minimize, and mitigate impacts to state-listed species
Minnesota Pollution Control Agency (MPCA)	National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit	Minimizes impacts to waters due to construction of the project
Minnesota Pollution Control Agency (MPCA)	Section 401 Clean Water Act – Water Quality Certification	Ensures project will comply with state water quality standards
Minnesota Pollution Control Agency (MPCA)	Spill Prevention, Control and Countermeasure Plan	Ensures project will develop and implement a plan to prevent discharge of oil
Minnesota State Historic Preservation Office (SHPO)	National Historic Preservation Act Section 106 consultation; Minnesota Field Archaeology Act; Minnesota Historic Sites Act	Ensures adequate consideration of impacts on significant cultural resources
Minnesota Department of Agriculture (MDA)	Agricultural Impact Mitigation Plan	Establishes measures for protection of agricultural resources
Minnesota Department of Transportation (MNDOT)	Utility Permit	Authorizes accommodation of utilities along highway rights-of-way
Minnesota Department of Transportation (MNDOT)	Driveway Access	Authorizes access to driveways along highways
Minnesota Department of Transportation (MNDOT)	Oversize/Overweight Permit	Authorizes the use of roads for oversize or overweight vehicles
Minnesota Board of Water and Soil Resources (BWSR)	Wetland Conservation Act	Coordination with BWSR and local governments to ensure conservation of wetlands

Table 2-3 Potential Local and Other Permits and Approvals Required for the Northland Reliability Project

Unit of Government	Type of Application	Purpose
Local/County Governments	Road Crossing, Driveway, Oversize or Overweight, and Land Permits	Permits from local governments to ensure proper use of local roads and lands
City	Municipal Stormwater Permit	Ensures stormwater discharge is in compliance with local ordinances
Other utilities (pipelines, railroads, etc.)	Crossing Permits/Agreements/Approvals	Notifications to railroads and utilities

2.6.1 Federal Approvals

The United States Army Corps of Engineers (USACE) regulates potential impacts to waters of the United States. Dredged or fill material, including material that moves from construction sites into these waters, could impact water quality. The USACE requires permits for projects that may cause such impacts. The USACE is also charged with coordinating with the State Historic Preservation Office (SHPO) and Native American tribes regarding potential impacts to significant cultural resources pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The U.S. Fish and Wildlife Service (USFWS) requires permits for the taking of threatened or endangered species, bald and golden eagles, and native migratory birds. The USFWS encourages consultation with project proposers to ascertain a project's potential to impact these species and to identify general mitigation measures for the project.

The Federal Aviation Administration (FAA) regulates civil aviation, including the airspace used for aviation. The FAA requires permits for tall structures that could adversely impact aviation.

2.6.2 State of Minnesota Approvals

The Minnesota Department of Natural Resources (DNR) regulates potential impacts to Minnesota's public lands and waters. The DNR requires a license to cross public lands and waters; licenses may require mitigation measures. Similar to the USFWS, the DNR also encourages consultation with project proposers to ascertain a project's potential to impact state-listed threatened and endangered species and possible mitigation measures.

A general National Pollutant Discharge Elimination System (NPDES) / Sanitary Disposal System (SDS) construction stormwater permit from the Minnesota Pollution Control Agency (MPCA) is required for stormwater discharges from construction sites. A permit is required if a project disturbs 1 acre or more of land. The general NPDES/SDS permit requires (1) use of best management practices (BMPs), (2) a stormwater pollution prevention plan, and (3) adequate stormwater treatment capacity once the project is constructed. The NPDES/SDS permit ensures that state water quality standards are not compromised. If new transformers are added to the Iron Range Substation or Benton County Substation that result in changes to oil storage, a Spill Prevention, Control and Countermeasure (SPCC) plan update would be needed.

The Minnesota State Historic Preservation Office (SHPO) is charged with preserving and protecting the state's cultural resources. SHPO consults with project proposers and state agencies to identify cultural resources (e.g., through surveys) and to avoid and minimize impacts to these resources.

The Minnesota Department of Agriculture (MDA) ensures the integrity of Minnesota's food supply while protecting the health of its environment and the resources required for food production. MDA assists in the development of agricultural impact mitigation plans (AIMPs) to avoid and mitigate impacts to agricultural lands.

A permit from the Minnesota Department of Transportation (MnDOT) is required for transmission lines that are adjacent to or cross over Minnesota trunk highway ROW. MnDOT's utility accommodation policy generally allows utilities to occupy portions of highway ROW where such occupation does not put the safety of the traveling public or highway workers at risk or unduly impair the public's investment in the transportation system.

The Minnesota Board of Water and Soil Resources (BWSR) oversees implementation of Minnesota's Wetland Conservation Act (WCA). The WCA is implemented by local units of government (LGUs). For linear projects that cross multiple LGUs, BWSR typically coordinates the review of potential wetland impacts among the affected LGUs. The WCA requires anyone proposing to impact a wetland to (1) try to avoid the impact, (2) try to minimize any unavoidable impacts, and (3) replace any lost wetland functions.

2.6.3 Local Approvals

The Commission's route permit supersedes local planning and zoning regulations and ordinances. However, the applicants must obtain all local approvals necessary for the project that are not preempted by the Commission's route permit, such as approvals for the safe use of local roads.

2.6.4 Other Approvals

Other approvals and/or crossing agreements may be required where project facilities cross an existing utility, such as a pipeline, solar facility, or railway. The need for such approvals will be determined after the final route is selected, and the applicants have indicated that these approvals would be obtained after a route permit has been issued by the Commission.

2.6.5 Conservation Programs

There are lands throughout the project area that are part of various conservation programs, including but not limited to Reinvest in Minnesota (RIM), Conservation Reserve Enhancement Program (CREP), the Sustainable Forest Incentive Act (SFIA), and Forest for the Future. The applicants indicate that they will work with landowners, local governmental entities administering such programs, and sponsoring federal agencies on a site-specific basis to coordinate the approvals necessary for placing the project on these lands.

2.6.6 Electric Safety and Reliability Costs

The project must meet the requirements of the National Electrical Safety Code (NESC). Utilities must comply with the most recent edition of the NESC, as published by the Institute of Electrical and Electronics Engineers, Inc., and approved by the American National Standards Institute, when constructing new facilities or upgrading existing facilities (Minn. Statute 326B.35).

The NESC is designed to protect human health and the environment. It also ensures that the transmission lines and all associated structures are built from high-quality materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment, provided that routine maintenance is performed.

Utilities must also comply with North American Electric Reliability Corporation (NERC) standards. NERC standards define the reliability requirements for planning and operating the electrical transmission grid in North America.

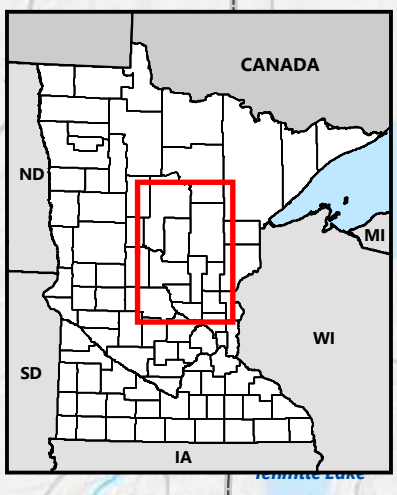
3 Overview of Project and Routing Alternatives

The applicants are proposing to construct an approximately 180-mile-long double-circuit 345 kV transmission line between Grand Rapids, St. Cloud, and Becker, Minnesota. To facilitate analysis and discussion of the project, this EA divides the project into eight regions (Map 3-1). The regions begin in the north, with the Iron Range Substation Region, and extend southward, ending with the Sherburn County Region.

In addition to the applicants' proposed route, there are 25 route alternatives and 15 alignment alternatives that could be used for the project (Map 3-1). Any of these alternatives, or a combination of these alternatives, could be selected and permitted by the Commission. Each of the routing alternatives is described in Chapter 3 and Appendix A, with accompanying maps in Appendix C.

This chapter describes the transmission line structures that could be used for the project and the project's associated facilities. Additionally, this chapter discusses how the project would be constructed and its anticipated costs and schedule. Several terms used throughout this Chapter and the remaining document have specific meaning and are defined here for clarity.

- **ROW** means the land interest required within a route for the construction, maintenance, and operation of a high-voltage transmission line (Minn. Rule 7850.1000).
- **ROW sharing** means that the new transmission line would be co-located with an existing transmission line or other existing infrastructure ROW (e.g., transportation corridors, pipelines, etc.) to partially share that existing ROW and lessen the overall easement width required from landowners.
- **ROW paralleling** refers to siting a transmission line such that it would run adjacent to existing rights-of-way (e.g., transportation corridors, pipelines, and other electrical transmission lines), thereby lessening impacts to the landscape and environment. ROW paralleling does not lessen the overall ROW width required from landowners for the new transmission line.
- **Double-circuiting** refers to a transmission line design whereby transmission structures are designed to carry two alternating current (AC) lines, as opposed to a single circuit (i.e., one line). Double-circuiting is advantageous because two transmission lines use the same ROW and same structures in a double-circuit design.



Iron Range Substation

Iron Range Substation Region (IRSR)

Hill City to Little Pine Region (HCLPR)

Cole Lake/Riverton Region (CLRR)

Cuyuna Series Compensation Station

Long Lake Region (LLR)

Morrison County Region (MCR)

Benton County Elk River Region (BCERR)

Benton County Substation

Sherburne County Region (SCR)

Sherco Substation

Mud Lake
Grand Rapids
Pokegama Lake
Leech Lake
Boy Lake
Itasca County
Saint Louis County
Cass County
Woman Lake
Sandy Lake Reservoir
St. Louis River
Upper/Lower Whitefish
Mississippi River
Aitkin County
Crow Wing County
Wadena County
Pelican Lake
Carlton County
Rice Lake
Gull Lake
North Long Lake
Brainerd
Crow Wing River
Snake River
Mille Lacs Lake
Long Prairie River
Todd County
Little Falls
Morrison County
Mille Lacs County
Kanabec County
Pine County
Benton County
Isanti County
Chisago County
Cambridge
St. Croix River
Sauk River
Sauk Rapids
Waite Park
Saint Cloud
Stearns County
Sherburne County
Wright County
Rum River
Anoka County
East Bethel
Monticello
Elk River
Meeker County
Crow River

Applicants' Proposed Route
Route Alternative
Alignment Alternative
Regions of Analysis
Existing Transmission Line

Benton County Substation
Iron Range Substation
Sherco Substation
Cuyuna Series Compensation Station

0 5 10 15
Miles

Map 3-1

ROUTING ALTERNATIVES OVERVIEW MAP
Northland Reliability Project

3.1 Route and Alignment Alternatives

Route and alignment alternatives are presented here by region from north to south. Each region includes a portion of the applicants' proposed route. A detailed overview of each routing alternative is also provided in Map Book 3A.

3.1.1 Iron Range Substation Region

The Iron Range Substation region, located in Trout Lake and Blackberry Townships, Itasca County, is the northernmost region of the project. This region includes the Iron Range Substation area, which is the northern endpoint of the project. In addition to the applicants' proposed route, the region has four route alternatives (A1, A2, A3 and A4) and one alignment alternative (AA15) (Map 3-2).

3.1.1.1 Applicants' Proposed Route – Iron Range Substation Region

The applicants' proposed route begins at Minnesota Power's existing Iron Range Substation and continues south for approximately 1 mile before turning due west for 0.75 mile where it crosses County Road 10. It then turns south for 0.5 mile and turns west again for 0.75 mile. The transmission line then travels southwest for approximately 3.1 miles where it meets US Highway 2 at the southern end of the Iron Range Substation region.

3.1.1.2 Route Alternative A1

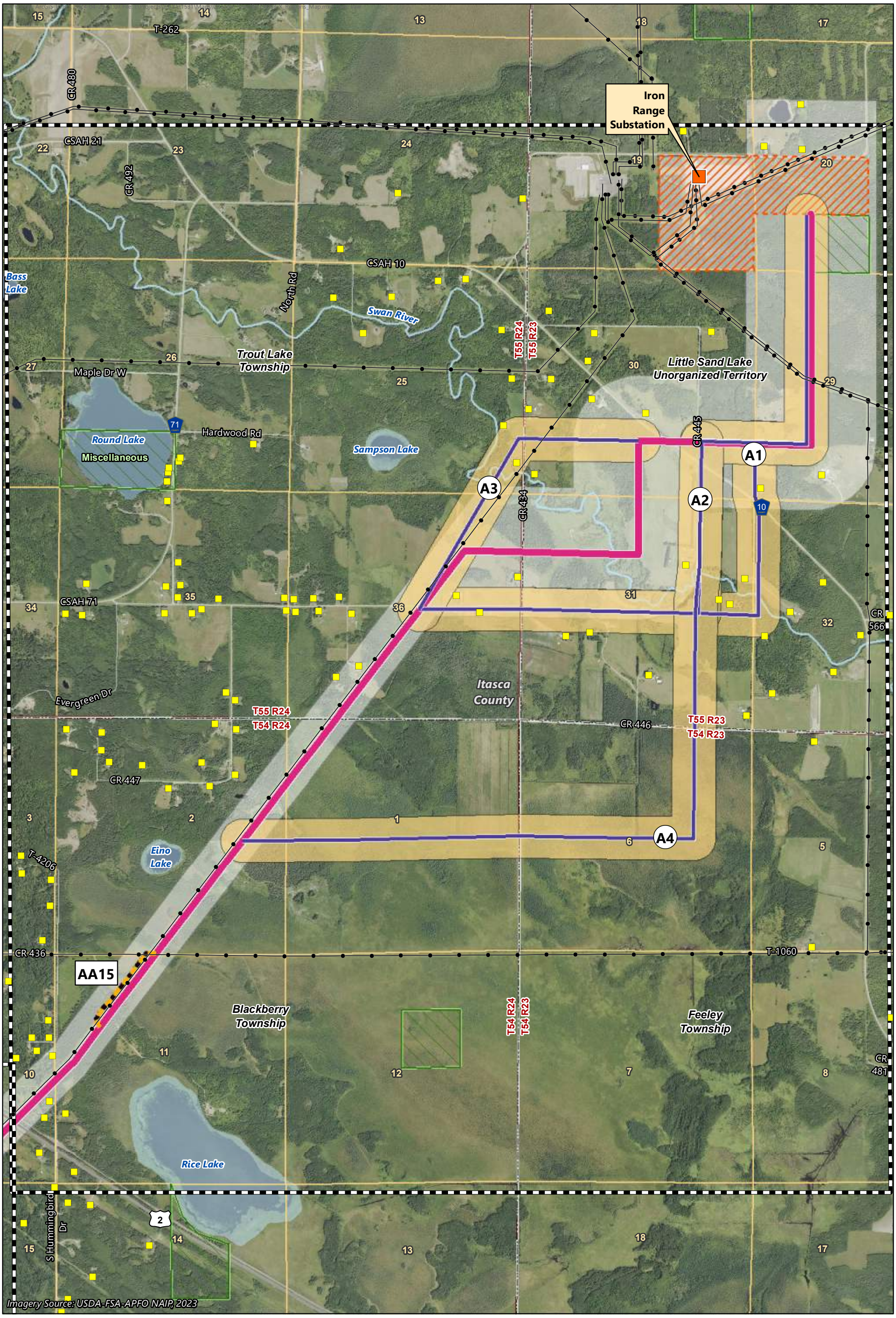
The A1 route alternative is 3.4 miles long and generally follows the applicants' proposed route but shifts west away from state property and onto the applicants' property at the northern end near the Iron Range Substation. Route alternative A1 then turns south and crosses County Road 10 southeast of the applicants' proposed route, ultimately crossing the Swan River at a previously disturbed bridge location. Route alternative A1 does not include any transmission line ROW sharing, paralleling, or double-circuiting.

3.1.1.3 Route Alternative A2

The A2 route alternative is 3.4 miles long and generally follows the applicants' proposed route but shifts west away from state property and onto the applicants' property at the northern end near the Iron Range Substation. Route alternative A2 veers southward, intersecting County Road 10 southeast of the applicants' proposed route. The route then follows County Road 445 until it reaches a junction with a lengthy driveway bordering an agricultural field. At this point, it shifts westward, crossing the Swan River at a previously disturbed bridge site. Route alternative A2 does not include any transmission line ROW sharing, paralleling, or double-circuiting.

3.1.1.4 Route Alternative A3

Route alternative A3 is 1.4 miles long and diverges from the applicants' proposed route just west of County Road 10. From that point, route alternative A3 continues west for 0.5 mile, then turns southwest after crossing County Road 434, where it continues for approximately 0.85 mile, crossing the Swan River at a previously disturbed bridge location, before rejoining the applicants' route. Route alternative A3 would cross an existing transmission line in two locations (once to cross over the existing transmission line and once to cross back). It does not include any transmission line ROW sharing, paralleling, or double-circuiting.



Applicants' Proposed Route
Route Width
Route Alternative
Alignment Alternative
Route Alternative Width
Existing Transmission Line
Iron Range Substation
Substation Siting Area
Residence
PWI Waterway
PWI Basin
Region Boundary

Feet
0 1,000 2,000

Map 3-2

IRON RANGE SUBSTATION REGION
Northland Reliability Project

3.1.1.5 Route Alternative A4

Route alternative A4 is 3.7 miles long and diverts from the applicants' proposed route near County Road 10, where it turns south for approximately 1.75 miles and then turns west for approximately 2 miles before rejoining the applicants' proposed route. Route alternative A4 does not include any transmission line ROW sharing, paralleling, or double-circuiting.

3.1.1.6 Alignment Alternative AA15

One alignment alternative is included in the Iron Range Substation region. Alignment Alternative AA15 would shift the applicants' proposed route from private property onto Itasca County tax forfeit lands. The AA15 alignment alternative is 0.4 mile long and shifts the alignment west of the applicants' proposed route south of County Road 436. Alignment alternative AA15 would require crossing over existing transmission infrastructure and then crossing back. Alignment alternative AA15 would parallel an existing transmission line ROW for its entire length.

3.1.2 Hill City to Little Pine Region

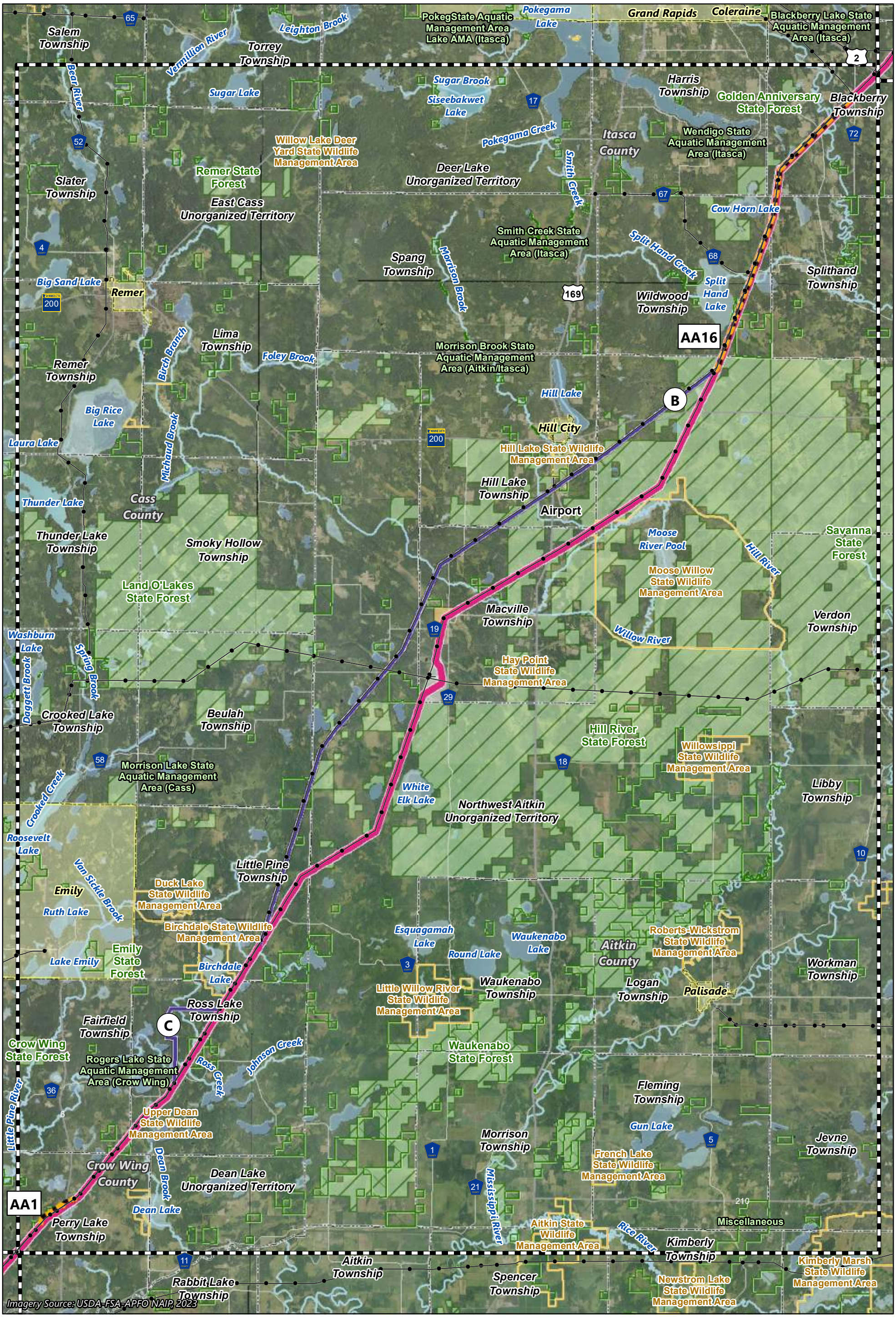
The Hill City to Little Pine region is in Aitkin, Cass, Crow Wing, and Itasca counties. The region includes the applicants' proposed route, two route alternatives (B and C) and three alignment alternatives (AA1, AA2, and AA16) (Map 3-3).

3.1.2.1 Applicants' Proposed Route – Hill City to Little Pine Region

The applicants' proposed route generally moves southwest through the Hill City to Little Pine region, following a portion of Minnesota Power's existing 230 kV line (92 Line). The applicants' proposed route begins at US Highway 2 where it moves southwest for approximately 4.75 miles, crossing the Mississippi River. The applicants' proposed route then moves more southerly as it crosses Danson Road, continuing for approximately 11.5 miles, where it then turns westerly north of Hill River State Forest and continues for 8.6 miles. The applicants' proposed route turns south and jogs east of an Enbridge pump station and continues along the 92 Line ROW for approximately 27 miles, where it crosses the Mississippi River at the southern end of the region.

3.1.2.2 Route Alternative B

Route alternative B is 26.4 miles long and shifts west from the applicants' proposed route to potentially reduce natural resource impacts. Route alternative B turns west 1.5 miles north of State Highway 200 and parallels an existing transmission line ROW for a majority of the route length. Route alternative B continues southwest crossing the Hill River Ditch, Willow River, Moose River, and East Lake, before rejoining to the applicants' proposed route approximately 0.8 miles south of County Road 1. A portion of route alternative B, in an area where it parallels an existing transmission line ROW, is adjacent to the Hill City/Quadna Mountain Airport. Specialty structures would be required near the Hill City/Quadna Mountain Airport to lower structure heights to less than 80 feet for approximately 0.5 to 1 mile. This lower height would be required to maintain airport clear-zone requirements.



Map 3-3

HILL CITY TO LITTLE PINE REGION

Northland Reliability Project

3.1.2.3 Route Alternative C

Route alternative C is 4.6 miles long and shifts west from the applicants' route. Route alternative C generally follows existing roads and disturbed corridors. This route turns west from the applicants' proposed route along Lens Road and then turns south to follow County Road 106 for 2.6 miles before rejoining the applicants' proposed route approximately 0.5 mile south of County Road 36. Route alternative C would cross an existing transmission line in two locations (once to cross over the existing transmission line and once to cross back). It would also require at least three heavy-angle structures to accommodate 90-degree and angled turns along the route. Route alternative C does not include any transmission line ROW sharing, paralleling, or double-circuiting.

3.1.2.4 Alignment Alternative AA1

Alignment alternative AA1 is 1.6 miles long and shifts west of the applicants' proposed route to avoid private property. This alternative crosses State Highway 6 further north than the applicants' proposed route and crosses Wood Road further northwest than the applicants' proposed route. Alignment alternative AA1 does not include any transmission line ROW sharing, paralleling, or double-circuiting. It would cross an existing transmission line in two locations (once to cross over the existing transmission line and once to cross back). It would also require at least two heavy-angle structures to accommodate proposed 90-degree and angled turns.

3.1.2.5 Alignment Alternative AA2

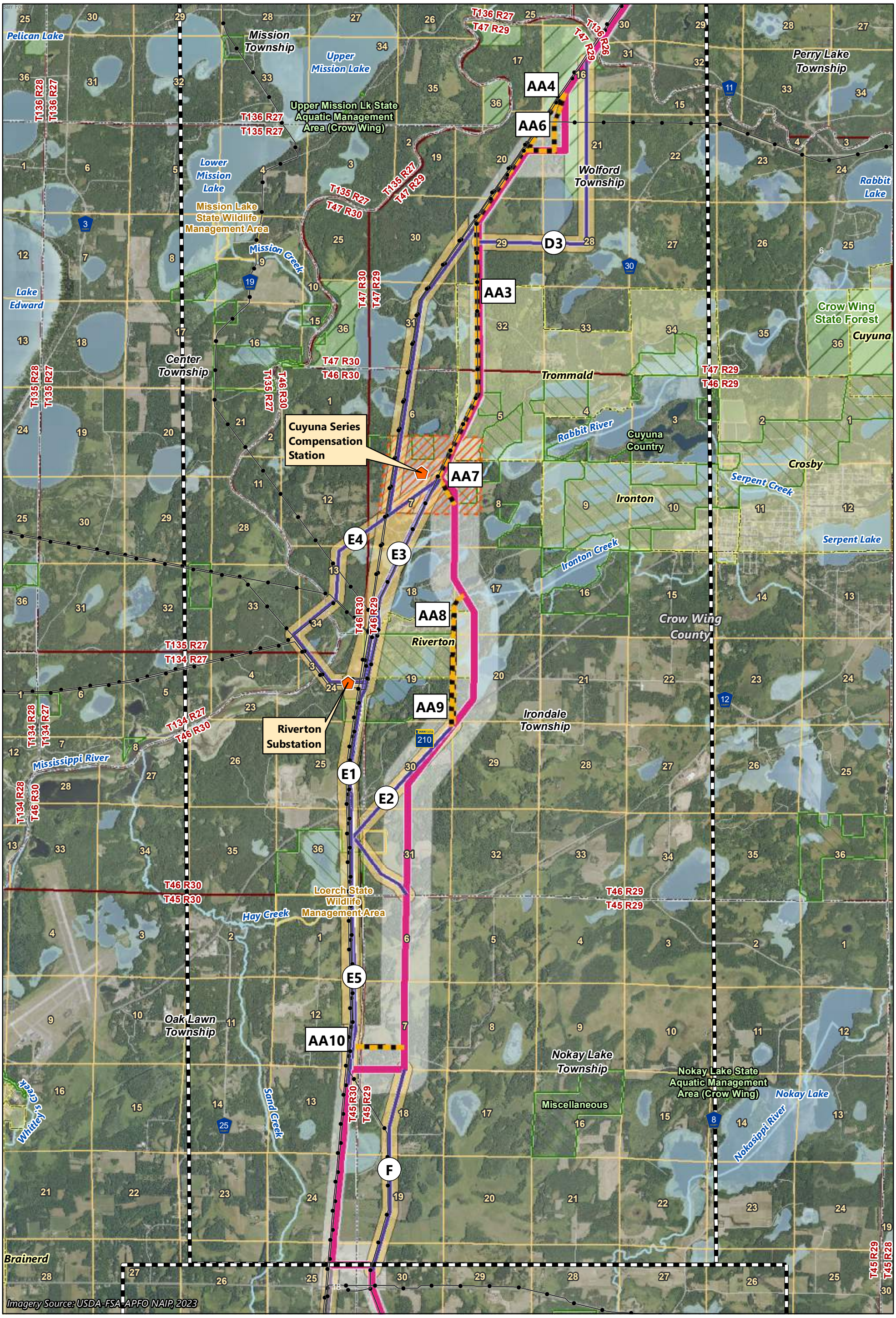
Alignment alternative AA2 is 0.6 mile long and shifts west of the applicants' proposed route to avoid private property. Alignment alternative AA2 crosses State Highway 6 further north than the applicants' proposed route and follows the highway south for approximately 0.2 miles before rejoining the applicants' proposed route. Alignment alternative AA2 does not include any transmission line ROW sharing, paralleling, or double-circuiting. It would cross an existing transmission line in two locations (once to cross over the existing transmission line and once to cross back). It would also require at least two heavy-angle structures to accommodate proposed 90-degree and angled turns.

3.1.2.6 Alignment Alternative AA16

Alignment alternative AA16 is 11 miles long and would entail double-circuiting two existing transmission lines in order to allow alignment alternative AA16 to utilize that existing ROW, to minimize potential impacts in the area. Alignment alternative AA16 is located west of the applicants' proposed route. Alignment alternative AA16 continues southwest for approximately 5.75 miles before rejoining the applicants' proposed route just south of the Itasca County and Aitkin County border.

3.1.3 Cole Lake-Riverton Region

The Cole Lake-Riverton region is located in the central portion of the project in Crow Wing County (Map 3-4). The Cole Lake-Riverton region contains the applicants' proposed route, eight route alternatives (D3, E1, E2, E3, E4, E5, F, and G) and seven alignment alternatives (AA3, AA4, AA6, AA7, AA8, AA9, and AA10). The five route alternatives labeled E1 through E5 offer route alternatives around the town of Riverton.



Applicants' Proposed Route
Route Width
Route Alternative
Alignment Alternative
Route Alternative Width
Existing Transmission Line
Riverton Substation
Cuyuna Series Compensation Station
Substation Siting Area
PWI Waterway
PWI Basin
State Forest
Municipal Boundary
Region Boundary

Miles
0 0.5 1

Map 3-4

COLE LAKE/RIVERTON REGION
Northland Reliability Project

3.1.3.1 Applicants' Proposed Route – Cole Lake-Riverton Region

The applicants' proposed route moves southwesterly through the Cole Lake region, beginning at the Mississippi River crossing and ending at the new Cuyuna Series Compensation Station. The route moves southwest for 0.75 mile along the 92 Line before deviating and turning southerly then westerly for 1 mile to avoid residences. It rejoins the 92 Line for approximately 3.75 miles where it crosses Miller Kae Road and South Black Bear Road before arriving at the new Cuyuna Series Compensation Station. As the applicants' proposed route leaves the Cuyuna Series Compensation Station, it extends southeast for approximately 7.8 miles along new ROW, crossing the western portion of Hay Lake, before joining GRE's 230 kV MR Line (MR Line). The route shares the MR Line ROW for approximately 2 miles then turns due east for 0.5 mile at the southern end of the region.

3.1.3.2 Route Alternative D3

Route alternative D3 is 3.3 miles long and is shifted east and south from the applicants' proposed route in an effort to reduce potential impacts. Route alternative D3 diverges south from the applicants' proposed route just south of County Road 11 and heads south for approximately 2 miles, and then turns west for 1.3 miles before rejoining with the applicants' proposed route. Route alternative D3 does not include any ROW sharing, paralleling, or double-circuiting; however, it would cross one existing transmission line.

3.1.3.3 Alignment Alternative AA3

Alignment alternative AA3 involves double-circuiting two existing transmission lines, which would then allow placement of the project within existing transmission line ROW. Alternative AA3 is approximately 5 miles long and would terminate at the new Cuyuna Series Compensation Station.

3.1.3.4 Alignment Alternative AA4

Alignment alternative AA4 is a shorter version of AA3. Alignment alternative AA4 would double-circuit two existing transmission lines so that the project could be constructed within existing transmission line ROW. Alignment alternative AA4 is approximately 0.8 miles long.

3.1.3.5 Alignment Alternative AA6

Alignment alternative AA6 is 1 mile long; it would divert from the applicants' proposed route north of River Road and head due south along Cole Lake Way for approximately 0.7 miles, then turn due west for 0.3 mile before rejoining the applicants' proposed route. Alignment alternative AA6 does not include any ROW sharing, paralleling, or double-circuiting; however, it would cross one existing transmission line.

3.1.3.6 Route Alternative E1

Route alternative E1 is 7.2 miles long and diverts from the applicants' proposed route north of Bluegill Road and heads southwest for approximately 7.2 miles before rejoining the applicants' proposed route on Woodrow Road. Route alternative E1 was proposed to avoid impacts to the Cuyuna County State Recreation Area by using existing transmission line ROW. Route alternative E1 would double-circuit two existing transmission lines, which would then allow placement of the project route within existing transmission line ROW (Photo 3-1). Although this alternative would cross into a Wildlife Management Area (WMA), it would utilize existing transmission line ROW through this area. Route alternative E1 would require modifying existing transmission lines in the area and may also need a wider route width in certain areas.

Photo 3-1 View of Route Alternative E1 ROW from CR 159

3.1.3.7 Route Alternative E2

Route alternative E2 is 4.4 miles long and diverts from the applicants' proposed route just south of State Highway 210 where it heads southwest for 1.75 miles before turning due south for 2.6 miles and rejoining the applicants' proposed route. Where the line turns and heads south, route alternative E2 would share existing transmission line ROW for approximately 2.6 miles.

3.1.3.8 Route Alternative E3

Route alternative E3 is, for the most part, a shorter version of route alternative E1. It is 5.2 miles long and diverts from the applicants' proposed route north of Bluegill Road and heads southwest for approximately 4.2 miles, generally following route alternative E1. However, just south of State Highway 210, route alternative E3 would break away from route alternative E1 and turn southeast for 1 mile to rejoin the applicants' proposed route.

3.1.3.9 Route Alternative E4

Route alternative E4 is 11 miles long; it diverts from the applicants' proposed route 1 mile north of Miller Lake Road. It then heads southwest of the applicants' proposed route and west of the town of Riverton, where it begins a sinuous route edging west around Hay Lake, with two Mississippi River crossings. Route alternative E4 then heads due south for approximately 4.5 miles before rejoining the applicants' proposed route at Woodrow Road. Route alternative E4 would share existing transmission line ROW for approximately 8 of its 11 miles. Route alternative E4 would cross six existing transmission lines and

would require at least two heavy-angle structures to accommodate 90-degree and angled turns along the route.

3.1.3.10 Route Alternative E5

Route alternative E5 is 8.1 miles long; it diverts from the applicants' proposed route approximately 0.7 mile north of Bluegill Road, heading west of the town of Riverton, around Hay Lake, and then south to rejoin the applicants' proposed route at Woodrow Road. This route was proposed as a shorter alternative to route alternative E4. It would share existing transmission line ROW for approximately 6.3 miles and would also cross the Mississippi River two times. Route alternative E5 would cross six existing transmission lines and would require at least two heavy-angle structures to accommodate 90-degree and angled turns along the route.

3.1.3.11 Route Alternative F

Route alternative F is 2.4 miles long and was proposed to reduce impacts to natural resources. Route alternative F diverts from the applicants' proposed route 0.25 mile south of Woodrow Road and continues traveling south for approximately 2.5 miles before rejoining the applicants' proposed route just north of State Highway 18. Route alternative F would parallel existing transmission line ROW for approximately 1.5 miles.

3.1.3.12 Route Alternative G

Route alternative G is 3.5 miles long and was proposed to avoid impacts to residential areas. Route alternative G would divert from the applicants' proposed route approximately 0.35 mile north of State Highway 18 and continue south for approximately 1.75 miles. From there, it would turn due east for approximately 1.15 miles and turn north for approximately 0.75 mile to rejoin the applicants' proposed route west of Burgwald Road. Route alternative G would parallel existing transmission line ROW for approximately 1.7 miles and would require at least one heavy angle structure to accommodate a 90-degree turn along the route.

3.1.3.13 Alignment Alternative AA7

Alignment alternative AA7 is 0.3 mile in length and diverts from the applicants' proposed route 0.7 mile north of Bluegill Road. Alignment alternative AA7 removes one angled turn from the applicants' proposed route, straightening the proposed transmission line ROW in this area. Alignment alternative AA7 does not include any transmission line ROW sharing, paralleling, or double-circuiting.

3.1.3.14 Alignment Alternative AA8

Alignment alternative AA8 is 1.5 miles long and diverts from the applicants' proposed route where it crosses County Road 128. Alignment alternative AA8 heads southwest along the east side of County Road 128 and then follows the east side of County Road 59 due south around the Cuyuna Recreational Area until it rejoins the applicants' proposed route just south of State Highway 210. Alignment alternative AA8 does not include any transmission line ROW sharing, paralleling, or double-circuiting.

3.1.3.15 Alignment Alternative AA9

Alignment alternative AA9 is 1.6 miles long and diverts from the applicants' route where it crosses County Road 128. Alignment alternative AA9 routes around the Cuyuna Recreation Area by heading southwest along the east side of County Road 128 for approximately 0.5 mile before following the west side of

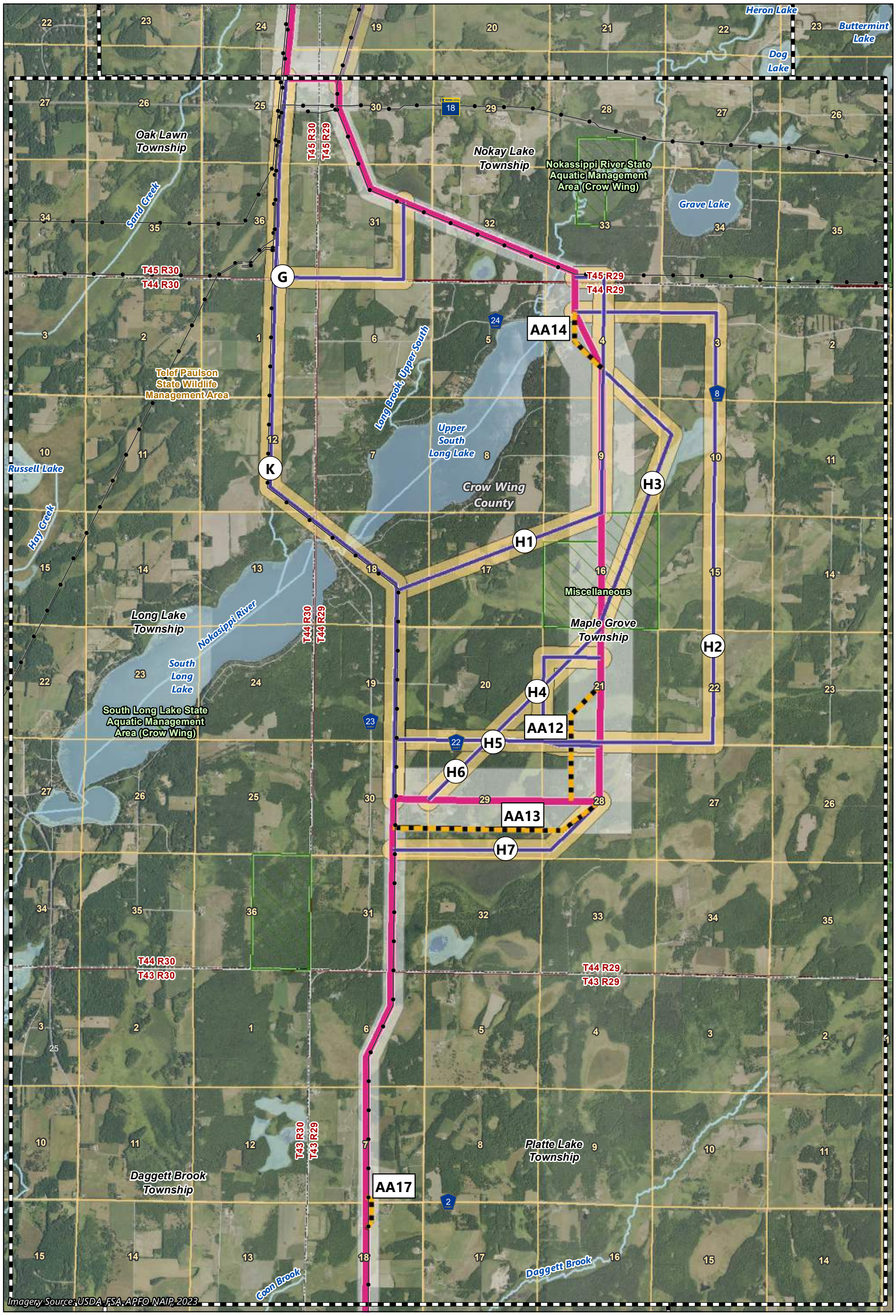
County Road 59 due south for approximately 1.1 miles until it rejoins the applicants' proposed route just south of State Highway 210. Alignment alternatives AA8 and AA9 present similar proposals; however, alignment alternative AA9 would share existing transmission line ROW.

3.1.3.16 Alignment Alternative AA10

Alignment alternative AA10 diverts from the applicants' proposed route approximately 0.1 mile north of Woodrow Road and runs parallel (but offset by 0.25 mile) to the applicants' proposed route for 0.75 mile, then turns due south for 0.25 mile where it rejoins the applicants' proposed route. Alignment alternative AA10 would share an existing transmission line ROW for approximately 0.25 mile.

3.1.4 Long Lake Region

The Long Lake region is located in the central portion of the project, south of the Riverton region (Map 3-5). The Long Lake region contains the applicants' proposed route, eight route alternatives (H1, H2, H3, H4, H5, H6, H7, and K), and four alignment alternatives (AA12, AA13, AA14, and AA17) (Map 3-5).



Applicants' Proposed Route
Route Width
Route Alternative
Alignment Alternative
Route Alternative Width
Existing Transmission Line
PWI Waterway
PWI Basin
Region Boundary

Feet
0 2,000 4,000

Map 3-5

LONG LAKE REGION
Northland Reliability Project

3.1.4.1 Applicants' Proposed Route – Long Lake Region

The applicants' proposed route moves generally southeast through the Long Lake region, paralleling GRE's 69 kV RW Line (RW Line) for approximately 3 miles where it then turns south then west along a new ROW for 6.5 miles. The route then rejoins the MR line just east of County Road 23 and continues south for approximately 3.75 miles, paralleling the MR line this entire for this entire distance, to where the Long Lake region ends.

3.1.4.2 Route Alternative H1

Route alternative H1 is 6 miles long and diverts eastward of the applicants' proposed route just north of County Road 24 and heads south for 2 miles around an Aquatic Management Area (AMA), along a portion of the applicants' proposed route. Route alternative H1 then turns southwest for just under 2 miles before turning due south for 1.8 miles where it would parallel an existing transmission line ROW before rejoining the applicants' proposed route south of County Road 22.

3.1.4.3 Route Alternative H2

Route alternative H2 is 8.2 miles long and routes around an AMA. This route alternative diverts due east from the applicants' proposed route south of County Road 24 for approximately 1.25 miles before turning due south along County Road 8 for 1.75 miles. From there, route alternative H2 continues south along County Road 108 to County Road 22. Route alternative H2 then turns due west along County Road 22 for approximately 2.75 miles before turning south and paralleling an existing transmission line ROW where it proceeds for 0.5 mile to reconnect with the applicants' proposed route. Route alternative H2 would require at least one heavy angle structure to accommodate a 90-degree turn in the route.

3.1.4.4 Route Alternative H3

Route alternative H3 is 2.6 miles long and was proposed to avoid private land enrolled in a state program. Route alternative H3 diverts from the applicants' proposed route 0.75 mile north of Crust Road, where it progresses southeast for 0.8 mile before turning southwest for 1.75 miles before rejoining the applicants' proposed route in an undeveloped area 1 mile north of County Road 22. Route alternative H3 does not include any transmission line ROW sharing, paralleling, or double-circuiting. It would also require at least one heavy angle structure to accommodate an angled turn in the route.

3.1.4.5 Route Alternative H4

Route alternative H4 is 2.1 miles long and was proposed to avoid private land by rerouting through tax-forfeited land. Route alternative H4 diverts southwest from the applicants' proposed route 0.75 mile north of County Road 22. It would progress southwest for 2 miles before rejoining the applicants' proposed route at the edge of an agricultural field southeast of the County Road 22 and County Road 23 intersection. Route alternative H4 does not include any transmission line ROW sharing, paralleling, or double-circuiting. It would also require at least one heavy angle structure to accommodate an angled turn in the route.

3.1.4.6 Route Alternative H5

Route alternative H5 is 2.4 miles long and was proposed to avoid private property and certain natural resources. This route alternative diverts from the applicants' proposed route 0.75 mile north of County Road 22, where it turns west for 0.5 mile and then due south for 0.75 mile. It then runs west along County Road 22 for 0.5 mile before heading southwest for 0.75 mile where it then rejoins the applicants'

proposed route southwest of the County Road 22 and County Road 23 intersection. Route alternative H5 does not include any transmission line ROW sharing, paralleling, or double-circuiting. It would also require at least four heavy-angle structures to accommodate 90-degree and angled turns in the route.

3.1.4.7 Route Alternative H6

Route alternative H6 is 1.7 miles long and was proposed to cross less private property and natural resources. Route alternative H6 diverts from the applicants' proposed route where it crosses County Road 22 and heads due west along the road for 1 mile before it progresses southwest for 0.75 mile. It rejoins the applicants' proposed route southeast of the County Road 22 and County Road 23 intersection. Route alternative H6 does not include any transmission line ROW sharing, paralleling, or double-circuiting. It would also require at least three heavy-angle structures to accommodate angled turns in the route.

3.1.4.8 Route Alternative H7

Route alternative H7 is 2 miles long and was proposed to avoid private property and certain natural resources. This route alternative diverts from the applicants' proposed route 0.5 mile south of the County Road 22 crossing. Route alternative H7 turns southwest for 0.6 mile before heading due west for 1.4 miles where it rejoins the applicants' proposed route on the east side of County Road 23. Route alternative H7 does not include any transmission line ROW sharing or paralleling, or double-circuiting. It would also require at least one heavy angle structure to accommodate an angled turn in the route.

3.1.4.9 Route Alternative K

Route alternative K is 6.8 miles long and generally runs west of the applicants' proposed route. Route alternative K diverts from the applicants' proposed route 0.25 mile north of State Highway 18, where it runs due south for 3.5 miles before turning southeast for 1.4 miles. Route alternative K then progresses due south for 1.9 miles before rejoining the applicants' proposed route southeast of the County Road 22 and County Road 23 intersection. Route alternative K would share existing transmission line ROW for its entire length, including where the line would cross between South Long Lake and North Long Lake.

3.1.4.10 Alignment Alternative AA12

Alignment alternative AA12 is 1.1 miles long and was proposed to avoid private property. Alignment alternative AA12 is located approximately 0.25 mile east of the applicants' proposed alignment, near where the line crosses County Road 22. Alignment alternative AA12 does not include any transmission line ROW sharing, paralleling, or double-circuiting. It would also require at least two heavy-angle structures to accommodate an angled turn in the route.

3.1.4.11 Alignment Alternative AA13

Alignment alternative AA13 is 1.9 miles long and was proposed to avoid private property and certain natural resources. Alignment alternative AA13 diverts from the applicants' proposed alignment 0.5 mile south of County Road 22 and progresses southwest before heading due west for approximately 1.5 miles where it rejoins the applicants' proposed alignment east of County Road 23. Alignment alternative AA13 does not include any transmission line ROW sharing, paralleling, or double-circuiting. It would also require at least one heavy-angle structures to accommodate an angled turn in the route and cross one existing transmission line.