The Environmental Protection Agency (EPA) Environmental Justice Screening Tool (reference (37) was also used to evaluate a 0.25-mile buffer of the project routes to consider the composition of the affected area to determine whether low-income, minority or tribal populations are present and whether there may be disproportionately high and adverse human health or environmental effects on these populations. This tool suggests that the project population's exposure to environmental hazards is similar to, or less than, the state and national average exposure values across a range of variables.

5.3.9.1 Potential Impacts and Mitigation Measures

There are eight townships that meet the definition of communities with EJCs located within or adjacent to the project. No adverse or permanent impacts to the identified EJCs are anticipated, particularly because the routing alternatives proposed in/adjacent to these communities are areas where the project would parallel existing transmission line ROW. There are no known minority populations or low-income populations that would be adversely affected by the project. Thus, environmental justice impacts are not anticipated.

5.4 Transportation and Public Services

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

Chapters 5.4.1 through 5.4.4 summarize the project's potential impacts on local roadways, utilities, emergency services, and airports. Methods for mitigating these impacts are also summarized. Temporary impacts to public services resulting from the project are anticipated to be minimal. Long-term impacts to public services are also anticipated to be minimal, but impacts would depend on the route selected for the project. Transportation impacts for specific route alternatives are discussed further in Chapter 6.

5.4.1 Roadways/Railways

The project is located primarily in rural areas. St. Cloud is the largest city near the project and a roadway hub. Major roadways located along the project include U.S. Highways 10 and 2; Minnesota Highways 6, 18, 23, 25, 27, 95, 169, 200, and 210; as well as numerous other county, city, and township roads (Map 5-3). The population density near St. Cloud is considerably higher than most areas along the project; therefore, roadways in this area tend to have higher traffic volumes than roadways near the remainder of the project.

There is no passenger rail service near the project; however, several freight lines are present (Map 5-3). The Burlington Northern Santa Fe (BNSF) rail line intersects the project in three separate locations, once at the northern end near Grand Rapids, once in a central portion near Brainerd, and once at the southern end of the project near St. Cloud.

5.4.1.1 Potential Impacts and Mitigation Measures

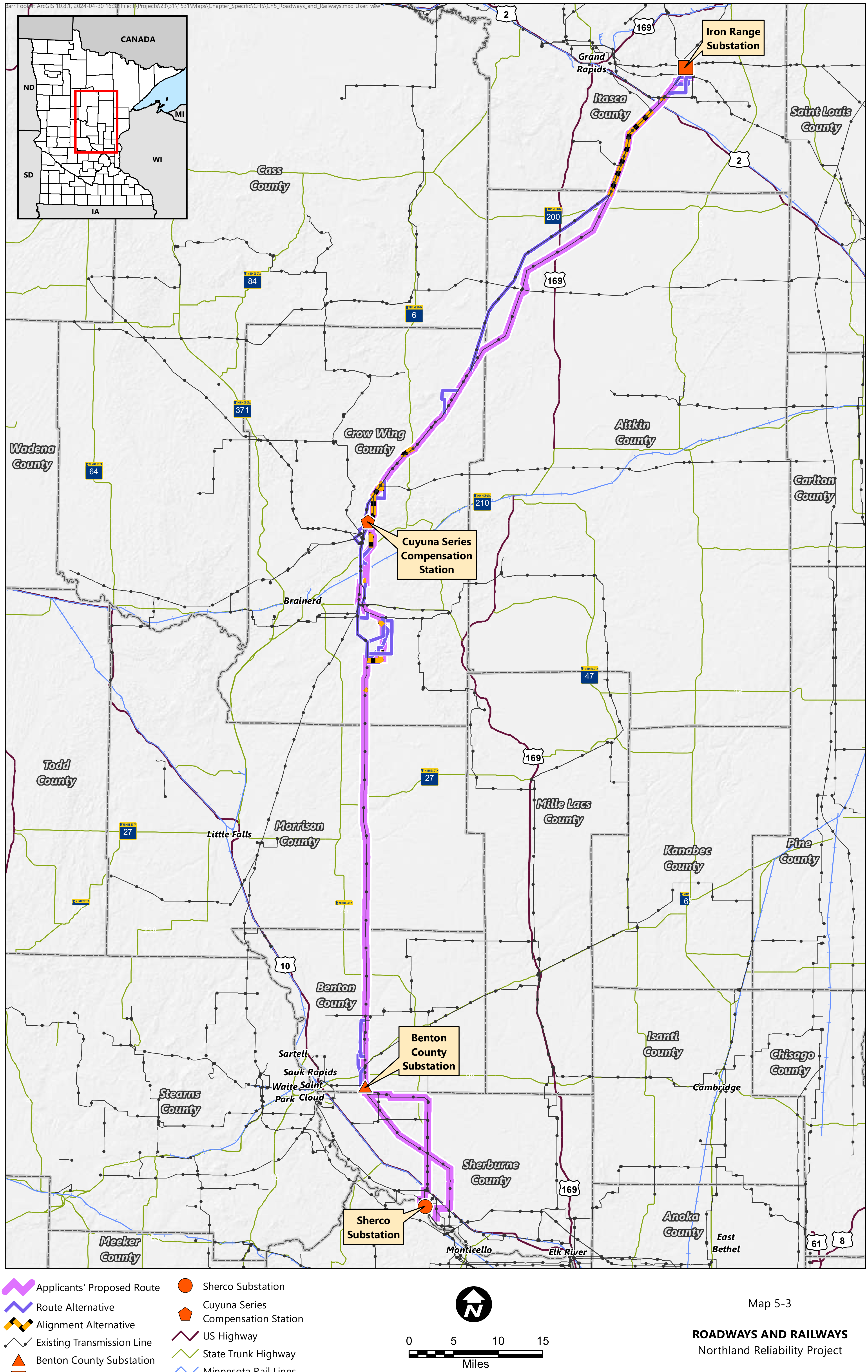
Construction could occasionally cause lanes or roadways to be closed, although these closures would only last for the duration of the construction activity in a given area. Construction equipment and delivery vehicles would increase traffic along roadways throughout project construction, with effects lasting from a few minutes to a few hours, depending upon the complexity and duration of the construction activities.

Drivers could experience increased travel times as a result. In cities, construction vehicles could temporarily block public access to streets and businesses.

The project could impact roadways and roadway users in several ways, including:

- Causing temporary traffic delays, detours, and congestion during construction.
- Interfering with future roadway expansions or realignments.
- Impairing the safe operation and maintenance of roadways.
- Causing safety risks during severe weather, where roadways are within the fall distance of transmission line structures.

Vehicles and equipment that would be used for construction of the transmission line (e.g., overhead line cranes, concrete trucks, construction equipment, and material delivery trucks) are generally heavier than 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.



Map 5-3

ROADWAYS AND RAILWAYS
Northland Reliability Project

Construction workers and construction-related vehicles using public roadways to access the transmission line ROW are likely to have localized adverse impacts on traffic volumes. Approximately 75-100 workers would be employed during construction. During the course of construction, workers would be dispersed throughout the project. Accordingly, the increase in vehicle traffic would represent a small increase over existing traffic volumes at any given time and location.

Transmission lines that parallel roads could affect future road expansions or realignments because structures placed along the road ROW might need to be moved to preserve a safe distance between structures and the edge of the expanded roadway. The project does not intend to locate any structures within the existing MnDOT road rights-of-way and coordination with the MnDOT will be completed to confirm that construction of the project will not interfere with routine roadway maintenance. When stringing lines across a road, the applicants will install appropriate traffic control and safety devices, such as H braces, signs, or flaggers. The applicants will work with townships and counties on the appropriate safety measures during stringing and haul routes.

Severe weather, including high winds, ice, snowstorms, and tornadoes, could possibly create safety hazards on any roadways located within the designed fall distance of an overhead transmission line. Snow and ice accumulation and high winds could increase a structure's weight, making it more susceptible to failure or collapse.

The applicants indicate that their design standards exceed NESC requirements for safe design and operation of transmission lines (reference (6)). These standards include designing transmission lines to withstand severe winds from summer storms and the combination of ice and strong winds from winter weather.

No impacts to railways are anticipated as a result of the project. Project construction would not cause delays or interfere with safe operation of the railways. There are very few opportunities for the project's transmission line route alternatives to parallel railways. Thus, the project is not anticipated to impact future rail expansions.

5.4.2 Public Utilities

Electric utilities near the project are provided by GRE, Connexus Energy, Xcel Energy, East Central Energy, Minnesota Power, Crow Wing Cooperative Power & Light Inc., Millie Lacs Electric Cooperative, and Lake Country Power. Four GRE substations, three Xcel Energy substations, and one Southern Minnesota Municipal Power Agency substation are located near the project.

Natural gas for the southern half of the project is provided by CenterPoint Energy. Natural gas for the remainder of the project is provided by Xcel Energy, Northern Natural Gas, and Great Plains Natural Gas Company. In addition to those previously listed natural gas facilities, there are several bulk transportation pipelines near the project. Additional pipelines are operated by Great Lakes Gas Company, ONEOK Inc., Lakehead Pipeline Company, Minnesota Pipeline Company, and Enbridge Energy. These pipelines are crossed by routing alternatives for the project.

Potable water is supplied to the project primarily by local wells. Near urban areas, primarily within municipalities, water mains and other public utilities are provided. Public works and utility departments design, construct, and maintain sanitary sewers, streets and sidewalks, parks, public landscaping, and water mains.

5.4.2.1 Potential Impacts and Mitigation Measures

Project impacts to public utilities are anticipated to be minimal to moderate depending on the project route selected. Potential public utility impacts are discussed further in Chapter 6.

In some areas, the project could cross over existing transmission lines, follow existing transmission line rights-of-way or cross or parallel electric distribution lines. No impacts to electrical service are anticipated as a result of these routing options; however, an overarching project objective is to enhance electrical service in the area. The project crosses over pipeline ROWs in multiple locations; the project crosses two pipelines in Itasca County, one pipeline in Atkin County, one pipeline in Crow Wing County, one pipeline in Morrison County, and two pipelines in Benton County. Potential project pipeline impacts can be avoided and mitigated by coordinating with the appropriate pipeline companies. The applicants indicate that they will use the Gopher State One-Call system to locate and mark all underground utilities to avoid potential impacts.

5.4.3 Emergency Services

Emergency services in the region are provided by local law enforcement and emergency response agencies of various counties and communities. Sheriffs' offices and municipal police departments in the area provide regional law enforcement. Itasca, Atkin, Cass, and Crow Wing Counties each have sheriff departments that provide services to their respective counties. Additionally, the cities of St. Cloud, Brainerd, Cross Lake, Breezy Point, Hill City, Crosby, and Grand Rapids all have local police departments.

Fire services within the region are provided by a mix of city and township fire departments. Grand Rapids, Hill City, Crosslake, Garrison, Brainerd, Little Falls, St. Cloud, Sartell, Rice, Pierz, Crosby, Becker, Emily, Clear Lake, and Mission Township all have fire departments that service surrounding cities and townships adjacent to the project.

Ambulance districts provide emergency medical response services throughout the region. The Mayo Clinic Ambulance – St. Cloud provides response services to Benton County; the Mayo Clinic Ambulance – Little Falls provides response services to Morrison County; North Memorial Ambulance (Brainerd) and Cuyuna Regional Medical Center provide response services to Crow Wing County; the North Memorial Ambulance provides response services to Aitkin County; Meds – 1 Ambulance Service Inc. provides response services to Itasca County; and Remer Area Ambulance Services provides response services to Cass County. Emergency medical response is also available from local hospitals, such as the Grand Itasca Clinic and Hospital, Cuyuna Regional Medical Center Emergency, Essential Health – St. Joseph's Medical Center, CHI St. Gabriel's Hospital, St. Cloud Hospital and CentraCare Health – Monticello (reference (40)).

5.4.3.1 Potential Impacts and Mitigation Measures

The project is not anticipated to impact emergency services. Any temporary road closures required during construction would be coordinated with local jurisdictions to provide for safe access of police, fire, and other emergency service vehicles. Any accidents that might occur during construction of the project would be handled through local emergency services. Given the limited number of construction workers involved in the project and the low probability of a construction-related accident, it is expected that the current emergency services will possess ample capacity to address any potential emergencies that may occur during project construction.

5.4.4 Airports

Transmission line structures and conductors can conflict with the safe operation of an airport if they are too tall and/or too close for the applicable safety zones. Different classes of airports have different safety zones depending on several characteristics, including runway dimensions, classes of aircraft they can accommodate, and navigation and communication systems (reference (12)). These factors determine the necessary take-off and landing glide slopes, which in turn determine the setback distance of transmission line structures.

The FAA and MNDOT have each established development guidelines on the proximity of tall structures to public-use airports. The FAA has also developed guidelines for the proximity of structures to very high frequency omni-directional range (VOR) navigation systems. Transmission lines near public airports are limited by FAA height restrictions, which prohibit transmission line structures above a certain height, depending on the distance from the specific airport. Regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. Private airstrips and personal use airstrips cannot be used in commercial transportation or by the general public and are therefore not subject to FAA regulatory obstruction standards (Minn. Rule part 8800.2400).

In addition, MNDOT has established separate zoning areas around airports. The most restrictive safety zones are safety zone A, which does not allow any buildings, temporary structures, places of public assembly, or transmission lines, and safety zone B, which does not allow places of public or semi-public assembly such as churches, hospitals, or schools. Permitted land uses in both zones include agricultural uses, cemeteries, and parking lots. Safety zone C, the horizontal airspace obstruction zone, encompasses all land enclosed within the perimeter of the imaginary horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii (5,000 to 10,000 feet) from the center of each end of the primary surface of each runway, and which is not included in zone A or zone B. As with FAA regulations, MNDOT zoning requirements only apply to public airports (Minn. Rule 8800).

One public airport and one private airport are located within the 1-mile ROI. The Hill City/Quadna Mountain Airport is a public airport located outside of Hill City in the Hill City to Little Pine region. It contains one runway. The project is not within safety zones A or B of the Hill City/Quadna Mountain Airport but is located within zone C, the horizontal Airspace Obstruction Zone (reference (41)). The Schroeder Airport is a private landing strip located in Becker Township within the Sherburne County region. The Schroeder Airport is privately-owned and is not subject to public airport zoning ordinances.

There are three FAA-listed, public use airports near the project: St. Cloud Regional Airport, Brainerd Lakes Regional Airport, and Grand Rapids/Itasca County Airport. The St. Cloud Regional Airport is owned by the St. Cloud Regional Airport Regional Authority. The project is located within zone C of the horizontal Airspace Obstruction Zone for the St. Cloud Regional Airport (reference (42)). The Brainerd Lakes Regional Airport is located approximately 2.6 miles west of the project and is owned by the City of Brainerd and Crow Wing County. The Grand Rapids / Itasca County Airport is located approximately 6.8 miles west of the project and is owned by the city of Grand Rapids and Itasca County.

5.4.4.1 Potential Impacts and Mitigation Measures

If the project’s transmission line structures are placed along a route near one of the airports identified above, and if these structures were not in accordance with applicable FAA, MNDOT, and airport guidelines, the structures could negatively impact airport use.

Potential airport impacts, as they exist today, are anticipated to be minimal as there are mitigation measures that can be employed to avoid these impacts, such as, routing away from the airport, the use of appropriate height structures to avoid impact to glide or approach slopes, and structure marking or lighting.

5.5 Public Health and Safety

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

5.5.1 Electric and Magnetic Fields

EMFs are invisible lines of force that surround electrical devices (e.g., power lines, electrical wiring, and electrical equipment) which are produced through the generation, transmission, and use of electric power. The term “EMF” is typically used to refer to EMF that are coupled together. However, for lower frequencies associated with power lines, EMF are relatively decoupled.

Electric fields are the result of electric charge, or voltage, on a conductor. The intensity of an electric field is related to the magnitude of the voltage on the conductor and is typically described in terms of kV per meter (kV/m). Magnetic fields are created and increase from the strength of the flow of current though wires or electrical devices. The intensity of a magnetic field is related to the magnitude of the current flow through the conductor and is typically described in units of magnetic flux density expressed as Gauss (G) or milliGauss (mG). Magnetic fields, unlike electric fields, are not shielded or weakened by materials that do not conduct electricity (e.g., trees, buildings). Rather, they pass through most materials.

Both magnetic and electric fields decrease rapidly with increased distance from the source. EMF are invisible just like radio, television, and cellular phone signals, all of which are part of the electromagnetic spectrum (reference (43)). EMF are found anywhere there are energized, current-carrying conductors, such as near transmission lines, local distribution lines, substation transformers, household electrical wiring, and common household appliances (reference (43)).

5.5.1.1 Magnetic Field Background Levels

The wiring and appliances located in a typical home produce an average background magnetic field of between 0.5 mG and 4 mG (references (44); (45)). 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 2 mG or less (reference (43)). Typical magnetic field strengths near common appliances are shown in Table 5-6.

Table 5-6 Typical Magnetic Field Strengths

Source	Distance from Source			
	0.5 foot	1 foot	2 feet	4 feet
	Typical Magnetic Fields (mG)			
Air Cleaners	180	20	3	0
Copy Machines	90	20	7	1
Fluorescent Lights	40	6	2	0
Computer Displays	14	5	2	0
Hair Dryers	300	1	0	0
Baby Monitor	6	1	0	0
Microwave Ovens	200	4	10	2
Vacuum Cleaner	300	60	10	1

Source: reference (43)

5.5.1.2 Research on EMF and Health Impacts

Research on whether exposure to low frequency EMF causes biological responses and health effects has been performed since the 1970s. The U.S. National Institute of Environmental Health Sciences and the World Health Organization have been a part of this research. Their research does not support a relationship or association between exposure to electric power EMF and adverse health effects.

The U.S. National Institute of Environmental Health Science evaluated numerous epidemiologic studies and comprehensive reviews of the scientific literature that examined associations of cancers with living near power lines, with magnetic fields in the home, and with exposure of parents to high levels of magnetic fields in the workplace. They concluded that "no consistent evidence for an association between any source of non-ionizing EMF and cancer has been found" (reference (44)).

Minnesota, Wisconsin, and California have also all performed literature reviews or research to examine this issue. In 2002, Minnesota formed an Interagency Working Group to evaluate EMF research and to develop public health policy recommendations regarding EMF associated with high-voltage transmission lines. The Working Group included staff from a number of state agencies and published its findings in a White Paper on EMF Policy and Mitigation Options. They found that some epidemiological studies have shown no statistically significant association between exposure to EMF and health effects, and some have shown a weak association. The Working Group noted that studies have not been able to establish a biological mechanism for how EMF may cause health impacts.

Worldwide, the majority of scientific panels that have reviewed the research conducted to date conclude that there is insufficient evidence to establish a direct association between EMF and adverse health effects. Based on this work, the Commission has repeatedly found that "there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects" (reference (46)). Appendix I provides detailed background on EMF health impact research.

5.5.1.3 Regulatory Standards

There are currently no federal regulations regarding allowable electric or magnetic fields produced by transmission lines in the United States; however, a number of states have developed state-specific regulations (Table 5-7), and a number of international organizations have adopted EMF guidelines (Table 5-8).

The Commission has established a standard that limits the maximum electric field under transmission lines to 8 kV/m. All transmission lines in Minnesota must meet this standard. The Commission has not adopted a magnetic field standard for transmission lines. However, the Commission has adopted a 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.

Table 5-7 State Electric and Magnetic Field Standards

State	Area where limits apply	Field	Limit
Florida	Edge of ROW	Electric	2 kV/m (lines ≤ 500 kV
		Magnetic	150 mG (lines ≤ 230 kV) 200 mG (> 230 kV- ≤ 500 kV) 250 mG (> 500 kV)
	On ROW	Electric	8 kV/m (≤ 230 kV) 10 kV/m (> 230 kV- ≤ 500 kV) 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: reference (43)

1 May be waived by landowner

Table 5-8 International Electric and Magnetic Field Guidelines

Organization	Electric Field (kV/m) General Public	Electric Field (kV/m) Occupational	Magnetic Field (mG) General Public	Magnetic Field (mG) Occupational
Institute of Electrical and Electronics Engineers	5	20	9,040	27,100
International Commission of Non-ionizing Radiation Protection	4	8	2,000	4,200
American Conference of Industrial Hygienists	0	25	0	10,000/1,000[1]
National Radiological Protection Board	4	0	830	4,200

Source: reference (47)

1 For persons with cardiac pacemakers or other medical electronic devices

5.5.1.4 Potential Impacts and Mitigation Measures

The predicted electric field level associated with the project is shown in Table 5-9 for the edge of ROW and at the location where the maximum electric field will be experienced (typically, under the transmission line). Where the project parallels existing transmission lines, the presence of another energized line nearby would impact the electric field profile around the parallel lines. Therefore, the predicted electric field levels associated with the various project scenarios where new transmission line parallels existing transmission lines are also shown in Table 5-9.

Because electric fields are dependent on the transmission line voltage, the values in Table 5-9 were calculated at the line’s maximum continuous operating voltage. Values were calculated assuming minimum conductor-to-ground clearance (that is, at mid-span) and a height of 1 meter above ground. The maximum calculated electric field among all possible configurations is 7.91 kV/m, which is within the Commission’s 8 kV/m limit. Lateral profiles of electric fields for each corridor configuration being considered for the project were provided in the RPA (reference (6)) and are in Appendix J.

Table 5-9 Calculated Electric Fields for Transmission Line Configurations

Transmission Line Configuration	Line Voltage	Edge of Right-of-Way, Electric Field (kV/m)	Maximum Electric Field (kV/m)
Project: Double-Circuit 345 kV	379.5 kV	0.54	7.89
Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	253 kV 379.5 kV	0.68	7.80
Existing: 115 kV H-Frame Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	126.5 kV 253 kV 379.5 kV	0.43	7.88
Existing: 115 kV H-Frame Existing: 115 kV H-Frame Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	126.5 kV 126.5 kV 253 kV 379.5 kV	0.54	7.79
Existing: 115 kV H-Frame Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	126.5 kV 253 kV 379.5 kV	0.44	7.80
Existing: 69 kV Monopole Project: Double-Circuit 345 kV	75.9 kV 379.5 kV	0.54	7.91
Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	253 kV 379.5 kV	0.61	7.65
Existing: 69 kV Monopole Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	75.9 kV 253 kV 379.5 kV	0.51	7.90
Existing: 69 kV Monopole Existing: Double-Circuit 230 kV Project: Double-Circuit 345 kV	72.5 kV 241.5 kV 379.5 kV	0.54	7.68
Project: Triple Circuit 345 kV with 69 kV	379.5 kV 72.5 kV	0.58	1.61
Existing: 345 kV Monopole Project: Double-Circuit 345 kV	362.3 kV 362.3 kV	0.12	5.99

The predicted magnetic field level associated with the project is shown in Table 5-10 for the edge of ROW and at the location where the maximum magnetic field will be experienced (typically, under the transmission line). Where the project parallels existing transmission lines, the presence of another energized line nearby would impact the magnetic field profile around the parallel lines. Therefore, the predicted magnetic field intensity associated with the various project scenarios where new transmission line parallels existing transmission lines are also shown in Table 5-9.

Because magnetic fields are dependent on the current flowing on the transmission line, the values in Table 5-10 are provided for the projected typical loading under high transfer conditions for the project. Typical loading for the project was derived from power system modeling of the project during winter peak power flow. Values were calculated assuming minimum conductor-to-ground clearance (that is, at mid-span) and a height of 1 meter above ground. The maximum calculated magnetic field among all possible configurations during typical loading is 173.2 mG. The maximum possible magnetic field at the edge of the ROW was calculated to be 28.5 mG.

Table 5-10 Calculated Magnetic Fields for Transmission Line Configurations

Transmission Line Configuration	Line Current (Amps)	Edge of Right-of-Way Magnetic Field (mG)	Maximum Magnetic Field (mG)
Project: Double-Circuit 345 kV	1549.0	22.6	171.5
Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	39.9 1549.0	25.7	167.0
Existing: 115 kV H-Frame Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	29.6 39.9 1549.0	19.98	170.7
Existing: 115 kV H-Frame Existing: 115 kV H-Frame Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	29.6 88.4 39.9 1540.0	22.4	166.0
Existing: 115 kV H-Frame Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	43.7 376.8 1549.0	17.4	173.2
Existing: 69 kV Monopole Project: Double-Circuit 345 kV	104.6 1549.0	26.4	165.8
Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	376.8 1549.0	28.5	160.4
Existing: 69 kV Monopole Existing: 230 kV H-Frame Project: Double-Circuit 345 kV	67.8 376.8 1549.0	14.9	167.6
Existing: 69 kV Monopole Existing: Double-Circuit 230 kV Project: Double-Circuit 345 kV	67.8 472.9 1549.0	22.8	165.2
Project: Triple Circuit 345 kV with 69 kV	986.3 119.7	21.8	40.6
Existing: 345 kV Monopole Project: Double-Circuit 345 kV	986.3 119.7	19.2	68.2

There is no federal standard for transmission line electric or magnetic fields. The Commission has historically imposed a maximum electric field limit of 8 kV/m measured at 1 meter above ground for new transmission projects. All transmission lines in Minnesota must meet this standard. The Commission has not adopted a magnetic field standard for transmission lines. However, the Commission has adopted a 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. No impacts are anticipated for the project, so no mitigative measures are proposed.

5.5.2 Medical Devices

Electromechanical implantable medical devices, such as cardiac pacemakers, implantable cardioverter defibrillators (ICDs), neurostimulators, and insulin pumps may be subject to interference from EMF (electromagnetic interference, EMI), which could mistakenly trigger a device or inhibit it from responding appropriately (reference (33)). While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. The American Conference of Governmental Industrial Hygienists (ACGIH) and ICD Manufacturer's recommended magnetic and electric field exposure limits are 1 g and 1 kV/m, respectively, for people with pacemakers (references (48); (33)). One gauss is five to 10 times greater than the magnetic field likely to be produced by a high-voltage transmission line (reference (33)).

5.5.2.1 Potential Impacts and Mitigation Measures

EMF exposure produced by transmission lines generally does not affect implantable devices, but in the event that they are affected it is typically a temporary asynchronous pacing. Electric and magnetic field levels decrease with distance; however, and maximum levels at the edge of the ROW are anticipated to be less than 1.5 kV/m, and, in most instances, less than 1 kV/m (Table 5-9). Maximum levels of magnetic fields at the edge of the ROW are anticipated to be 28.5 mG (Table 5-10). Accordingly, impacts to implantable medical devices and their users are anticipated to be minimal. If a medical device is affected, the device will return to normal operation when the person moves away from the source of the EMF (reference (33)). Therefore, no adverse health impacts or permanent impacts on implantable medical devices are anticipated as a result of the project.

5.5.3 Stray Voltage

Electrical systems that deliver power to end-users and electrical systems within the end-user's business, home, 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. Stray voltage could 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. Thus, stray voltage could exist at any business, house, or farm which uses electricity—independent of whether there is a transmission line nearby.

Where utility distributions systems are grounded, a small amount of current will flow through the earth at those points. This is called neutral-to-earth voltage (NEV), which is voltage that is associated with distribution lines and electrical wiring within buildings and other structures (reference (49)). Stray voltage is not created by transmission lines, as they do not directly connect to businesses or residences. Site-specific mitigation measures are required to address potential stray voltage impacts (reference (50).

The USDA defines stray voltage as "a small voltage (less than 10 volts) measured between two points that can be simultaneously contacted by an animal" (reference (49)). Stray voltage and its effects on farms have been studied for nearly 30 years. Numerous studies have found that though it is likely to exist on farms, it is rarely strong enough to affect the behavior or production of dairy cattle. (reference (51)). The Commission issued a report in 1998 supporting the conclusion that no credible scientific evidence has been found to show 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 (reference (51)).

5.5.3.1 Potential Impacts and Mitigation Measures

Stray voltage is, generally, an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms. Accordingly, no impacts due to stray voltage are anticipated from the project. The project would not directly connect to businesses or residences in the area and would not change local electrical service.

5.5.4 Induced Voltage

It is possible for electric fields from a transmission line to extend to a conductive object that is near a line. This may induce a voltage on the object; the magnitude of the voltage depends on several factors such as the size, shape and orientation of the object along the ROW. Smaller conductive objects near the line could cause a nuisance shock to a person, but it is not a potential safety hazard. If there were insulated pipelines, electric fences, telecommunication lines, or other conductive objects with greater lengths and sizes, induced voltage from a transmission line could become unsafe to people who touch them but still this has not been found to be considered a health safety hazard (reference (52)).

5.5.4.1 Potential Impacts and Mitigation Measures

Shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. The transmission line would follow the NESC, which requires the steady-state (continuous) current between the earth and an insulated object located near a transmission line to be below 5 milliamps (mA) (reference (52)). In addition, the Commission limits electric fields to 8 kV/m to prevent serious hazard from shocks due to induced voltage under transmission lines (reference (53)). Any route permits that are issued have to meet the NESC standards and the Commission's electric field limit.

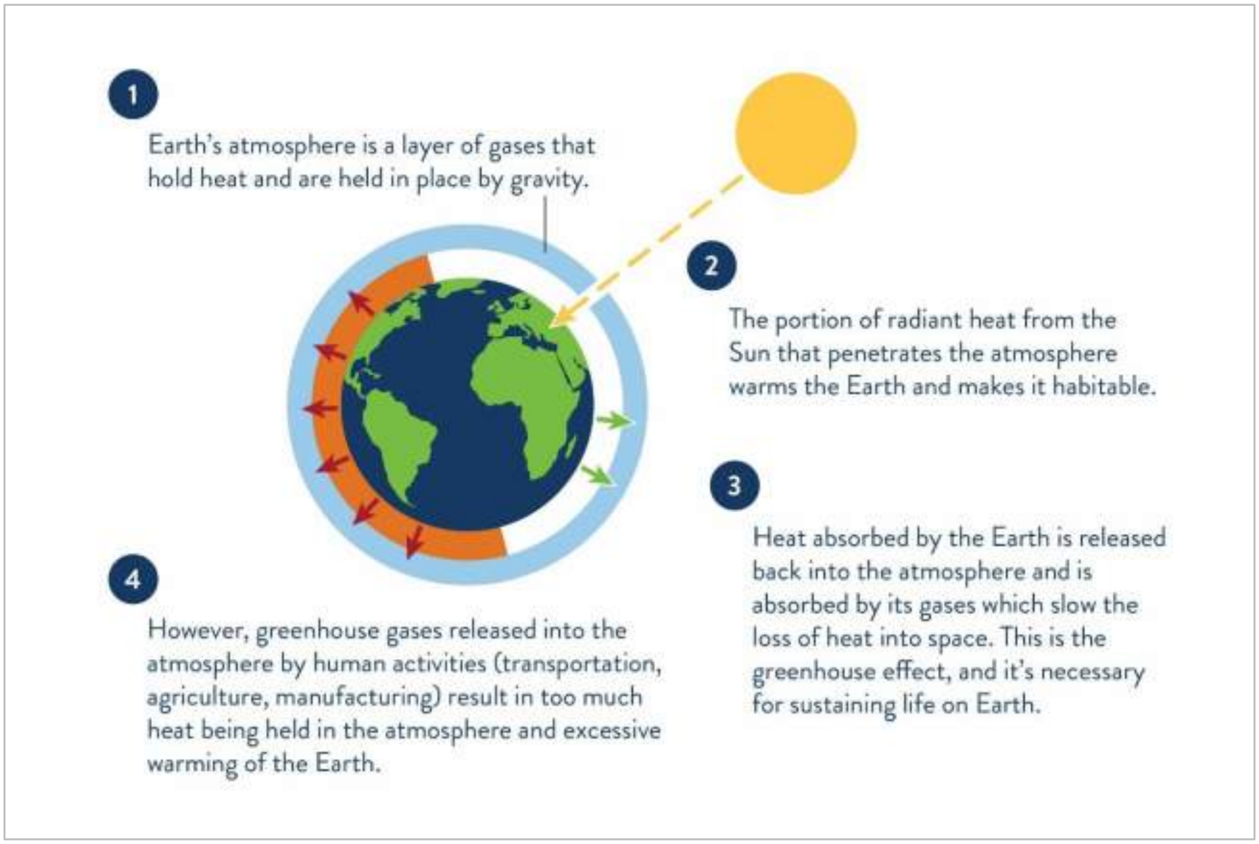
5.6 Climate Change

Chapters 5.6.1 and 5.6.2 describe potential impacts of the project on climate change and the project's climate resilience.

5.6.1 Greenhouse Gases

GHGs are gases that trap heat in the atmosphere. Some of the solar radiation that reaches Earth's surface radiates back toward space as infrared radiation. GHGs trap heat in the atmosphere from the absorption of this infrared radiation, which causes a rise in the temperature of Earth's atmosphere. This warming process is known as the greenhouse effect (reference (54)). This greenhouse effect is illustrated in Figure 5-2.

Figure 5-2 Greenhouse Effect



The most common GHGs include CO_2, methane (CH_4), nitrous oxide (N_2O), and fluorinated gases. Anthropogenic GHG emissions are responsible for about two-thirds of the energy imbalance that is causing Earth's temperature to rise, which has direct and cascading effects on weather and climate patterns, vegetation, agriculture, disease, availability of water, and ecosystems (reference (55)).

Climate change and decarbonization have been discussed for decades at all levels of government, as well as in global, national, and local institutions. There is general agreement that immediate and large-scale progress toward carbon neutrality is needed. Many countries have announced decarbonization initiatives. The first binding global agreement, the Paris Agreement, was established in 2016. The Paris Agreement goal is to keep the rise in mean global temperature to well below 3.6°F, and preferably limit the increase to 2.7°F. To meet this goal, global emissions will need to be reduced as soon as possible and reach net zero by the middle of the 21st century (reference (56)).

More recently in 2021, the United States announced the Net Zero World Initiative to reach net zero by 2050 and the 2030 Greenhouse Gas Pollution Reduction target to achieve a 50-52 percent reduction in greenhouse gas emissions from 2005 levels. The reductions would be accomplished by accelerating transitions to net zero, resilient, and inclusive energy systems (references (57): (58)).

The State of Minnesota has also established a goal for the reduction of GHG emissions, set forth in Minn. Statute 216H.02:

> *It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions by at least the following amounts, compared with the level of*

emissions in 2005: (1) 15 percent by 2015; (2) 30 percent by 2025; (3) 50 percent by 2030; and (4) to net zero by 2050.

Minn. Statute 216B.1691 Renewable Energy Objectives, which became effective in 2023, requires all electric utilities to generate or procure 100 percent of electricity sold to Minnesota customers from carbon-free sources by 2040, with an interim goal of 80 percent (for public utilities) and 60 percent (for other electric utilities) carbon-free electricity by 2030. Carbon-free sources are those that generate electricity without emitting CO_2. Electric utilities are also required to generate or procure 55 percent of electricity sold to Minnesota customers from an eligible energy technology by 2035. Eligible energy technology includes technology that generates electricity from solar, wind, and certain hydroelectric, hydrogen, and biomass sources (Minn. Statute, 216B.1691).

Identified GHG emissions associated with the construction and operation of the project consist of direct emissions generated from combustion sources (e.g., mobile on- and off-road sources) and land use change. Indirect emissions associated with the construction and operation of the project include the GHG emissions associated with electrical consumption. GHG emissions are anticipated to be similar for each routing alternative and are therefore not presented in this chapter. However, calculations for each alternative are summarized in Appendix K.

Construction emissions from mobile combustion were calculated for tree clearing equipment (flatbed trucks, excavators, portable heaters, etc.) and other construction equipment (dump trucks, cranes, bulldozers, etc.). Construction emissions from combustion sources are anticipated to be similar for each routing alternative. Therefore, the total construction combustion emissions and length of the applicants' proposed route were used to calculate an emission rate per route length, in metric tons CO_2e/mile, to quantify combustion emissions for each alternative. Construction emissions from temporary land use changes were calculated with an assumed construction duration of 60 days for each land use change area.

Identified greenhouse gas emissions associated with operation of the project include direct emissions generated from combustion sources (e.g., mobile on- and off-road sources) and land use change, and indirect emissions from electrical consumption. Operational emissions from mobile combustion were calculated for yearly inspection maintenance equipment (ATVs, pickup trucks, helicopters), yearly maintenance or emergency work equipment (helicopters, bucket trucks, personnel carriers), and vegetation management equipment assumed to be used every five years (ATVs, pickup trucks, chainsaws, etc.). Operation emissions from mobile combustion are anticipated to be similar for each routing alternative. Therefore, operation emissions from mobile combustion have only been calculated for the applicants' proposed route. Operation emissions from temporary land use changes were calculated with the assumption that forest land, cropland, and settlement land would be converted to grassland following completion of the project and for the duration of operations. Operational emissions from electrical consumption included the operation of all substations and associated equipment.

Potential emission of the fluorinated gas sulfur hexafluoride (SF_6) is also associated with this project. SF_6 is a powerful GHG that is used in high-voltage circuit breakers in transmission systems. The use of such a substance is extremely common due to its stability and effectiveness at insulating electrical equipment. However, SF_6 emissions from high-voltage circuit breakers are minimal and not expected routinely since they are largely attributed to faulty equipment and leakage.

5.6.1.1 Potential Impacts and Mitigation Measures

The project construction and operations will result in GHG emissions. However, the project is proposed to optimize regional transfer capability as coal-fired generation ceases in northern Minnesota and significant renewable generation comes online in the upper Midwest. The Project would ultimately result in a net decrease of GHG emissions during operation, as it would facilitate the replacement of legacy fossil fuel generation with renewable resources. The project is anticipated to reduce CO_2 emissions in the broader MISO region by 399 million metric tons over the first twenty years. The project would also increase regional transmission reliability and allow additional carbon-free energy sources to be integrated into the power supply. The project will therefore assist in achieving climate goals.

Minimization efforts to reduce project GHG emissions may include efficient planning of vehicle and equipment mobilization and travel, vehicle idle time reduction, proper equipment upkeep, efficient planning of material delivery, proper use of power tools, battery power tools when feasible, and alternative fuel vehicle usage when feasible. Additionally, SF_6 breakers would be properly tracked and maintained at substation sites to ensure leak detection and minimize malfunctions.

5.6.2 Climate Resilience

Climate change is observed as changes in temperature and precipitation patterns, increases in ocean temperatures and sea level, changes in extreme weather events, and ecosystem changes. These changes are largely attributed to the greenhouse effect. As the amount of GHGs in Earth's atmosphere increases, the greenhouse effect causes Earth to become warmer (reference (59)).

There are also naturally occurring climate variations. These are cyclical patterns caused by variations in ocean circulation and atmospheric pressure patterns that occur on timescales of weeks to decades. Increased global surface temperatures may change these natural climate patterns and the resulting impact on regional precipitation and temperature anomalies (reference (60)).

Warmer and wetter conditions have been observed in Minnesota since 1895, especially in the past several decades. An increase in precipitation and precipitation intensity has also been observed, including devastating, large-area extreme rainstorms. A rise in temperatures, particularly during the winter season, has been occurring as well. These trends are expected to continue (reference (61)).

To understand how climate change is anticipated to affect the project location, historical and projected climate data is considered, as well as climate hazard projections. The DNR's Minnesota Climate Explorer tool provides a summary of historical climate data for various regions across Minnesota.

Figure 5-3 summarizes the mean, maximum, and minimum average daily temperature from 1895 to 2023 for counties traversed by the project. It also shows the temperature trends per decade from 1895 to 2023 and from 1994 to 2023 to represent the full record of data and the most recent 30-year climate normal period, respectively. In each temperature statistic, the counties exhibited an increase in daily temperature from 1895 to 2023. The annual average minimum daily temperature has increased at the largest rate of the three temperature statistics.

Figure 5-3 **Historical Annual Mean, Maximum, and Minimum Daily Air Temperature (°F) for Counties Traversed by the Project from 1895 to 2023**

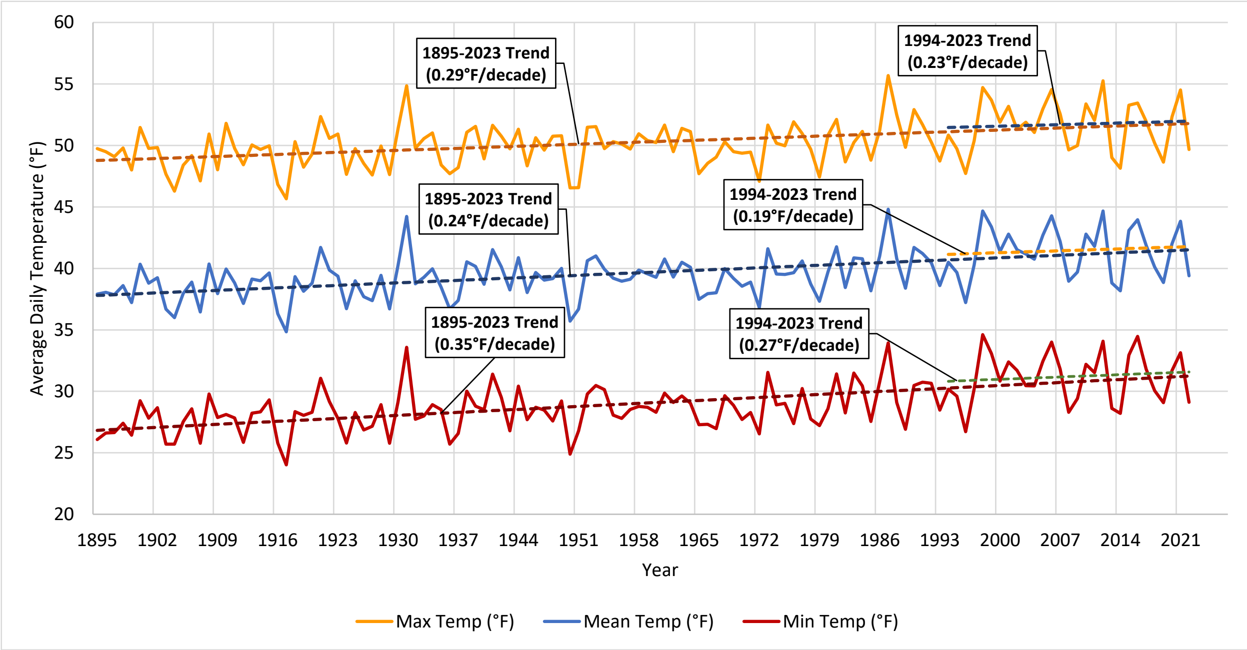


Figure 5-4 shows the total annual precipitation for counties traversed by the project from 1895 to 2023. Total annual precipitation has increased from 1895 to 2023 by a rate of 0.30 in/decade and decreased from 1994 to 2023 by a rate of 0.17 in/decade.

Figure 5-4 **Historical Total Annual Precipitation (inches) for Counties Traversed by the Project from 1895 to 2023**

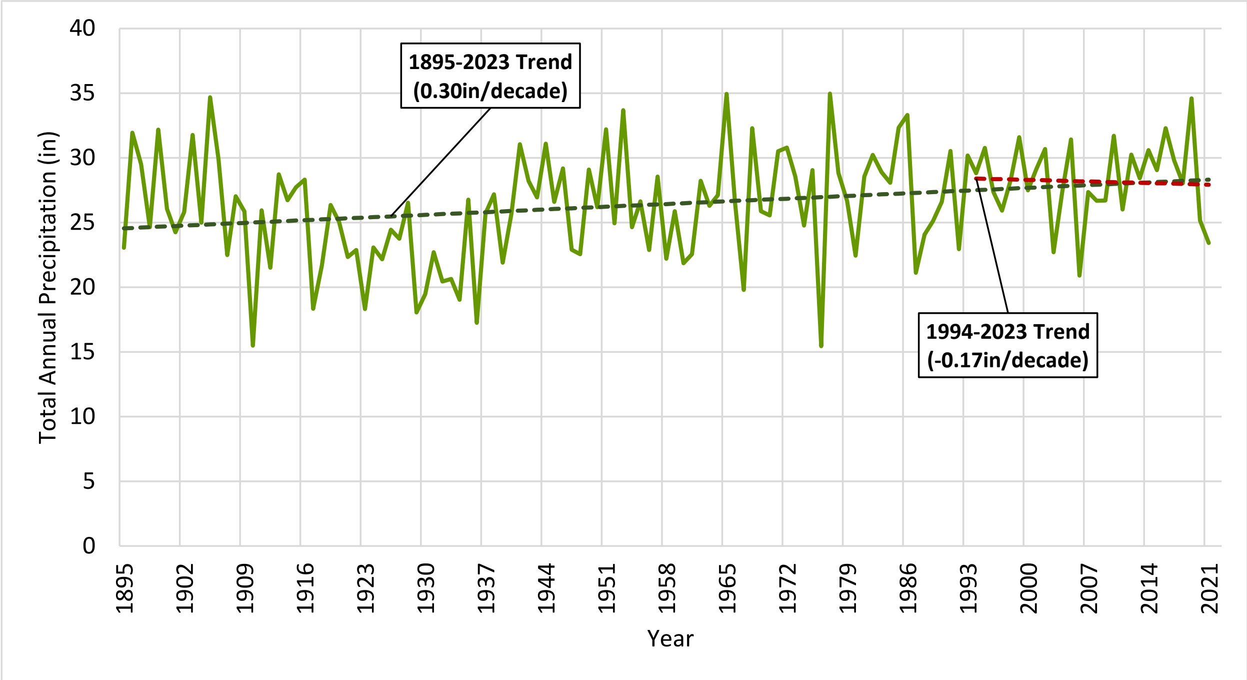
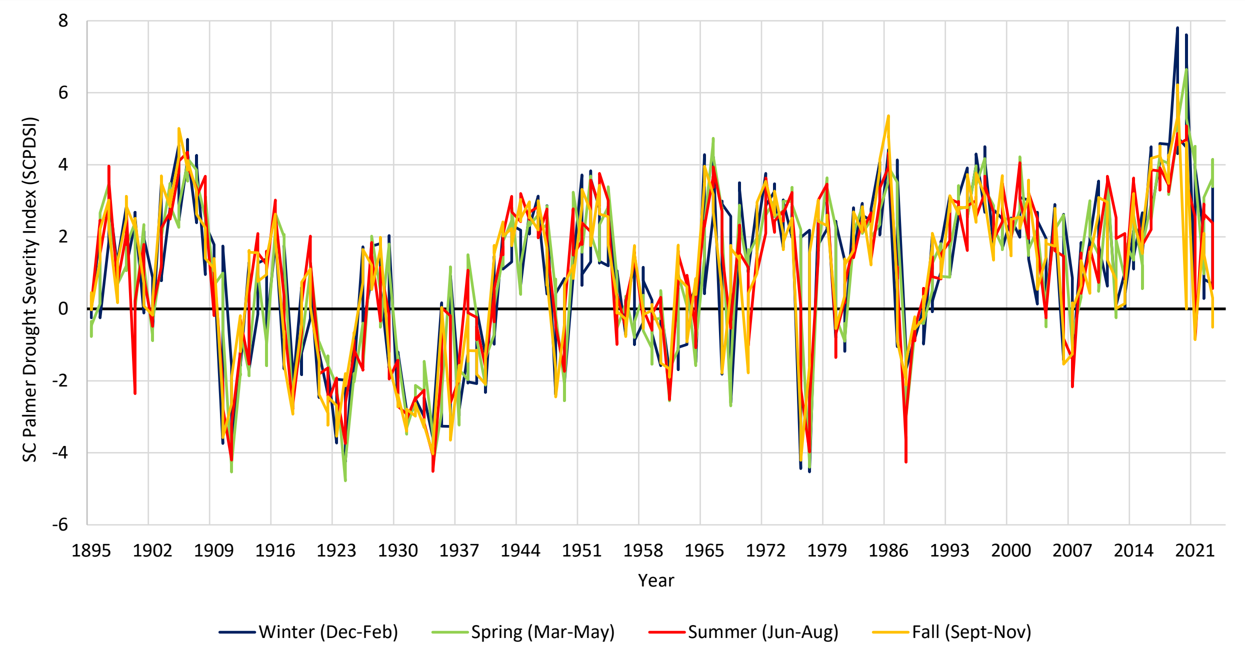


Figure 5-5 shows the seasonal drought severity for counties traversed by the project from 1895 to 2023 using the Self-Calibrated Palmer Drought Severity Index (scPDSI). The scPDSI is a meteorological drought index that measures the departure of moisture. Negative scPDSI values indicate drought conditions, positive values indicate wet conditions, and values near zero indicate normal conditions (reference (62)x). The counties experienced frequent drought episodes from 1910 to 1940 and 1955 to 1965. From 1966 to 2023, seasonal wet conditions have generally been more frequent.

Figure 5-5 Historical Drought Severity for Counties Traversed by the Project from 1895 to 2023



Future projections are based on dynamically downscaled climate model data that was developed by the University of Minnesota and are summarized in two scenarios, Representative Concentration Pathway (RCP) 4.5 and RCP 8.5 (reference (2)). RCP is a measure adopted by the Intergovernmental Panel on Climate Change to represent various greenhouse gas concentration pathways. The numbers (i.e., 4.5 and 8.5) represent the amount of net radiative forcing the earth receives in watts per meter squared where a higher RCP signifies a more intense greenhouse gas effect resulting in a higher level of warming. RCP 4.5 represents an intermediate scenario where emissions begin to decrease around 2040 and RCP 8.5 represents a scenario with no emissions reductions through 2100 (reference (63)).

Figure 5-6 shows the modeled upper limit, average, and lower limit annual mean, maximum, and minimum historical and projected air temperature for counties traversed by the project. The climate models predict the average temperature for the counties to increase by approximately 4°F by Mid-Century (2040 to 2059) compared to Historical Present (1980 to 1999) conditions under the RCP 4.5 scenario. For Late-Century (2080 to 2099), average temperature is projected to increase by approximately 6°F under RCP 4.5 and approximately 10°F under the RCP 8.5 scenario.

Figure 5-6 Historical and Projected Annual Mean, Maximum, and Minimum Temperature for Counties Traversed by the Project

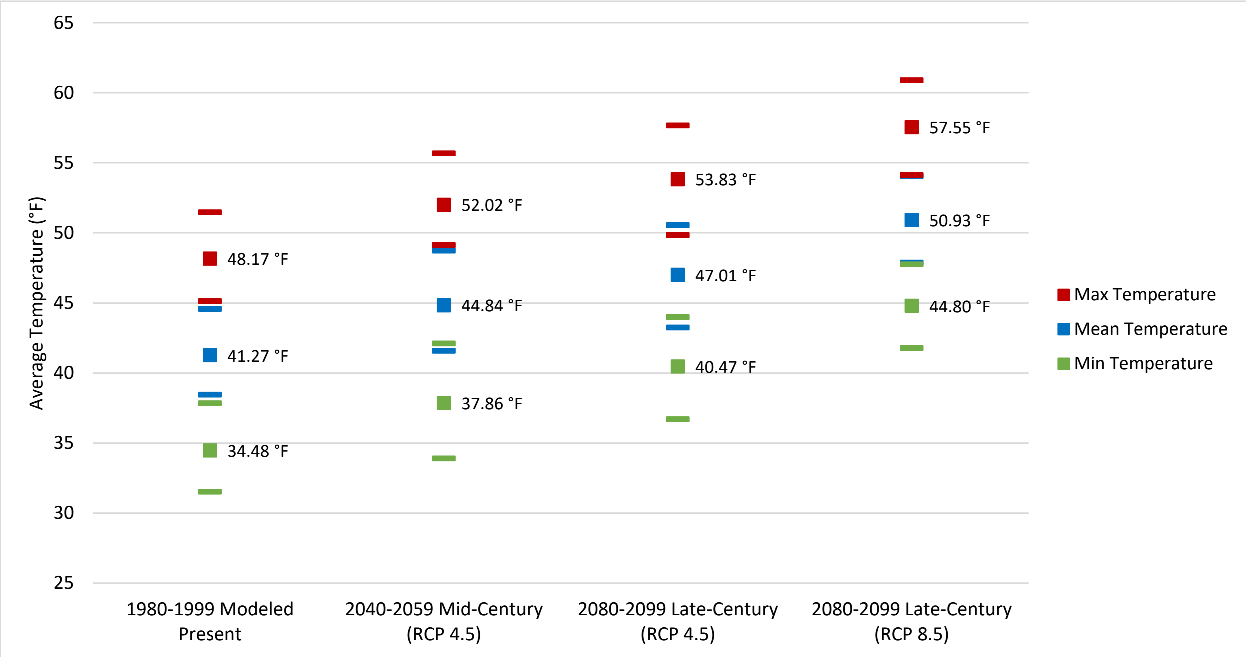
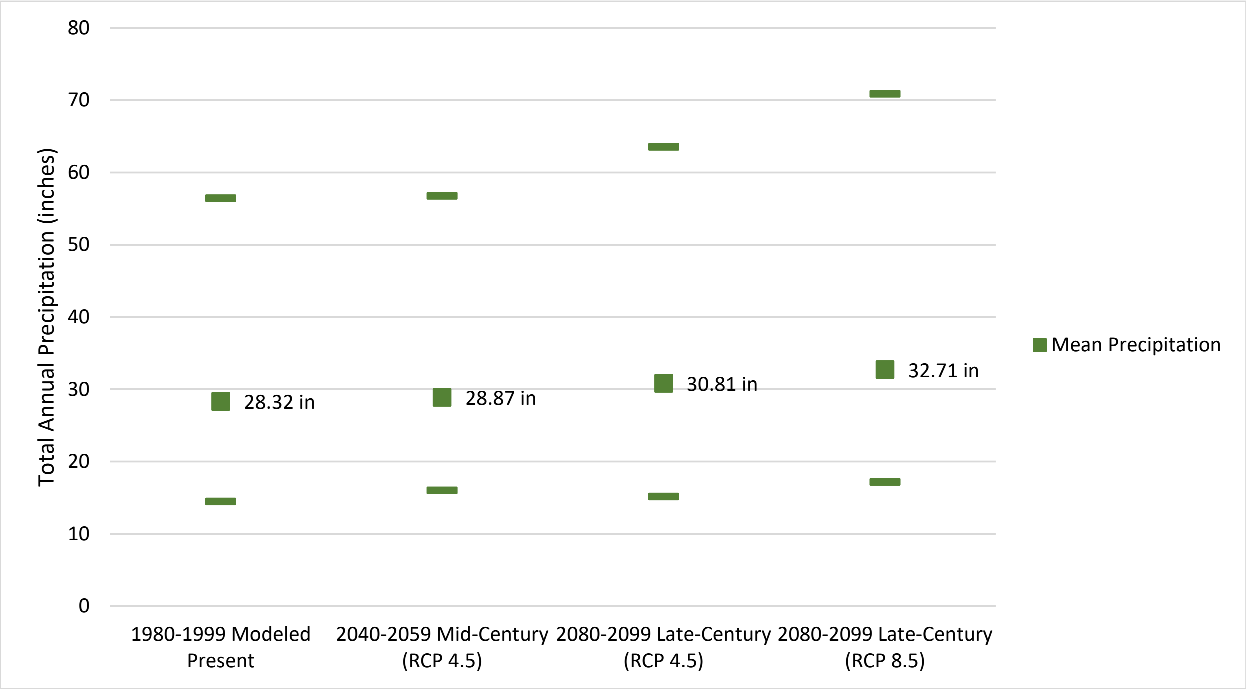


Figure 5-7 shows the modeled upper limit, mean, and lower limit historical and projected total annual precipitation for counties traversed by the project. The model mean shows that from the Historical Present to Mid-Century under RCP 4.5 conditions, there may be a slight increase in average precipitation of 0.55 inches. For Late-Century, the model mean shows an increase of 2.49 inches (RCP 4.5) and 4.39 inches (RCP 8.5) annually.

Figure 5-7 Historical and Projected Total Annual Mean Precipitation (inches) for Counties Traversed by the Project



The EPA Climate Resilience Evaluation and Awareness Tool (CREAT) provides general climate projections to help planning in water, wastewater, and stormwater utilities (reference (64)). For the project area, CREAT anticipates the 100-year storm intensity of 2.1 to 2.5 increasing to a value between 13.1 and 14.4 percent in 2035. CREAT anticipates the 100-year storm intensity of 4.0 to 4.8 increasing to a value between 25.6 and 28.1 percent in 2060. The EPA Streamflow Projections Map summarizes general projections related to streamflow under climate change (reference (65)). The EPA Streamflow Projections Map shows the anticipated general change in average streamflow of streams within the project area by a ratio of 1.24 to 1.30 (90th percentile) under wetter projections and a ratio of 0.74 to 0.78 (10th percentile) under drier projections in 2071 to 2100 (RCP 8.5) compared to baseline historical flow (1976 to 2005).

The risk assessment and map tool was used to create a risk assessment for the counties traversed by the project to help identify current and future climate change risks (reference (65)). Risks for flood, heat, wind, and wildfire are summarized in Table 5-11.

Table 5-11 Climate Change Risks for Counties Traversed by the Project

County	Flood Risk	Heat Risk	Wind Factor	Wildfire Risk
Itasca	Moderate	Minimal	Minimal	Moderate
Aitkin	Minor	Minimal	Minimal	Moderate
Cass	Major	Minimal	Minimal	Major
Crow Wing	Moderate	Minimal	Minimal	Moderate
Morrison	Moderate	Minimal	Minimal	Moderate
Benton	Moderate	Minor	Minimal	Moderate
Sherburne	Moderate	Minor	Minimal	Moderate
Wright	Major	Minor	Minimal	Moderate
Stearns	Moderate	Minor	Minimal	Moderate

The flood risk is moderate for the majority of counties traversed by the project, with the exception of a minor risk for Aitkin County and major risk for Cass and Wright Counties. The heat risk is minor or minimal for all counties. The wind factor is minimal for all counties. The wildfire risk is moderate for a majority of counties traversed by the project, with the exception of a major risk for Cass County.

5.6.2.1 Potential Impacts and Mitigation Measures

The project would be routed and designed to be resilient under changing climatic factors such as increased temperatures and changes in intensity and timing of storm events and associated precipitation. High temperatures can affect the sagging of a transmission line and its thermal tolerance. However, the transmission lines would be built to NERC reliability standards to address thermal limitations. Changes in storm timing and intensity could increase landslide potential in steep areas and increase local flooding. Final structure placement would consider slope to avoid areas with steeper slopes that could be prone to future erosion or landslides from increased, intense precipitation events. During construction, a Stormwater Pollution Prevention Plan would be implemented to manage stormwater and reduce the potential for runoff and erosion. Upon the conclusion of construction, the work areas would be restored. During operation, wildfire prone debris will be removed as a maintenance activity.

5.7 Air Quality

The Clean Air Act (CAA) is a federal law that regulates air emissions from stationary and mobile sources. The CAA requires the EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants, referred to as “criteria pollutants”. The six criteria pollutants are ground-level O_3, particulate matter (PM_{10}/$PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and lead (Pb) (reference (66)). NAAQS are set to address the public health and welfare risks posed by certain widespread air pollutants (references (67); (68)). Compliance with the national and state air quality standards in the state of Minnesota is assessed at the county level. The EPA designates all counties traversed by the project to be in attainment for all NAAQS.

In Minnesota, air quality is monitored using stations located throughout the state. The MPCA uses data from these monitoring stations to calculate the Air Quality Index (AQI) on an hourly basis for O_3, $PM_{2.5}$,

SO_2, NO_2, and CO. Each day is categorized based on the pollutant with the highest AQI value for a particular hour (reference (69).

The Iron Range Substation Region and Hill City to Little Pine Region are located nearest to the Fond du Lac air quality monitor. This station is located approximately 30 miles southeast of the Iron Range Substation Region and 30 miles east of the Hill City to Little Pine Region. The station monitors for O_3 and $PM_{2.5}$. A summary of days in each AQI category at the Fond du Lac monitor for the most recent five-year period available, covering 2018-2022, is provided in Table 5-12.

Table 5-12 Days in Each Air Quality Index Category – Fond du Lac Monitor

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2022	354	1	0	0	0
2021	329	32	4	0	0
2020	351	3	0	0	0
2019	346	10	0	0	0
2018	330	24	0	0	0

Air quality has been considered good for the majority of the past five reported years in Fond du Lac. Since 2018, 2021 had the largest number of days classified as moderate or worse. In 2021, 32 days were classified as moderate, and 4 days were classified as unhealthy for sensitive groups.

The Cole Lake-Riverton Region and Long Lake Region are located nearest to the Brainerd air quality monitor. This station is located approximately 3 miles west of the Cole Lake-Riverton Region and 4 miles northwest of the Long Lake Region. The station monitors for O_3 and $PM_{2.5}$. A summary of days in each AQI category at the Brainerd monitor for the most recent five-year period available, covering 2018-2022, is provided in Table 5-13.

Table 5-13 Days in Each Air Quality Index Category – Brainerd Monitor

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2022	344	21	0	0	0
2021	304	47	2	2	0
2020	348	11	0	0	0
2019	335	23	1	0	0
2018	311	36	1	0	0

Air quality has been considered good for the majority of the past five reported years in Brainerd. Since 2018, 2021 had the largest number of days classified as moderate or worse. In 2021, 47 days were classified as moderate, 2 days were classified as unhealthy for sensitive groups, and 2 days were classified as unhealthy.

The Morrison County Region, Benton County Elk River Region, and Sherburne County Region are located nearest to the St. Cloud air quality monitor. This station is located approximately ten miles southwest of the Morrison County Region, five miles west of the Benton County Elk River Region, and five miles west of the Sherburne County Region. The station monitors for O_3 and $PM_{2.5}$. A summary of days in each AQI category at the St. Cloud monitor for the most recent five-year period available, covering 2018-2022, is provided in Table 5-14.

Table 5-14 Days in Each Air Quality Index Category – St. Cloud Monitor

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2022	246	30	0	0	0
2021	290	66	3	2	0
2020	336	30	0	0	0
2019	313	31	0	0	0
2018	310	54	1	0	0

Air quality has been considered good for the majority of the past five reported years in St. Cloud. Since 2018, 2021 had the largest number of days classified as moderate or worse. In 2021, 66 days were classified as moderate, 3 days were classified as unhealthy for sensitive groups, and 2 days were classified as unhealthy (reference (69)).

5.7.1.1 Potential Impacts and Mitigation Measures

Air emissions during construction would primarily consist of emissions from construction equipment and would include pollutants such as CO_2, nitrogen oxides (NO_x), and PM. Dust generated from earth disturbing activities also gives rise to PM_{10}/$PM_{2.5}$. Emissions from construction vehicles could be minimized by using modern equipment with lower emissions ratings. Adverse effects on the surrounding environment are expected to be negligible due to the temporary disturbance during construction and the intermittent nature of the emission- and dust-producing construction phases. If construction activities generate problematic dust levels, the applicants may employ construction-related practices to control fugitive dust.

During operations, air emissions would be minimal and therefore would not require any air quality permits. Small amounts of emissions would be associated with the intermittent project operation and maintenance activities via mobile combustion and particulate roadway dust generation. If dust levels become problematic during operation and maintenance activities, the applicants may employ fugitive dust control practices such as wetting of unpaved roads. Cleared ROWs, storage areas, and access roads would be restored and revegetated once construction is complete, limiting further dust production. A small amount of O_3 would be created due to corona from the operation of transmission lines. The emission of O_3 during operations is not anticipated to have a significant impact on air quality (reference (70)).

5.8 Land-Based Economies

The project's construction and operation have the potential to impact land-based economies. Transmission lines are a physical, long-term presence on the landscape which could prevent or otherwise limit use of land for other purposes. When placed in an agricultural field, transmission line structures have a relatively small footprint, yet they can interfere with farming operations. In addition, structures and tall growing trees are not allowed in transmission line ROW, a restriction that could affect businesses along the ROW.

Project impacts to agricultural operations are anticipated to range from minimal to moderate depending on the project route selected, the type of structures used, and the configuration of the structures. Agricultural impacts for specific routing alternatives are discussed further in Chapter 6. Impacts to forestry and mining operations are anticipated to be minimal to moderate. Impacts to recreation and tourism are anticipated to be minimal to moderate and generally limited to the aesthetic impacts of the project. The primary means of mitigating impacts to land-based economies is prudent routing (i.e., by choosing routes and alignments that avoid such economies). Impacts can also be mitigated through use of structures and structure configurations that are compatible with land-based economies.

5.8.1 Agriculture

Agriculture comprises approximately 30 percent of the land cover within the project area (Map Book 5C). Agricultural land use is more prevalent in the southern portion of the project area, which includes greater percentages of cultivated crops and farmland of statewide importance in comparison to the northern portion of the project area, which primarily consists of hay/pasture lands.

The USDA Natural Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database (reference (71)) identifies farmland soils based on three categories, which are subject to protection under the Farmland Protection Policy Act (FPPA). These categories include prime farmland, prime farmland when drained, and farmland of statewide importance. Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland when drained includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance includes soils that are nearly prime, but are not as productive due to permeability, slope, erosion potential, or some other soil property. The project includes areas of prime farmland, prime farmland if drained, and farmland of statewide importance.

5.8.1.1 Potential Impacts and Mitigation Measures

Transmission lines have the potential to impact agriculture both temporarily and permanently. Temporary impacts typically include impacts from transmission line construction and annual transmission line inspections. Any construction impacts would cease once the transmission line construction phase is completed. Temporary impacts from annual transmission line inspections would be limited to the ROW and areas where obstructions may require off ROW access. These temporary impacts may result in the displacement of livestock or impacts to crops and soil.

Permanent transmission line impacts result from the placement of transmission line structures within agricultural fields. Permanent structures can have varying sized footprints due to the structure design and distance from each another. The project anticipates using steel monopole structures with concrete pier foundations ranging from 7 to 10 feet in diameter and a span of 800 to 1,000 feet between structures. Examples of permanent impacts resulting from transmission line structures include restriction of farming equipment, interference with aerial spraying, and obstruction of irrigation systems. These impacts have the ability to result in financial impacts through loss of income and decreases in property values.

Impacts to agricultural operations could be mitigated by prudent routing (i.e., by selecting routes that avoid agricultural fields by following existing ROW, field lines, and property lines). Impacts could also be mitigated by the type and configuration of structures used for the project. The use of double-circuiting, for example, would minimize potential impacts. Impacts to agricultural operations could also be mitigated by limiting temporary construction impacts and ensuring that any impacts are remediated (e.g., repair of drain tile). Impacts could be mitigated by the preparation of an AIMP prepared in collaboration with the MDA. The AIMP identifies measures that the applicants would take to avoid, mitigate, or provide compensation for agricultural impacts resulting from constructing and operating the project. It also specifies procedures for repairing damaged drain tile, alleviating compaction, and removing construction debris. Compliance with an AIMP could be included as a permit condition for the project.

5.8.2 Forestry

Minnesota's forests primarily consist of aspen/birch, spruce/fir, and oak/hickory forest types, which are managed by private/tribal industry (44 percent), state government (24 percent), federal government (17 percent), and counties/municipalities (15 percent) (reference (72)). As of 2020, Minnesota's forest products industry was the state's fifth largest manufacturing sector by employment and provided 64,500 jobs (reference (72)). In 2017, Minnesota's forest products industry produced $17.8 billion of shipment value (gross sales) and provided 8.5 percent of all manufacturing payroll employment.

As of 2018, timberlands constituted the majority (15.8 million acres) of forest land in Minnesota (reference (72)). Total timber harvest in Minnesota began declining from approximately 3.73 million cords per year in 2005 to 2.9 million cords per year in 2016 (reference (72)). Roundwood harvested for pulpwood, sawlogs, and fuelwood has remained stable with typical annual harvest between 2.7 million cords in 2007 and 3.4 million cords in 2016. According to a 50-year projection documented in the Generic Environmental Impact Statement on timber harvest completed in 1994, Minnesota's forests could sustain a total harvest of approximately 5.5 million cords annually (references (73); (74)).

There are extensive forested lands in the project area (Map Book 5C), with the most forested land in the northern portion of the project area. Forested lands within the proposed ROW are composed of DNR state forests, school trust lands and other conservation program lands, state forest lands, and private commercial forest lands. State forests crossed by the project include Crow Wing State Forest, Golden Anniversary State Forest, and Hill River State Forest. State recreation areas crossed by the project include the Cuyuna State Recreation Area. Although there are forested lands that occur within the substation expansion area for both the Cuyuna Series Compensation Station and the Iron Range Substation Expansion, these lands are owned by Minnesota Power.

Timber harvested in Minnesota and the project area is used for construction materials, paper products, and heating for homes, among other commercial goods. Additionally, timber harvested from private commercial forest lands is primarily used in the manufacturing of paper products. As of 2023, 473 furniture manufactures, 99 paper manufactures, 357 wood product manufactures, 215 forestry and logging companies were in operation in Minnesota (reference (75)).

5.8.2.1 Potential Impacts and Mitigation Measures

For safe operation of the project, trees and other tall-growing vegetation must be removed from the transmission line ROW. Vegetation clearing typically consists of initial tree and vegetation clearing before construction, and on-going maintenance within the ROW following construction.

The loss of trees in the ROW could impact forestry production resulting. in negative financial impacts to state owned forest lands and privately owned commercial forest lands. Impacts to forestry could be mitigated by prudent routing (i.e., by selecting routes that avoid forested areas and by following existing ROW, field lines, and property lines to the extent possible).

5.8.3 Mining

Mining is a significant industry in Minnesota, with mining operations classified into two categories: metallic minerals and non-metallic minerals (reference (76)). Metallic minerals consist of materials such as iron ore, copper, and nickel, while non-metallic minerals consist of materials such as aggregate, peat, and kaolin clay. Aggregate materials are used in construction activities and usually consist of raw materials such as sand, gravel, and crushed stone.

There are multiple aggregate mines present in the project area, consisting of both active and inactive operations (Map Book 5D). No public data is available for Cass, Crow Wing, or Morrison counties; as a result, these areas were evaluated by performing a visual search of available aerial imagery to identify potential mining operations. There are three potentially active aggregate mines within the ROW of the applicants' proposed route. There are no active or idled metallic mineral mines in the rights-of-way of the routing alternatives for the project.

5.8.3.1 Potential Impacts and Mitigation Measures

Transmission line construction and operation can result in potential impacts to mining operations. These impacts may occur if a transmission line inhibits access to and removal of resources. Impacts are most likely to occur during transmission line construction if resource extraction must be ceased temporarily in order to safely string a transmission line. Although there are three active aggregate mines within the ROW of the applicants' proposed project, the project parallels existing transmission lines where it would cross mines and permanent impacts to mining operations would have already occurred in these areas. As a result, minimal mining operation impacts are anticipated as a result of the project.

5.8.4 Recreation and Tourism

Recreation and tourism opportunities in the project area consist of outdoor activities such as recreational use of parks, public trails, rivers and lakes, and state forests. Tourism and recreational activities commonly overlap; the difference between the two is the distance traveled to access these opportunities. Recreational activities are generally located within the vicinity of one's home and easily accessible, while tourism involves activities that require substantial travel and may incur additional expenses as a result.

There are several recreational areas located near the project (Map Book 5E). The Cuyuna Country State Recreation Area offers recreational opportunities including camping, canoeing, fishing, mountain biking, and scuba diving. Multiple state trails also extend throughout the area, attracting outdoor enthusiasts interested in biking, hiking, and off-roading.

State water trails on the Mississippi River are also present. Furthermore, several segments of the Great River Road scenic byway traverse the region. This scenic route traces the path of the Mississippi River, covering 565 miles in Minnesota. There are multiple state forests located near the project, including Golden Anniversary State Forest, Hill River State Forest, Crow Wing State Forest, and Land O'Lakes State Forest. Savanna Portage State Park is located near the eastern edge of the project and provides opportunities for fishing, hiking, snowmobiling, and swimming.

Several snowmobile trails traverse the area. These trails are maintained by the Aitkin Sno-Drifters Snowmobile Club, Inc., Benton County Snowmobile Club, C-I Loop, Great River Trail, Greenway

Snowmobile Club, Inc, Harding Trail, Haypoint Jack Pine Snowmobile Club, Itasca Driftskippers Snowmobile Club, Kathio, Merri Trail, Morrison County Recreational Trails Association, Sherburne County Snowmobile Trail Association, and Smokey Hollow.

Several bodies of water located in or near the project have public water access sites. These include the Mississippi River, Cowhorn Lake, Taylor Lake, Hill Lakes, Upper Dean Lake, Perry Lake, Black Bear Lake, Snowshoe Lake, Hay Lake, Upper South Long Lake, Lake Briggs, Rush Lake, Elk Lake, in addition to multiple unnamed waterbodies near the City of Riverton. In addition, several WMAs used for hunting and wildlife viewing are scattered throughout the project area. Recreational users of these trails, lakes, and wildlife areas are likely to spend money in nearby communities and help support local economies.

5.8.4.1 Potential Impacts and Mitigation Measures

Project impacts on recreation and tourism are anticipated to be minimal and temporary in nature, lasting only for the duration of construction. Short-term disturbances, such as increased noise and dust, could detract from nearby recreational activities and could, depending on the timing, affect hunting by temporarily displacing wildlife. However, wildlife is expected to return to the area once construction has been completed.

Once constructed, the project itself could impact aesthetics in the project area or at a specific recreational feature such that recreation may be less enjoyable for some citizens. Project-related impacts to recreation and tourism are anticipated to be minimal. Mitigating potential impacts is primarily achieved through prudent routing (i.e., selecting routes away from recreational resources). Impacts can also be mitigated by the measures noted above for potential aesthetic impacts (Chapter 5.3.1.1).

5.9 Archaeological and Historic Resources

Cultural resources consist primarily of archaeological sites and historic architectural resources. Archaeological sites are defined as the material remains of past human life or activities (reference (77) Pursuant to the Minnesota Historic and Architectural Survey Manual (reference (78)), historic architectural resources are defined as sites, buildings, structures, or objects that are over 45 years in age (reference (78)) and “create tangible links to the American past, whether in relation to historical events and people, traditional ways of life, architectural design, or methods of construction” (reference (79)). Traditional cultural properties are defined as locations of significance to a community because of their association with important cultural practices and beliefs (reference (80)).

Federal laws and regulations, including Section 106 of the NHPA of 1966 and the Archaeological Resources Protection Act of 1979, provide the standards for cultural resources identification, evaluation, and mitigation of impacts. Pursuant to Section 106 of the NHPA of 1966, a historic property is any archaeological site, historic architectural resource, or traditional cultural property included in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

The proposed project is also subject to the Minnesota Historic Sites Act (Minn. Statutes 138.661 to 138.669) and the Field Archaeology Act (Minn. Statutes 138.31 to 138.42). The Minnesota Historic Sites Act (Minn. Statutes 138.661 to 138.669) requires that state agencies consult with the SHPO before undertaking or licensing projects that may affect properties on the State or National Registers of Historic Places. The Minnesota Field Archaeology Act (Minn. Statutes 138.31 to 138.42) establishes the position of State Archaeologist and requires State Archaeologist approval and licensing for any archaeological work that takes place on non-federal public property.

Under the Minnesota Private Cemeteries Act (Minn. Statute 307.08), if human remains are encountered during construction, construction at that location must be halted immediately and local law enforcement and the Office of the State Archaeologist (OSA) and the Minnesota Indian Affairs Council (MIAC) must be contacted. Construction cannot proceed at that location until authorized by the OSA, MIAC, and local law enforcement.

To determine potential cultural resource impacts, known archaeological and historic sites in or adjacent to the project were identified through a review of the OSA online portal and MnSHIP, the Minnesota SHPO online portal. MnSHIP is a comprehensive database of all documented historic architectural resources for the entire state, while the OSA portal is a database of all previously recorded archaeological sites in the state.

5.9.1 Archaeological Resources

The OSA online portal search indicated that there are 59 known archaeological resources located within 1 mile of the potential project routes (Map Book 5F). Of the 59 archaeological sites, four are considered eligible for listing in the NRHP, one has been determined not eligible, and the remaining properties have not been evaluated for listing. Additional route alternative analysis is provided in Chapters 6 and 7, evaluating the presence of archaeological sites and potential project impacts.

One NRHP eligible site falls within the route width of a routing alternative; this is site 21CW0176/Rowe Mine Concentration Plant and Railroad Grade (post-contact structural ruin, constructed between 1914 and 1919). Three additional archaeological sites within 1 mile of the project are considered eligible for listing on the NRHP and include 21CW0096/Black Bear (pre-contact and post-contact artifact scatter and earthwork), 21CW0156/Zofia’s Terrace (pre-contact and post-contact artifact scatter and features), and 21CW0175/Little Rabbit Lake Site (pre-contact lithic scatter).

In addition to these NRHP eligible sites, earthworks are present at 13 sites within the ROI; potential human burials were identified at three of these sites (21CW0010, 21CW0011, and 21SH0002). Site 21SH0002 is a part of a complex of 10 precontact sites in Sherburne County within a proposed county park (Big Elk Lake Park) (reference (81)).

5.9.2 Historic Architectural Resources

Review of the MnSHIP portal indicates that there are 146 known historic architectural resources located within 1 mile of the project, 42 of which are within the route width of a routing alternative (Map Book 5F). Of the 146 resources, three are listed on the NRHP, four are considered eligible for listing on the NRHP, six have been determined not eligible and the remaining properties have not been evaluated for NRHP eligibility. Additional analysis regarding the proximity of these historic architectural resources to specific routing alternatives is provided in Chapter 6.

Two NRHP-listed historic architectural resources are located within the route width of a routing alternative and consist of IC-UOG-017/Frank Gran Farmstead and SH-BKC-012/Herbert Maximillian Fox House (this structure has been relocated twice since 1981). One other resource listed on the NRHP is within the 1-mile ROI and consists of CW-TMC-00001/Trommald Elevated Metal Water Tank.

The four NRHP-eligible historic architectural resources within the ROI consist of resources CW-PLK-001/Perry Lake School, CW-XXX-00001/Cuyuna Iron Range Historic Mining Landscape District (4,693 acre district, dating between 1904-1953; contributing features include open pit mines, stockpiles, structures and foundations, tailings piles, access roads and railroad corridors), IC-UOG-088/Marsh

Rainbow Arch Bridge, and XX-RRD-NRP021/Northern Pacific Railway Company. Of these resources, CW-XXX-00001, IC-UOG-088 and XX-RRD-NRP021 are located within the route width of a routing alternative.

5.9.3 Potential Impacts and Mitigation Measures

Archaeological and historic resource impacts could result from construction activities—ROW clearing, placement of structures, expansion of the existing Iron Range Substation and Benton County Substations, the construction of a new compensation station, construction of access roads, temporary construction areas, and vehicle and equipment operation. Impacts could also result from the removal of historic buildings or structures.

Additional impacts can result from transmission line location and operation. Impacts can occur if the project is located near or within view of a resource (typically a historic building, structure, or TCP) and the resulting change in viewshed negatively affects the setting, feeling, and/or association of the resource. This issue is especially pertinent when considering cultural resources, where the surrounding environment plays a crucial role in defining their character and significance.

The preferred impact mitigation for cultural resources is prudent routing or structure placement (i.e., avoiding known archaeological and historic resources). If archaeological resources are anticipated or known to exist within a specific part of a route, potential resource impacts could be mitigated by measures developed in consultation with the SHPO prior to construction. Additionally, construction workers will receive training to recognize archaeological resources in the field so that work can be halted in the event a relevant resource discovery occurs during construction.

If unanticipated archaeological or historic resources are discovered during construction, Commission route permits require that construction activities cease at that location and that SHPO be contacted to assist in the development of appropriate resource protection measures (Appendix H). In addition, if human remains or suspected burial sites are discovered during construction, the state archaeologist would be contacted, and construction would cease at the location until the applicants and the state archaeologist have developed adequate mitigation measures as per Minn. Statute 307.08.

5.10 Natural Environment

Transmission lines have the potential to impact the natural environment through temporary, construction-related impacts and long-term impacts to water resources, vegetation, and wildlife.

5.10.1 Water Resources

Hydrologic features located within the project include rivers and streams (watercourses), lakes and ponds (waterbodies), wetlands, floodplains and groundwater resources (Map Book 5G). The project crosses the Mississippi River (Grand Rapids, Brainerd, Sartell, St. Cloud) and Pine River watersheds (the Elk River is located within the Mississippi River watershed). The regulatory landscape governing water resources in Minnesota is complex, encompassing various federal and state laws, which is explored further in Chapters 5.10.1.1 through 5.10.1.4.

5.10.1.1 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.). The CWA could potentially regulate several types of activities and their impacts associated with the project.

Watercourses and waterbodies such as such as lakes, rivers, and streams, may be regulated under both Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 et seq.) and Section 404 of the CWA (33 U.S.C. 1344). The Rivers and Harbors Act regulates activities such as excavating and dredging and altering the course of Section 10-designated waterways (33 U.S.C. 403). Section 404 of the CWA prohibits discharge of dredged or fill materials without a permit. It extends to more waterbodies than the Rivers and Harbors Act, namely all waters of the United States, including navigable waters, interstate waters, and wetlands adjacent to navigable waters (33 CFR 320.1(d); 33 CFR 328.3). The USACE holds both Section 10 and Section 404 permitting authority.

Many activities regulated under either Section 10 or Section 404 must obtain a state Section 401 water quality certification to ensure that the project would comply with state water quality standards.
Section 401 of the CWA is administered by the EPA; however, the CWA gives the EPA the authority to delegate 401 certification to the states. In Minnesota, the EPA has delegated Section 401 certification to the MPCA.

5.10.1.1.1 Impaired watercourse and waterbodies

Section 303(d) of the CWA requires that states publish a list of streams and lakes that are not meeting their designated uses because of excess pollutants (impaired waters) every two years. The list, known as the 303(d) list, is based on exceedances of water quality criteria and standards. In Minnesota, the MPCA is charged with classifying impaired waterbodies. Consistent with the requirements of the CWA, the MPCA has established water quality standards, including the identification of beneficial uses of the state's waters, numeric standards and narrative criteria, and non-degradation protections for high-quality or unique waters. Minnesota advances the CWA's presumption that a waterbody should sustain healthy aquatic life and recreation uses, and groups the waters of the state into one or more of the following seven designated use classifications:

- Class 1 waters, domestic consumption
- Class 2 waters, aquatic life and recreation
- Class 3 waters, industrial consumption
- Class 4 waters, agriculture and wildlife
- Class 5 waters, aesthetic enjoyment and navigation
- Class 6 waters, other uses and protection of border waters
- Class 7 waters, limited resource value waters

The project could cross 16 impaired streams. Of the impaired streams the project may cross, seven are designated as "Impaired, but a total maximum daily load (TMDL) study has been approved by EPA," eight streams are listed with a designation of "Impaired and a TMDL study is required," and one stream with a designation of "Impaired or threatened but doesn't require a TMDL study because the impairment is due to natural conditions with only insignificant anthropogenic influence" (reference (82)). Stream impairments for these 16 streams include mercury in fish tissue, fish bioassessments, dissolved oxygen, Escherichia coli (E. coli), turbidity, total mass of suspended particles, and benthic macroinvertebrate bioassessments (reference (82)).

The project could also cross two impaired lakes, Little Rabbit Lake and Upper South Long Lake. Little Rabbit Lake is designated as impaired for mercury in fish tissue, and a TMDL study is required. Upper South Long Lake is designated as impaired for sulfates, and a TMDL has been approved by the EPA (reference (82)).

5.10.1.1.2 Public Waters

DNR-regulated public waters are wetlands, water basins, and watercourses of significant recreational or natural resource value in Minnesota. The statutory definition of a public water is found in Minn. Statute 103G.005, and these waters are documented in the state's public waters inventory (PWI). These water resources are under the jurisdiction of the DNR, and a DNR license to cross public waters would be required when an activity would cross a public water. Additionally, a work in public waters permit would be required for any projects that change or diminish the course, current, or cross-section of public waters by any means, including filling, excavating, or placing materials in or on the beds of public waters.

The DNR 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.

5.10.1.1.3 Potential Impacts and Mitigation Measures

It is anticipated that watercourses and waterbodies would be avoided by either prudent routing or spanning. Most of the watercourse and waterbodies crossed by the project would be less than 1,000 feet wide, which is a spannable distance. These crossings would not require structures to be placed within the features; and no direct impacts to those watercourses and waterbodies are anticipated. Crossings that extend over 1,000 feet would require structures within the waterbodies. These waterbodies would be directly impacted from construction and are identified and discussed further in Chapters 6 and 7.

Indirect impacts associated with crossing these resources could occur. Removal of vegetation and soil cover could result in short-term water quality impacts due to increased turbidity. Construction impacts could also include removal of riparian or shoreline forest areas within the ROW. Vegetation clearing could also increase light penetration to watercourses and waterbodies, potentially resulting in localized increases in water temperatures and changes to aquatic communities.

Mitigation measures would be implemented to prevent or minimize surface water impacts that could affect water quality. The MPCA, through the National Pollutant Discharge Elimination System (NPDES) and under the CWA and the State Disposal System (SDS), regulates construction activities that may impact stormwater runoff. The applicants would apply for authorization to discharge stormwater associated with construction activity under the MPCA NPDES/SDS Construction Stormwater General permit (MNR100001). The project would develop a SWPPP that will identify BMPs that will be implemented during construction to minimize erosion and sedimentation impacts to surface waters. Erosion and sedimentation abatement measures, for example, would be employed to mitigate impacts to impaired waters.

Anticipated BMPs for the project include no vehicle fueling, maintenance, or herbicide application within 100 feet of streams, ditches, and waterways to protect against contamination of surface or groundwater systems. Materials such as fuels, lubricants, paints, and solvents required for construction would be stored away from surface water resources. Any spills or leaks would be cleaned up immediately and leaking equipment removed from the area for proper maintenance.

In addition, public waters crossed by the project would require DNR utility crossing license. The applicants have indicated that they will work with the DNR to ensure all proper licenses and approvals are obtained for public water crossings. Additionally, through the licensing process, the applicants emphasize that they will work with the DNR to determine appropriate public water crossing mitigation measures.

5.10.1.2 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 flood waters, 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 1 percent chance of occurring during each year.

At the state level, the DNR oversees the state floodplain management program by promoting and ensuring sound land use development in floodplain areas to promote the public health and safety, minimize loss of life, and reduce economic losses caused by flood damages. The DNR also oversees the state of Minnesota national flood insurance program. Floodplains are further regulated at the local level. Along the project, Sherburne County, Benton County, Morrison County, Crow Wing County, Aitkin County, Itasca County, Cass County, and the city of Becker have designated floodplain zoning districts. Associated ordinances allow for utility transmission lines as a conditional use for floodway and floodplain districts.

FEMA has designated floodplains along the following watercourses: Elk River, Briggs Creek, Rice Creek, Ironton Creek, Rabbit River, Mississippi River, Mudd Brook, Swan River, and along several unnamed tributaries.

5.10.1.2.1 Potential Impacts and Mitigation Measures

No impacts to floodplains are anticipated as a result of the project. Should a floodplain crossing be greater than the 1,000-foot typical transmission line span length, the crossing may require permanent placement of fill to construct one or more structure foundations within the floodplain. 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 these 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.

5.10.1.3 Wetlands

Wetlands are defined in both the 1977 EO 11990-Protection of Wetlands and in Section 404 of the CWA as those areas that are inundated by surface or groundwater with a frequency to support, and under normal circumstances does or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands are protected at the federal level under Section 404 of the CWA and at the state level under the Minnesota WCA and the DNR PWI program.

Similar to watercourses and waterbodies, some wetlands are protected as USACE-regulated waters of the United States under Section 404 of in the CWA. Under Section 404 of the CWA, a permit from the USACE is required for the discharge of dredged or fill materials into wetlands. As part of the USACE permitting process, wetlands along the entire project ROW would be identified and delineated by the applicants. For unavoidable impacts, compensatory mitigation is required to replace the loss of wetland, stream, or other aquatic resource functions.

Minnesota has a number of state level mechanisms protecting wetlands. The Minnesota WCA (Minn. Rule 8420) is administered by the Board of Water and Soil 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 meet one or more the following criteria:

(1) avoid disturbing the wetland

(2) minimize wetland impacts

(3) 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 PWI program administered by the DNR (Minn. Statute 103G.005) as discussed in Chapter 5.10.1.1.2.

In addition, the DNR regulates calcareous fens under Minn. Rule 8420.0935. Calcareous fens are rare and distinctive peat-accumulating wetland that receive hydrology from groundwater that is rich in calcium and other minerals. According to the DNR, there are no known calcareous fens located within the project regions (reference (83)). The closest calcareous fen is located over 13 miles west of the Benton County Elk River Region.

5.10.1.3.1 Potential Impacts and Mitigation Measures

It is anticipated that wetlands in the project would be avoided by either prudent routing or spanning. Thus, no structures, or very few structures, would be placed within wetlands, and potential impacts would be minimal. However, where a wetland is crossed and such crossing requires construction activities within the wetland, there is a strong potential for impacts. Transmission line structure construction typically includes vegetation clearing, movement of soils, and construction traffic. These activities could alter or impair wetland function. Even small changes in hydrology (e.g., periods of inundation, changes in flow, sedimentation) can impair wetland function.

Wetlands can be 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.

Forested wetlands within the transmission line ROW would likely undergo a permanent change of vegetation type as a result of the project. The safe and reliable operation of transmission lines is compromised when trees encroach upon them. Therefore, existing trees must be removed throughout the ROW, including forested wetlands. The applicants may be required to provide wetland mitigation for the conversion of forested wetlands to non-forested wetlands that occurs as a result of the project.

Potential wetland impacts can be mitigated by selecting routes, alignments, and pole placements that avoid wetlands. If wetlands cannot be avoided, there are several strategies to mitigate their impact. These include: use of construction mats; constructing during winter months when the ground is frozen; use of all-terrain construction equipment designed to minimize soil impacts; assembling structures on upland areas prior to site installation; and, transporting crews and equipment, to the extent possible, over improved roads and via routes which minimize transit over wetlands Commission permits require mitigation measures for potential wetland impacts (Appendix H).

The applicants indicate they would restore all wetlands in accordance with USACE requirements and would obtain all necessary state and local approvals for work in wetlands.

5.10.1.4 Groundwater

The DNR divides Minnesota into six groundwater provinces. The project is located primarily within Minnesota's central groundwater province, with a small portion extending into the east-central groundwater province. These provinces are characterized by buried sand aquifers and relatively extensive surficial sand plains, part of a thick layer of sediment deposited by glaciers overlying the bedrock. The east-central province is underlain by sedimentary bedrock with good aquifer properties. The central province has thick glacial sediment, sand and gravel aquifers are common, and the deeper fractured crystalline bedrock has poor aquifer properties and limited use as an aquifer (reference (84)).

The Minnesota Department of Health maintains the Minnesota Well Index (MWI) which provides information about wells and borings such as location depth, geology, construction, and static water level. According to the MWI there are approximately 51 wells within the ROW of the project's routing alternatives. These wells are primarily domestic wells in addition to some exploratory wells, one scientific investigation well, and one abandoned well. Wells in the project area range from 50 to 520 feet in depth (reference (85))

5.10.1.4.1 Potential Impacts and Mitigation

Project groundwater impacts are anticipated to be minimal. Potential project groundwater could occur through: (1) surface water impacts; and (2) impacts directly to groundwater resulting from structure foundations. Surface water impacts can lead to groundwater impacts; thus, concerns are similar (i.e., construction activities which lead directly to sedimentation or through disturbed soils and vegetation). Mitigation of these impacts can be affected by measures to control soil erosion and sedimentation.

Direct groundwater impacts could occur as a result of the construction and placement of transmission line structures. Structure foundations will generally range from 25 to 60 feet in depth. Because wells in the area are at considerably greater depths than the structure foundations and because of the relatively low solubility of concrete components, no direct impacts to groundwater are anticipated. The applicants note that if shallow depths to groundwater resources are identified during geotechnical design of the project, specialty structures with wider, shallower foundations may be used.

5.10.2 Geology

The project area surface geology is dominated by quaternary aged glacial deposits from the most recent Wisconsinian glaciation. Gravelly sand to sandy loam sediments deposited by the Superior glacial lobe are most prevalent within the project and are part of the Cromwell Formation. Deposits from the Grantsburg lobe, Rainy lobe, and the St. Louis lobe are also located within the project, as well as glaciofluvial and glaciolacustrine deposits. Various surface glacial features are present including ground/end moraines, drumlins, and hummocks (reference (86)). Thickness of the glacial deposits vary depending on the location and type of deposit; thicknesses range from 25-350 feet (reference (87)).

The project area bedrock consists of various Paleoproterozoic aged igneous deposits. Dominant igneous bedrock includes granites, iron formations, mafic intrusions, and interlayered volcanic intrusive rocks. Some sedimentary bedrock is also present, including the Mille Lacs and North Range Groups (reference (87)).

Sand and gravel-rich glacial till can often be mined for aggregate resources. Less than 10 percent of the project has been identified as having significant potential for sand and gravel aggregate resources; the remainder of the project has nonsignificant potential for sand and gravel resources (reference (88)). There are multiple aggregate mines present within the proposed route (Chapter 5.8.3).

The project seismic risk is very low; it is located within an area rated as less than two-percent chance of damage from natural or human induced earthquake in 10,000 years (reference (89)). The most intense earthquake that has been recorded in the area occurred in 1860 and was documented as a seven on the Modified Mercalli Intensity Scale. The majority of the remaining recorded earthquakes were documented as less than 5 on the Modified Mercalli Intensity Scale (reference (90)).

Landslides are common throughout Minnesota due to the unconsolidated glacial till deposits located at the surface. Landslide susceptibility can vary based on several factors including the slope angle, water content, and sediment properties. Landslides most commonly occur in Minnesota due to slope failure during heavy rain events (reference (91)).

5.10.2.1 Potential Impacts and Mitigation Measures

No impacts to geologic resources are anticipated as a result of the project. Transmission line construction and operation can result in potential mining operation impacts; these impacts are discussed further in Chapter 5.8.3. Earthquakes are unlikely to occur in or near the project. Changes in slope are not anticipated during the project and as a result, there would be limited risk of landslides.

5.10.3 Soils

Soil information for the project was obtained from the USDA NRCS SSURGO database (reference (71) (71)). Soil mapped in the area surrounding the project primarily include five soil textural classes: sand, loamy sand, sandy loam, loam, and silt loam. Organic soils are also present within the area consisting of peat, muck, and mucky peat.

According to the SSURGO database, exposed soils within the area have a slight, low, medium, moderate, or severe potential erosion hazard. The ratings in this interpretation indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface.

Soil compaction susceptibility within the area ranges from low to high; however, some soil areas have not been rated. Soil compaction occurs when moist or wet soil particles are pressed together reducing pore space between them and is primarily caused by wheel traffic.

Hydric soils are present throughout the area. A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. Hydric soils are typically associated with lowlands and wetlands and are rated by their proportion of hydric soil in the map unit.

5.10.3.1 Potential Impacts and Mitigation Measures

Project soil impacts are anticipated to be minimal and temporary. Soil impacts are dependent, to some extent, on the soil surface conditions at the time of construction. Construction activities that occur on wet soils tend to have longer lasting impacts, regardless of the soil type. During dry conditions, soil disturbances will be temporary, minimal, and generally less invasive than typical agricultural practices such as plowing and tilling.

Surface soils would be disturbed by site clearing, grading, and excavation activities at structure locations, substation sites, pulling and tensioning sites, and setup areas. Soil disturbance would occur during the transport of crews, machinery, materials, and equipment over access routes (primarily along rights-of-way). Soil erosion may occur if surface vegetation is removed, especially on fine textured soils that occur on sloping topography, exposing soils to wind and water erosion. Topsoil could be lost to improper handling or erosion and loss of soils could adversely impact water resources in the area. Soil compaction and rutting could occur from movement of construction vehicles on access paths, and at other locations because of heavy equipment activity.

Identifying specific staging areas and associated impacts would be completed during final design. Potential impacts to soils would be minimized by using BMPs for construction of the project as required by the route permit (Appendix H) and other state and federal permits. The applicants have indicated that they would use a variety of methods to minimize soil erosion, including the prompt revegetation of disturbed soils. Common measures employed to minimize soil erosion include:

- Using low ground pressure construction equipment, which are designed to minimize impacts to soils in damp areas.
- Implementing measures to minimize erosion and sedimentation during construction and employing perimeter sediment controls, protecting exposed soil by promptly planting, seeding, using erosion control blankets and turf reinforcement mats, stabilizing slopes, protecting storm drain inlets, protecting soil stockpiles, and controlling vehicle tracking.
- Grading contours so that all surfaces provide for proper drainage, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation and prevent erosion. Returning all areas disturbed during construction to pre-construction conditions.
- Obtaining a NPDES construction stormwater permit from the MPCA and preparing a SWPPP if more than 1 acre of soil will be disturbed during construction.
- Erecting or using sediment control fences that are intended to retard flow, filter runoff, and promote the settling of sediment out of runoff via ponding behind the sediment fence.
- Using erosion control blankets and turf reinforcement mats that are typically single or multiple layer sheets made of natural and/or synthetic materials that provide structural stability to bare surface and slopes.
- Separating topsoil and subsoil and covering stockpiled soils.
- Returning locations, where grading or temporary access is required, to their original land contour and elevation to the greatest extent possible.

- Seeding to establish temporary and permanent vegetative cover on exposed soil. Soils will be revegetated as soon as practicable to minimize erosion.
- Revegetating disturbed areas using weed-free seed mixes and using weed-free straw and hay for erosion control.
- Using mulch to form a temporary and protective cover on exposed soils. Mulch can help retain moisture in the soil to promote vegetative growth, reduce evaporation, insulate the soil, and reduce erosion. A common mulch material used is hay or straw.

5.10.4 Vegetation

As mentioned in Chapter 5.2, the project traverses several ecological subsections, including the St. Louis Moraines, Tamarack Lowlands, Pine Moraines and Outwash Plains, and the Mille Lacks Uplands subsections in the Northern Laurentian Mixed Forest Province and the Anoka Sand Plain Subsection in the Eastern Broadleaf Forest Province; these subsections are shown on (Map 5-1).

Prior to European settlement, vegetation in the St. Louis Moraines Subsection consisted of coniferous and deciduous upland forests, with coniferous swamps and bogs also scattered throughout the subsection (reference (18)). At present, much of the subsection remains forested, and forestry and recreation are the dominant land uses.

The Tamarack Lowlands Subsection consisted primarily of upland and wetland coniferous and deciduous forests and sedge meadows prior to European settlement (reference (18)). At present much of the subsection remains forested and forestry is a dominant land use; agricultural land is also present in the subsection but not abundant.

Prior to European settlement, vegetation in the Pine Moraines and Outwash Plains Subsection was dominated by pine (Jack pine, red pine, and white pine) in coniferous and mixed coniferous-deciduous forests (reference (18)). At present, much of the subsection remains forested and forestry is a dominant land use, along with tourism. Agricultural land is also present in the western part of the subsection but not in the eastern part where the project is located.

The Mille Lacs Uplands Subsection consisted of deciduous, coniferous, and mixed upland and wetland forests prior to European settlement (reference (18)). At present, the western part of the subsection, where the project is located, is dominated by agricultural vegetation, with forested areas more dominant in the central and eastern part of the subsection.

Prior to European settlement, vegetation in the Anoka Sand Plain Subsection consisted of oak barrens in the uplands, with areas of Jack pine, brushland, upland prairie and floodplain forest also present (reference (18)). At present, the subsection is dominated by agricultural vegetation, with urban development rapidly expanding in the subsection.

In general, the vegetation resources across the project include upland and wetland forests, open and shrub wetlands, and herbaceous agricultural vegetation, consisting of cultivated cropland and hay and pastureland. The northern part of the project contains more forested vegetation while the southern part contains more agricultural vegetation, as identified by the National Land Cover Database (NLCD; see Map Book 5C). The NLCD is derived from Landsat imagery along with various other data sources. As such, it provides only an approximation of existing land cover types. Sensitive vegetation resources, such as native plant communities, are scattered across the project; these resources are discussed in Chapter 5.11.2.

5.10.4.1 Potential Impacts and Mitigation Measures

Project construction would result in short-term impacts on existing vegetation, including localized physical disturbance and soil compaction. Construction activities involving development and use of access roads, staging, and stringing areas would also have short-term impacts on vegetation by concentrating surface disturbance and equipment use. Permanent vegetation clearance will be required in the designated structure installation areas, resulting in an impact area measuring 8 feet in diameter for typical structures and 12 feet in diameter for dead-end and angle structures. Construction would also result in long-term impacts to vegetation by permanently removing forested vegetation within the ROW. The applicants would permanently convert forested areas to low-stature vegetation by clearing woody vegetation throughout the entire ROW where it occurs. The clearing of woody vegetation within the ROW would result in the widening of existing rights-of-way or bisecting (fragmenting) forests to establish new ROWs.

Fragmentation of forest vegetation can negatively impact species that depend on large contiguous blocks of interior forest. Conversion from forest to open habitats in the ROW could have indirect impacts on native vegetation by altering environmental conditions, such as light penetration; this could alter the vegetation community adjacent to the ROW and increase the potential spread of noxious weeds and other non-native species.

Construction and maintenance activities have the potential to result in the introduction or spread of noxious weeds and other non-native species. Noxious weeds could be introduced to new areas through propagating material like roots or seeds transported by contaminated construction equipment. Activities that could potentially lead to the introduction of noxious weeds and other non-native species include ground disturbance that leaves soils exposed for extended periods, introduction of topsoil contaminated with weed seeds, vehicles importing weed seed, and conversion of landscape type, particularly from forested to open settings.

The primary means of mitigating vegetation impacts is to avoid particular vegetation, such as trees, through prudent routing. Mitigation can be achieved, in part, by using existing infrastructure rights-of way (e.g., roadway, transmission line) such that tree removal is minimized. Mitigation can also be accomplished by spanning areas of sensitive vegetation, native plant communities, and other sensitive ecological resources. These resources are discussed further in Chapter 5.11.2.

Vegetation impacts can also be mitigated by a number of other strategies, including:

- Constructing during fall and winter months to limit plant damage.
- Leaving or replanting compatible plants at the edge of the transmission line ROW.
- Replanting the transmission line ROW with low-growing, native species.
- Limiting vehicle traffic to roads along the ROW and within previously disturbed areas.

Potential noxious weed impacts can be mitigated by:

- Revegetating disturbed areas using weed-free seed mixes and using weed-free straw and hay for erosion control.

- Removal of invasive species/noxious weeds via herbicide and manual means consistent with easement conditions and landowner restrictions.

- Cleaning and inspecting construction vehicles to remove dirt, mud, plant, and debris from vehicles prior to arriving at and leaving construction sites.

Vegetation impacts can also be mitigated by providing compensation to individual landowners through negotiated easement agreements. Mitigation and restoration measures for impacts to vegetation are standard Commission route permit conditions (Appendix H).

5.10.5 Wildlife

The project's landscape provides habitat for a variety of resident and migratory wildlife species, such as large and small mammals, songbirds, waterfowl, raptors, fish, amphibians, reptiles, and insects. These species use the area for forage, shelter, breeding, overwintering, and/or as a stopover during migration. Habitat diversity characterizes the area, from densely forested regions in the north to predominantly agricultural landscapes in the south.

The state of Minnesota is in the Central Flyway of North America. The Central Flyway is a bird migration route that encompasses the Great Plains of the U.S. and Canada. Migratory birds use portions of the Central Flyway as resting grounds during spring and fall migration, as well as breeding and nesting grounds throughout the summer. Suitable habitat for migratory birds is present throughout the project's landscapes.

Migratory birds are protected under the Migratory Bird Treaty Act of 1918 (16 USC 703-712), which prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. Bald eagles (*Haliaeetus leucocephalaus*) and golden eagles (*Aquila chrysaetos)* are protected under the MBTA and the federal Bald and Golden Eagle Protection Act (BGEPA; 16 USC 668-668d), which specifically prohibits the taking or possession of and commerce in, either alive or dead, or any part, nest, or egg of these eagles.

Several lands preserved or managed for wildlife and associated habitat are scattered throughout the geographic area; some of these areas are crossed by the project's ROI for wildlife (the 150-foot ROW), including DNR WMAs, lakes that are part of DNR Shallow Lakes Program, and USFWS Grassland Bird Conservation Areas (GBCA) (Map Book 5H).

The DNR established WMAs to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses (reference (92)). The DNR Shallow Lakes Program works to protect and enhance wildlife habitat on larger lakes (greater than 50 acres in size) that are dominated by shallow water (littoral zone) (reference (93)). The USFWS designates GBCAs as priority areas for grassland protection and enhancement that are thought to provide suitable habitat for many or all priority grassland bird species in tall grass prairie.

Additional lands managed or preserved for wildlife are scattered through the area but are not within the project's ROI, including USFWS National Wildlife Refuges, USFWS Waterfowl Production Areas, DNR State Game Refuges, DNR AMAs, and National Audubon Society Important Bird Areas. These lands are shown in Map Book 5H but are not discussed further in this EA. The applicants' route permit application stated that the Wolvert AMA lies within the applicants' proposed route's ROW. However, recent data from the Minnesota DNR website and the latest spatial data downloaded in March 2024 from Minnesota Geospatial Commons do not list this AMA or any others within the project's Region of Influence (ROI) for wildlife (reference (94)). State forests and state parks also provide habitat for a variety of wildlife; these resources are discussed in Chapter 5.8.4. In addition, there are several sensitive ecological resources, such as native plant communities, which would also provide habitat for wildlife; these resources are discussed in Chapter 5.11.2.

5.10.5.1 Potential Impacts and Mitigation Measures – Non-Avian Species

Construction activities that generate noise, dust, or disturbance of habitat may result in short-term, indirect impacts on wildlife. During project construction, wildlife would generally be displaced within the 150-foot ROW and footprints of associated facilities. Clearing and grading activities could also affect birds' eggs or nestlings and small mammals that may be unable to avoid equipment. Many wildlife species would likely avoid the immediate area during construction; the distance that animals would be displaced depends on the species and the tolerance level of each animal. However, comparable habitat is available adjacent to the project.

Project construction may result in long-term adverse impacts on wildlife due to loss, conversion, or fragmentation of habitat. The applicants would permanently clear forested vegetation within the ROW and footprints of associated facilities. Wildlife species previously occupying forested communities in these areas would be displaced in favor of species that prefer more open vegetation communities. Fragmentation could affect the survival of some species that depend on large areas of undisturbed habitat. Impacts are expected to be minimal in situations where an existing ROW is expanded because fragmented forest would already be present.

The potential long-term project impacts to wildlife are anticipated to be minimal. Potential wildlife impacts can be mitigated or minimized through several strategies. The primary impact mitigation strategy is to select route alternatives away from areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Wildlife impacts can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

5.10.5.2 Potential Impacts and Mitigation Measures – Avian Species

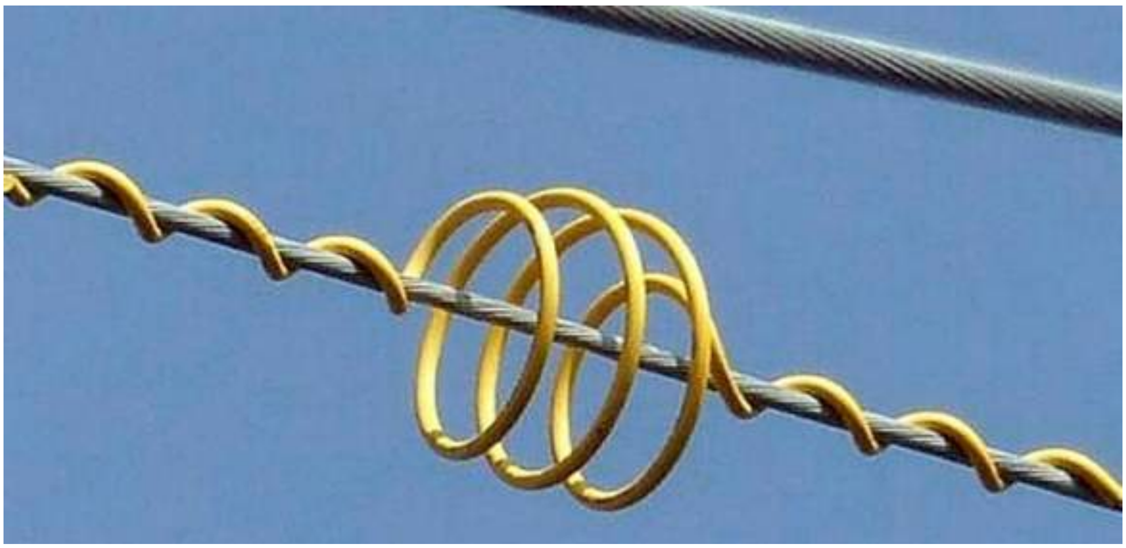
Potential impacts to avian species (e.g., songbirds, raptors, and waterfowl) include those described above for non-avian species, but also include impacts due to electrocution and collision with transmission line conductors. Electrocution occurs when an arc is created by contact between a bird and energized 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. To avoid and minimize potential electrocution of avian species, the project would be constructed in accordance with the Avian Power Line Interaction Committee's (APLIC) safety recommendations (reference (95)). These recommendations minimize electrocution risk by providing adequate clearance from energized conductors to grounded surfaces and to other conductors.

Independent of the electrocution risk, birds may be injured by colliding with transmission line structures and conductors. The collision risk is influenced by several factors including habitat, flyways, foraging areas, and bird size. Waterfowl, especially larger waterfowl such as swans and geese, are more likely to collide with transmission lines. The collision frequency increases when a transmission line is placed between agricultural fields that serve as feeding areas and wetlands or open water, which serve as resting areas. In these areas, it is likely that waterfowl and other birds would be traveling between different habitats, increasing the likelihood of a collision.

The incidence of birds colliding with transmission lines is also influenced by the number of horizontal planes in which the conductors are strung. Stringing the conductors in a single horizontal plane presents less of a barrier to birds crossing the transmission line ROW. A single horizontal plane; however, generally requires a wider structure (e.g., H-frame structure). Conversely, stringing the conductor wires in two or more planes creates a greater barrier to birds attempting to fly, not only across the lines, but over and potentially between them (e.g., monopole structure).

Beyond conductor configuration, bird collisions with transmission lines can also be mitigated by the use of bird flight diverters. Diverters enable birds to better see conductors during flight and avoid collisions with them. A typical diverter installation is shown in Figure 5-8.

Figure 5-8 Bird Flight Diverter



The coiled shape of the bird flight diverter makes transmission lines more visible to birds and minimizes collisions with the lines. Source: reference (7)

5.11 Rare and Unique Natural Resources

This Chapter describes the rare and unique natural resources, including federally and state protected species and sensitive ecological resources, which are present across the project's geographic area.

Federally endangered or threatened species are protected under Section 7 of the Endangered Species Act (ESA) of 1973. Data on federal protected species were reviewed using the USFWS Information for Planning and Consultation (IPaC) online tool.

State endangered or threatened species are protected under the Minnesota Endangered Species Statute (Minn. Statute 84.0895). The DNR Natural Heritage Inventory System (NHIS) database (License Agreement #2022-008) was used to assess the presence of state protected species within 1 mile of the project.

Publicly available GIS datasets and the DNR Conservation Explorer online tool were used to assess the presence of sensitive ecological resources in the area. Sensitive ecological resources may provide habitat suitable for federal and/or state protected species.

5.11.1 Protected Species

5.11.1.1 Federal Protected Species

The USFWS IPaC online tool was queried on March 28, 2024, for a list of federally threatened and endangered species, proposed species, candidate species, and designated critical habitat that may be present within the vicinity of the project (Appendix L). The IPaC query identified seven federal species that could potentially be in the vicinity of the project, including two endangered species, two threatened species, a proposed endangered species, a candidate species, and an experimental population, non-essential species. These species and their typical habitats are summarized in Table 5-15. The project does not traverse any federally designated critical habitat.

Table 5-15 Federal Species Potentially Present in the Vicinity of the Project

Scientific Name	Common Name	Federal Status	State Status	Habitat
Bombus affinis	Rusty patched bumble bee	Endangered	Not listed	Areas with a high number of flowering plants during active season; overwinter a few inches below the soil surface in mesic hardwoods.[1]
Myotis septentrionalis	Northern long-eared bat	Endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Canis lupus	Gray wolf	Threatened	Not listed	Forested, shrub, and open areas.[1]
Lynx canadensis	Canada lynx	Threatened	Special concern	Boreal forests where prey (snowshoe hare) is present.[1]
Perimyotis subflavus	Tricolored bat	Proposed Endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Danaus plexippus	Monarch butterfly	Candidate	Not listed	Areas with a high number of flowering plants. Presence of milkweed (Asclepias spp.) to complete the caterpillar life stage.[2]
Grus americana	Whooping crane	Experimental population, non-essential	Not listed	Wetlands, lakes, ponds, rivers, and agricultural fields.[3]

1 Habitat information if from reference (96) (97).
2 Habitat information from reference (98)
3 Habitat information from reference (99)

5.11.1.2 State Protected Species

The DNR's NHIS database was queried in February 2024 (Barr License Agreement LA-2022-008), to determine if any state endangered, threatened, or special concern species have been documented within 1 mile of the project. The NHIS database identified records for six endangered, nine threatened, and 31 special concern species within 1 mile of the project. State threatened and endangered species documented in the NHIS database, along with their typical habitats are summarized in Table 5-16. State special concern species documented in the NHIS database within 1 mile of the project are summarized in Appendix M; these species are tracked by the DNR; however, they are not legally protected under the Minnesota Endangered Species Statute.

Table 5-16 Natural Heritage Information System Database Records of State Threatened and Endangered Species Documented within One Mile of the Project

Scientific Name	Common Name	Type	State Status	Habitat[2]
Botrychium ascendens	Upswept moonwort	Vascular plant	Endangered	Fire dependent forests, wet meadows/shrub carr.
Botrychium lineare	Slender moonwort	Vascular plant	Endangered	Fire dependent forests.
Botrychium spathulatum	Spatulate moonwort	Vascular plant	Endangered	Fire dependent forests.
Juglans cinerea	Butternut	Vascular plant	Endangered	Mesic hardwood forests.
Lanius ludovicianus	Loggerhead shrike	Bird	Endangered	Upland prairies.
Utricularia purpurea	Purple-flowered bladderwort	Vascular plant	Endangered	Littoral zone of lakes.
Aristida tuberculosa	Seaside three-awn	Vascular plant	Threatened	Savannas and upland prairies.
Botrychium angustisegmentum	Narrow triangle moonwort	Vascular plant	Threatened	Mesic hardwood forests.
Botrychium oneidense	Blunt-lobed grapefern	Vascular plant	Threatened	Mesic hardwood forests.
Cardamine pratensis	Cuckoo flower	Vascular plant	Threatened	Fens and swamps.
Emydoidea blandingii	Blanding's turtle	Turtle	Threatened	Calm, shallow waters with rich, aquatic vegetation for foraging and adjacent sandy uplands for nesting.
Hudsonia tomentosa	Beach heather	Vascular plant	Threatened	Savannas and upland prairies.
Minuartia dawsonensis	Rock sandwort	Vascular plant	Threatened	Savannas, upland prairie, and rock outcrops.
Platanthera flava var. herbiola	Tubercled rein orchid	Vascular plant	Threatened	Wet meadows and sunny swales in savannas.
Poa paludigena	Bog bluegrass	Vascular plant	Threatened	Forested wetlands that have groundwater seeps.
Myotis septentrionalis[1]	Northern long-eared bat	Bat	Special concern	During winter inactive season, hibernates in caves and mines. During active season, forages and roosts in upland forests.

1 Although *Myotis septentrionalis* is a state special concern species, it is listed in this table because it is a federally endangered species. Records include both individuals and a maternity roost tree.
2 Habitat information if from reference (96)

5.11.1.3 Potential Impacts and Mitigation Measures

Construction-related potential short-term impacts on federal- or state-protected wildlife species would be similar to those described for non-listed species in Chapter 5.10.5 and may include displacement of protected species during construction activities that generate noise, dust, or disturbance of habitat. Permanent clearing of forested and shrub communities could impact protected species associated with these habitats.

Impacts to protected aquatic species are not anticipated, as waterbodies and watercourses would be spanned and BMPs, such as erosion control measures, would be incorporated to minimize the potential for sedimentation in surface waters crossed by the project.

The primary means to mitigate potential impacts to federally and state protected species is to avoid routing through habitat utilized by these species. Additionally, impacts can be mitigated by incorporating species (or species type) specific BMPs in coordination with the USFWS and/or the DNR. For example, impacts to Blanding's turtles could be minimized by using silt fencing around construction sites and training construction workers to recognize Blanding's turtles. The applicants may be required to conduct field surveys for protected species in coordination with USFWS and/or DNR to determine the presence of particular species along the permitted route (if the Commission issues a route permit). If a protected species is unavoidable, a takings permit may be required, and other permit conditions may be set.

5.11.1.3.1 Federal Species

The species identified in the IPaC query are potentially present in the vicinity of the project in areas where suitable habitat is present. Through implementation of BMPs and mitigation measures, along with the presence of comparable adjacent habitat, impacts to federally protected species are anticipated to be minimal.

The nearest federally designated critical habitat for the gray wolf is located approximately 40 miles north and east of the project's northern extent. The NHIS database does not track the locations of documented gray wolves. Impacts to gray wolves occupying habitats near the project could occur during construction as a result of human activity and noise associated with construction activities. Removal of forested habitat could also impact gray wolves; following existing rights-of-ways, where potential habitat has already been fragmented, would minimize potential impacts to gray wolves.

The nearest federally designated critical habitat for the Canada lynx is located approximately 40 miles east of the project's northern extent. The NHIS database does not track the locations of documented Canada lynx. Impacts to and mitigation measures for Canada lynx would be similar to those described for gray wolves.

As noted in Table 5-16, the NHIS database documents the presence of northern long-eared bats, and a northern long-eared bat maternity roost tree within 1 mile of the project. Impacts to northern long-eared bats could occur if clearing or construction take place during the bat's active season, when the species are breeding, foraging, or raising pups in forested habitat. Bats may be injured or killed if occupied trees are cleared during the active season, and the species may be disturbed during clearing or construction activities due to noise or human presence. Impacts to northern long-eared bats could be minimized by conducting clearing activities while the bats are hibernating in their inactive season habitats.

The tricolored bat is a federal proposed endangered species, which means that the USFWS has determined it is in danger of extinction throughout all or a significant portion of its range and has proposed a draft rule to list it as endangered. Until the rule to list this species is finalized, it is not protected by the take prohibitions of the federal ESA. The NHIS database does not identify any records of tricolored bats within 1 mile of the project; however, habitat suitable for the species is present in the area. Potential impacts to and minimization measures for tricolored bats would be similar to those described for northern long-eared bats.

The project is not located in the USFWS rusty patched bumble bee high potential zone (an area where the species is likely to be present) and the NHIS database does not identify any records of rusty patched bumble bees within 1 mile of the project. Potential impacts to rusty patched bumble bees could occur due to suitable habitat removal; however, impacts are anticipated to be minimal given the abundance of comparable habitat in the area. Potential impacts could be minimized by conducting clearing activities in the winter months.

The monarch butterfly is a federal candidate species, which means that it is a species for which the USFWS has sufficient information to propose listing them as endangered or threatened under the ESA but their listing is precluded by other higher listing activities. Candidate species have no federal protection under the ESA. The NHIS database does not track documented records of monarch butterflies. Potential impacts to and minimization measures for monarch butterflies would be similar to those described for rusty patched bumble bees.

Whooping cranes are designated as a non-essential experimental population in the state. This designation refers to a population that has been established within its historical range under Section 10(j) of the ESA to aid in recover of the species. Consultation under Section 7(a)(2) of the ESA is only required if project activities would occur within a National Wildlife Refuge or National Park. If project activities are proposed on lands outside of a National Wildlife Refuge or National Park, consultation is not required. The project does not intersect any National Wildlife Refuges or National Parks. Whooping cranes are rare in the state of Minnesota, and the NHIS database does not track documented records of them. Potential impacts to and mitigation measures for whooping cranes would be similar to those described for other waterfowl/avian species in Chapter 5.10.5.2.

5.11.1.3.2 State Species

The state threatened and endangered species identified in Table 5-16 and special concern species identified in Appendix N are known to occur in the project's geographic area where suitable habitat is present. The discussion below is focused on potential impacts to and mitigation measures for state threatened and endangered species; however, impacts to and mitigation measures for special concern species would generally be similar for many species occupying similar habitats. Through implementation of BMPs and mitigation measures and the presence of comparable adjacent habitats, impacts to state protected species are anticipated to be minimal.

The state threatened and endangered vascular plants identified in Table 5-16 may occupy habitats that are traversed by the project. If present, these species and/or their habitats could be impacted as a result of clearing activities associated with project construction. Many state protected vascular plants inhabit areas of native vegetation/sensitive ecological resources. These areas would generally be avoided or spanned to the extent possible, which would minimize potential impacts.

Potential impacts to Blanding's turtles could occur as a result of ground disturbing activities associated with project construction. Potential impacts to Blanding's turtles could be minimized by spanning large wetland complexes with adjacent sandy uplands. The use of silt fencing around construction sites and the training of construction workers would also minimize potential impacts to Blanding's turtles.

Loggerhead shrikes could be present in the project's vicinity and potential impacts to and mitigation measures for this species would be similar to those described for other avian species in Chapter 5.10.5.2.

5.11.2 Sensitive Ecological Resources

The DNR has established several classifications for sensitive ecological resources across the state, many of which are scattered throughout the project area (Map Book 5I). Some of these sensitive ecological resources are crossed by the project's ROI for sensitive ecological resources (the 150-foot ROW), including Sites of Biodiversity Significance (SBS), native plant communities, old growth stands, High Conservation Value Forests, and Lakes of Biodiversity Significance. DNR Scientific and Natural Areas are also scattered throughout the area but they are not within the project's ROI; these areas are shown in Map Book 5I but are not discussed further in this EA.

The DNR maps SBS and 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 (reference (100)). The DNR assigns biodiversity significance ranks, as follows:

- 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).

As shown in Map Book 5I, several SBS have been mapped across the area, many SBS ranked high, moderate, and below are crossed by the project's ROI for sensitive ecological resources.

The DNR also identifies and maps areas containing 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 (reference (101)). The DNR provides a state conservation status to each native plant community, 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

As shown in the Map Book 5I, several native plant communities have been mapped across the area, many of which are crossed by the project's ROI for sensitive ecological resources, including the following types and associated state conservation status (or range of statuses if multiple subtypes):

- Dry Barrens Oak Savanna (Southern); S1 or S2
- Red Pine - White Pine Forest; S2

- Northern Wet-Mesic Boreal Hardwood-Conifer Forest; S2-S4
- Graminoid Poor Fen (Basin); S3
- Lowland White Cedar Forest (Northern); S3
- Southern Dry-Mesic Oak (Maple) Woodland; S3 or S4
- Northern Wet Cedar Forest; S3 or S4
- Northern Poor Fen; S3-S5
- Central Mesic Hardwood Forest (Eastern); S4
- Northern Wet-Mesic Hardwood Forest; S4
- Northern Very Wet Ash Swamp; S4
- Red Oak - Sugar Maple - Basswood - (Bluebead Lily) Forest; S4
- Sedge Meadow; S4 or S5
- Northern Shrub Shore Fen; S5
- Alder - (Maple - Loosestrife) Swamp; S5
- Dry Barrens Oak Savanna (Southern); S1 or S2
- Northern Rich Mesic Hardwood Forest; S3
- White Cedar Swamp (Northcentral); S3
- Alder - (Red Currant - Meadow-Rue) Swamp; S3
- Northern Cedar Swamp; S3 or S4
- Northern Wet Ash Swamp; S3 or S4
- Central Dry-Mesic Oak-Aspen Forest; S4
- Northern Mesic Hardwood Forest; S4
- Northern Rich Fen (Basin); S4
- Poor Tamarack - Black Spruce Swamp; S4
- Graminoid Rich Fen (Basin); S4
- Northern Poor Conifer Swamp; S4 or S5
- Poor Black Spruce Swamp; S5
- Willow - Dogwood Shrub Swamp; S5
- Red Pine - White Pine Forest; S2

On state-administered lands, the DNR maps and designates old growth stands, future old growth stands, and candidate old growth stands. As shown on in the Map Book 5I, these stands are sparsely scattered throughout the area. Two candidate old growth stands are crossed by the project's ROI for sensitive ecological resources, both of which are located within northern cedar swamp native plant communities in the Hill River State Forest.

The DNR is required to manage a broad set of objectives and forest resources. The Forest Stewardship Council Forest Management Standard requires certificate holders to identify High Conservation Value Forests and manage such areas to "maintain or enhance" identified High Conservation Values (reference (102) (102)). As shown in the Map Book 5I, High Conservation Value Forests are scattered throughout the area, including one in the northern part of the project that is crossed by the project's ROI for sensitive ecological resources.

The DNR maps certain lakes as Lakes of Biological Significance based on the unique presence of aquatic plants or animals (reference (103)). The DNR assigns biological significance classes (outstanding, high, or moderate) to these lakes based on a variety of factors, such as the quality of the lake/habitat and presence of certain plants and animals. As shown in the Map Book 5I, several Lakes of Biological Significance have been mapped across the area, three of which (two ranked outstanding and one ranked moderate) are crossed by the project's ROI for sensitive ecological resources.

State and federal lands that are preserved or managed for wildlife would also be considered sensitive ecological resources; these lands are discussed in Chapter 5.10.5.

5.11.2.1 Potential Impacts and Mitigation Measures

Potential project impacts to sensitive ecological resources are anticipated to be minimal, as these resources can often be avoided and/or spanned. Sensitive ecological resources can be impacted by construction activities. The use of construction equipment during site preparation (grading, excavation, and soil stockpiling) could result in localized physical disturbance and soil compaction. The applicants would permanently convert forested and/or shrubland within the ROW to low-growing vegetation. Removal of vegetation and/or conversion to open habitats could increase the potential for the spread of invasive plant species/noxious weeds and could alter the structure and function of sensitive ecological resources, potentially making them less suitable for the rare species that would typically inhabit them.

The primary impact mitigation to manage sensitive ecological resources is prudent routing (i.e., by avoiding and/or spanning these communities if possible). In addition, following existing rights-of way and division lines such as roads, existing transmission lines, and field lines, would reduce the potential for fragmentation of these resources. Where structures must be placed within sensitive ecological resources, a biological survey, conducted in coordination with appropriate agencies, may be required.

5.12 Use or Paralleling of Existing Rights-of-Way

Sharing ROW with existing infrastructure or paralleling existing ROW minimizes fragmentation of the landscape and can minimize human and environmental impacts (e.g., aesthetic and agricultural impacts). The use and paralleling of existing ROW is considered by the Commission when determining the most appropriate route for the project.

There is a difference in potential impacts between using ROW for double-circuiting and paralleling existing ROW. Though both can minimize land-use, agricultural, and natural/cultural resource impacts, double-circuiting with existing transmission lines best minimizes potential impacts because no new ROW would be acquired.

ROW sharing opportunities for the project are shown in Map Book 5J. These opportunities exist where the ROW for the route would be shared with or would parallel the ROW of existing infrastructure—a transmission line, road, or railway—or existing field, parcel, or section lines. Specific analysis and comparisons of ROW sharing and paralleling between routing alternatives is discussed further in Chapters 6 and 7.

5.13 Electric System Reliability

The NERC has established mandatory reliability standards for American utilities. For new transmission lines, these standards require the utility to evaluate whether the grid would continue to operate adequately under various contingencies.

Two contingency categories apply here. Under Category C, NERC requires utilities to analyze the consequences of a single storm or other event that causes simultaneous outages of both circuits on a double-circuit transmission line. The applicable Category D contingencies 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. Route permits issued by the Commission require permittees to comply with NERC standards (Appendix H).

In developing possible project routes, the applicants analyzed whether these routes created reliability concerns. The applicants indicate that there are no reliability concerns with their proposed route and that this route supports and enhances the reliability of the regional electrical system. Thus, no adverse impacts to electric system reliability are anticipated. Specific analysis and comparisons of electrical reliability between routing alternatives is discussed further in Chapters 6 and 7.

5.14 Cost

As outlined in the RPA, the estimated project construction cost is approximately $970 million to $1.3 billion (2022$). Cost will be dependent upon the routing alternatives selected for the project. Construction cost estimates rely on the best available information at the filing time of the RPA. Estimates are made in year-2022 dollars, and include permitting, engineering, materials (e.g., steel, conductor, insulators, etc.), land rights and ROW, and construction costs. The cost estimate assumes the applicants will pay prevailing wages for applicable positions during project construction.

The construction cost estimate of $970 million to $1.3 billion was developed specifically for the applicants' proposed route. To estimate the cost of alternatives, transmission line construction costs were divided by the project's length to develop an approximate cost-per-mile estimate for new double-circuit 345 kV transmission. The cost estimate to remove existing transmission lines was calculated in a similar way. Cost estimates in cost-per-mile for other voltage classes (e.g., route alternative E1) are sourced from recent construction actuals.

Cost estimates vary depending on the addition of costs outside typical construction, referred to as cost "adders" for specialty structures, line crossings, and additional ROW. Multiple alternatives (e.g., route alternative C, alignment alternative AA15, etc.) create new crossings of existing transmission lines. To cross over an existing transmission line, taller, more robust structures (steel, foundation, and insulators), and thus more expensive transmission structures, known as "dead-ends" must be built on each side of the crossing. In other alternatives where a significant change in direction is required (e.g., route alternative E4, E5, and others), more robust (and therefore more expensive) transmission structures known as "heavy-angles" will be required to allow for a "turn" in the transmission line route. Conversely, some alternatives reduce the number of heavy-angle structures relative to the applicants' proposed route and instead allow use of non-specialty structures known as "tangents," which results in a cost savings. Construction costs for specific routing alternatives are discussed in Chapters 6 and 7.

5.15 Cumulative Potential Effects

In Minnesota, cumulative potential effects are impacts on the environment that result from:

> *The incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation has been laid, regardless of*

> *what person undertakes the other projects or what jurisdictions have authority over the projects* (Minn. Rule 4410.0200).

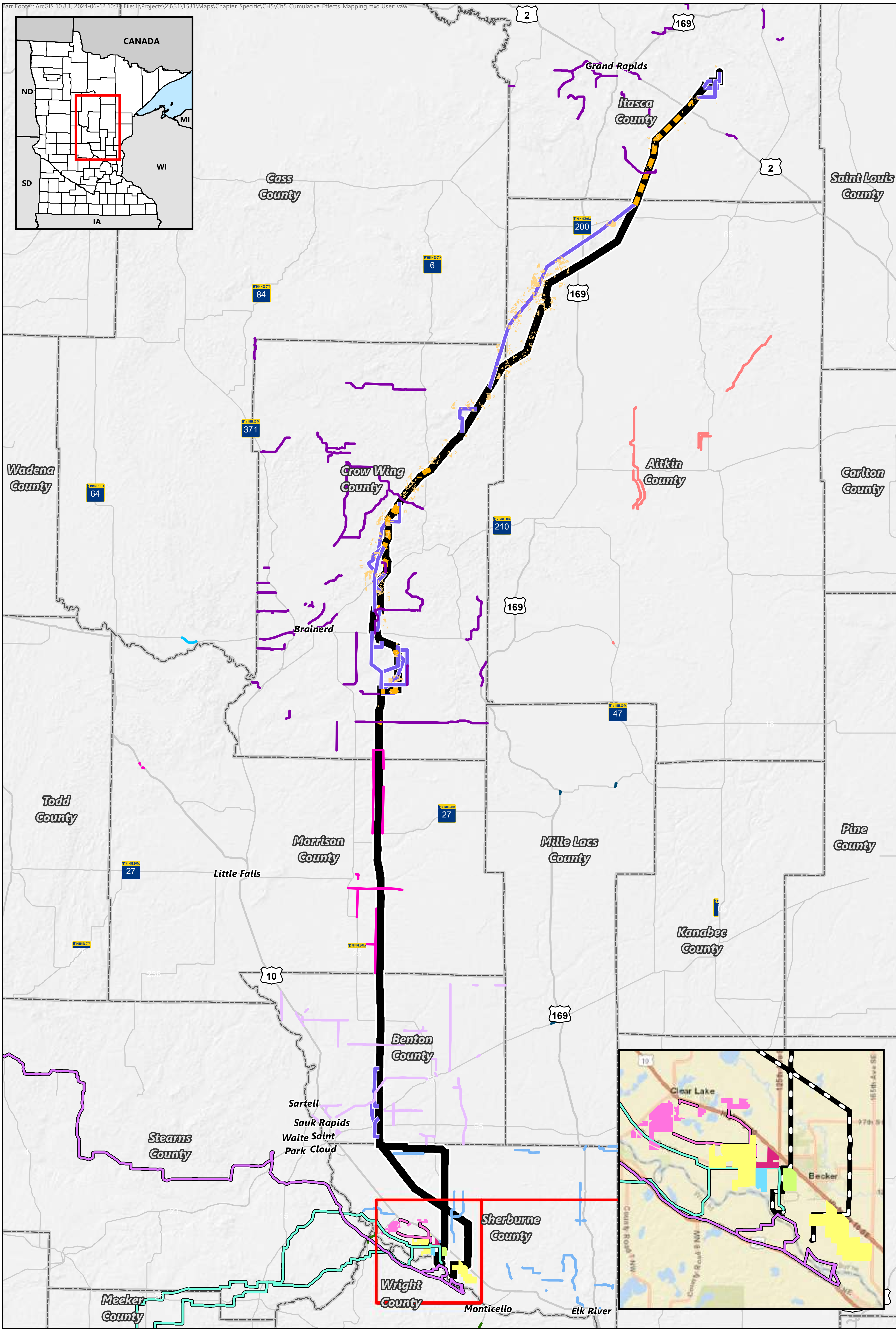
Considering cumulative potential effects serves to assist decision-makers in avoiding decisions about a specific project in isolation. Effects that might seem minimal when viewed in the context of a single project can accumulate and become significant when the broader landscape of all projects is taken into account.

Cumulative effects are discussed here for projects that have been planned or are otherwise foreseeable in the project area. The websites of several agencies/local governments were reviewed, and in some cases agencies/local governments were directly contacted to identify current and reasonably foreseeable future projects that are located within areas traversed by the project; these agencies included: the Minnesota Environmental Quality Board, Commission, Minnesota Department of Commerce, MnDOT, Minnesota BWSR, MPCA, and Minnesota DNR. In addition, the websites for Itasca, Aitkin, Crow Wing, Cass, Morrison, Benton, and Sherburne counties and associated Soil and Water Conservation Districts for each county were reviewed; as well as larger municipalities in the area, including Hill City, Riverton, Ironton, Harding, Lastrup, St. Cloud, and Becker.

Current and reasonably foreseeable future projects are summarized in Table 5-17 and shown on Map 5-4. The majority of projects identified in Table 5-17 are timber harvesting projects. Forestry is a dominant land use in the counties traversed by the northern part of the project; as such, several areas are proposed for forest harvest on state, county, or private land (Table 5-17 and shown on Map 5-4). These projects were identified through a data request to relevant counties within the project area. Timber harvesting projects are likely to create short-term impacts such as increased noise levels and potential traffic congestion as well as a reduction in tree density within the harvested areas; however, these harvesting activities are considered sustainable and not likely to cause long-term impacts to the project area.

A number of transportation-related projects were also identified through a review of the MnDOT Statewide Transportation Improvement Program (STIP) (Districts 1 and 3) for the period of 2024-2027 (reference (104)) and generally consist of routine maintenance activities such as roadway re-surfacing, asphalt surface treatments, concrete paving, and pedestrian/bike trail improvements. While these projects would provide long-term benefits to the area, their potential for cumulative effects would generally be minimal and tied to short-term construction related effects. As such, these projects are not evaluated as part of the cumulative potential effects analysis.

As noted in Table 5-17 and shown on Map 5-4, there are two other long-range transmission line projects that would connect near Becker, Minnesota. The Alexandria to Big Oaks project would connect to the new Big Oaks Substation, while the Minnesota Energy Connection Project would connect near the retiring Sherco coal plant, approximately 1.5 miles to the northwest of the Big Oaks Substation. Solar projects associated with the retiring Sherco coal plant are also planned in the area as well as up to three data centers (Table 5-17, Map 5-4). The cumulative potential effects of these projects are summarized below.



Applicants' Proposed Route
Route Alternative
Alignment Alternative
Alexandria to Big Oaks 345 kV Transmission Line Project
Minnesota Energy Connection
Sherco 3 Solar
Aitkin County
Benton County
Cass County
Crow Wing County
Isanti County
Itasca County
Mille Lacs County
Morrison County
Sherburne County
Wright County
Forest_Harvest_Plans
Sherco 3 Solar
Sherco Solar
Elk River Technologies Data Center
Microsoft Data Center
Potential Xcel Data Center

0 5 10 15
Miles

Map 5-4

CUMULATIVE EFFECTS

Northland Reliability Project

Table 5-17 Current and Reasonably Foreseeable Future Projects

Project Name	Description	Location	Source
Alexandria to Big Oaks 345 kV Transmission Line Project	Xcel Energy proposes to string approximately 105-108 miles of new transmission line on existing double-circuit capable structures running from the existing Alexandria Substation in Alexandria, Douglas County to Becker, Sherburne County where new transmission lines would cross the Mississippi River to facilitate the proposed Big Oaks Substation. Project is currently in environmental review phase.	Sherburne County Region Alexandria (Douglas County) to Becker (Sherburne County); terminating at the new Big Oaks Substation	https://eera.web.commerce.state.mn.us/web/project/15111
Minnesota Energy Connection Project	Xcel Energy proposes a new 345-kilovolt (kV) double-circuit transmission line between the existing Sherco Substation in the city of Becker, Minnesota and a new substation (Terminal Substation) proposed near the town of Garvin in Lyon County, Minnesota. Project is currently in environmental review phase.	Sherburne County Region Sherburne County, southwest to Lyon County	https://apps.commerce.state.mn.us/web/project/15000
Sherco 3 Solar Project	Xcel Energy proposes to construct a new 250 MW solar energy project in Sherburne County, Minnesota.	Sherburne County Region Between U.S. Highway 10 and the Mississippi River in the City of Clear Lake and Clear Lake Township	https://apps.commerce.state.mn.us/web/project/15104
Sherco Solar Project	Xcel Energy is proposing to construct an up to 460-megawatt solar project and two 345 kilovolt transmission lines to interconnect the Solar Project to the grid. Both transmission lines connect the Solar Project to the existing Sherburne County Substation. The Solar Project will partially replace energy production of the Sherco Generating Plant Unit 2	Sherburne County Region Between U.S. Highway 10 and the Mississippi River, and on the east and west sides of the existing Sherco Generating Plant in Becker	https://apps.commerce.state.mn.us/web/project/14335
Microsoft Data Center	Proposed Microsoft data center in Sherburne County near Becker. Microsoft recently purchased 295 acres from Xcel Energy to develop a data center	Sherburne County Region	Alexandria to Big Oaks EA
Elk River Technologies Data Center	Proposed data center in Becker, Sherburne County. Elk River Technologies has an option to develop a data center on 348 acres.	Sherburne County Region	Alexandria to Big Oaks EA
Potential Xcel Data Center	Proposed data center in Becker, Sherburne County. Xcel Energy is marketing a site to the west of the Sherco plant for a potential data center.	Sherburne County Region	Alexandria to Big Oaks EA

Project Name	Description	Location	Source
Benton County Road Construction/ Maintenance Projects	Three road improvement projects including reclaiming and paving	Various roads in the Morrison County Region	STIP, https://www.co.benton.mn.us/DocumentCenter/View/9011/5-YearPlan-2024-2028
Crow Wing County Road Construction/ Maintenance Projects	Seven Highway improvement projects, including TH 18 to CSAH 8, CSAH 3 to TH 6, and TH 25 to CSAH 8	Various highways in the Cole Lake-Riverton Region and Long Lake Region	STIP, https://hub-cwccm.hub.arcgis.com/apps/bc8c694c05f14bbc8cbce805eb5d491a/explore
Itasca County Road Construction/ Maintenance Projects	One Itasca County road construction project, CSAH 67 to CR 427	Hill City to Little Pine Region	Itasca County
Morrison County Road Construction/ Maintenance Projects	Various road improvement projects including paving and culvert work	Morrison County Region	Morrison County
Sherburne County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays	Sherburne County Region	https://gis.co.sherburne.mn.us/arcgis/rest/services/PublicWorks/Construction_Projects_Future/MapServer
County-level Timber Harvesting	Numerous anticipated timber harvesting events within 2,000 feet of the routing alternatives including: • 109 timber harvest areas in Aitkin County, • 131 timber harvesting areas in Crow Wing County • 13 timber harvest areas in Itasca County	Iron Range Substation Region, Hill City to Little Pine Region, Cole Lake-Riverton Region, Long Lake Region	DNR, counties

5.15.1 Human Settlements

Cumulative potential effects on human settlements are anticipated to be minimal. Future projects will result in aesthetic impacts. Most will occur at the southern end of the project where the Alexandria to Big Oaks, Minnesota Energy Connection, and Northland Reliability project will converge with the Sherco Solar project, the proposed data center projects, and the new Big Oaks Substation. In this area, the visual setting will further transition from one that is agricultural and pastoral to one that is more and more developed and industrial in nature. Cumulative aesthetic impacts in this area are anticipated to be minimal to moderate.

These concurrent projects and others that may happen at the same time are anticipated to have no cumulative effect on local zoning and land use, property values, noise, and cultural values.

5.15.2 Transportation and Public Services

Cumulative potential effects on transportation and public services are anticipated to be minimal to slightly positive. Transportation projects completed at the same time as the project would be undertaken to maintain and improve roads, to ensure their safe operation and the public's health and safety. This project and all of the projects identified in Table 5-17 are not anticipated to impact airports, public utilities, or emergency services.

5.15.3 Public Health and Safety

This project, in combination with the current and reasonably foreseeable future projects summarized in Table 5-17, are not expected to create impacts to public health and safety. Because the Commission imposes a maximum electric field limit of 8 kV/m for new transmission projects, this project as well as the Alexandria to Big Oaks project and the Minnesota Energy Connection project would have to meet this permit condition. Accordingly, public health impacts related to induced voltages are anticipated to be minimal.

5.15.4 Climate and Air Quality

This project, in combination with the current and reasonably foreseeable future projects summarized in Table 5-17, could interact to result in cumulative potential effects to climate and air quality. When considered singularly, small amounts of emissions would be associated with each project due to the intermittent operation and maintenance activities of the project via mobile combustion and particulate roadway dust generation. However, each of the proposed transmission line projects would also support the transition to renewable energy. Road construction and maintenance projects would result in temporary construction emissions, but only minimal operational emissions given existing traffic. A small amount of O_3 would also be created due to corona from the operation of each of the three proposed transmission line projects. While individually the emission of O_3 during operations is not anticipated to have a significant impact on the environment, together the projects would result in more O_3 emissions than present-day.

5.15.5 Land-Based Economies

Cumulative potential effects on land-based economies may occur but are anticipated to be minimal. Two projects (Northland Reliability and Alexandria to Big Oaks) would utilize existing transmission line rights-of-way to the extent possible, reducing land conversions and potential displacements. Some land would be converted from agricultural or forested use to other uses.

5.15.6 Archaeological and Historic Resources

This project, in combination with the current and reasonably foreseeable future projects summarized in Table 5-17, could interact to result in cumulative potential effects to archaeological and historic architectural resources. Any time new ground disturbance would occur as the result of a project, there is the potential to impact significant archaeological and historic architectural resources. However, survey and identification of these resources during project planning stages can help determine the presence of these resources. Once identified, prudent routing and/or efforts to avoid or minimize impacts to these resources would reduce the potential for cumulative effects.

5.15.7 Natural Environment

This project, in combination with the current and reasonably foreseeable future projects summarized in Table 5-17, could interact to result in cumulative potential effects to the natural environment, including water, soil, vegetation, and wildlife resources. However, it is anticipated that the cumulative potential effects to these resources would be minimal given the use of existing rights-of-way for this project and the Alexandria to Big Oaks project, the predominantly agricultural landscape of the Minnesota Energy Connection project and solar projects intersecting this project, the temporary nature of forest harvests (i.e., forested vegetation would return to these areas), and project design and impact minimization measures that would be incorporated into this project and the other projects.

This project and all of the other foreseeable projects identified in Table 5-17 would generally avoid or span surface waters; as such, the potential for cumulative effects on surface waters are not anticipated. Conversion of upland and wetland forested vegetation types would occur where this project and the other two transmission line projects identified in Table 5-17 cross forested land. These projects could together result in an increase in vegetation type conversion, forest fragmentation, an increase in the spread of noxious weeds and other non-native species, and soil disturbance in the region. In addition, the areas proposed for forest harvest could interact with this project to result in additional impacts to forested vegetation.

Cumulative potential effects to wildlife and associated habitat could occur as a result of vegetation clearing and associated habitat conversion or fragmentation in the more forested northern part of this project combined with forest clearing associated with proposed forest harvests in the region. However, while some species may abandon cleared habitats for adjacent forested habitats, other species that favor open and edge habitats may move into these areas. Given the extensive forest cover in the northern part of the project, the potential for cumulative effects is anticipated to be minimal.

This project could interact with the other two transmission line projects and solar projects to result in an increased potential for avian collisions with transmission line infrastructure. However, these projects intersect in an agricultural and industrial area, where extensive transmission line infrastructure is already present and the potential for collisions already exists. Furthermore, BMPs, such as bird flight diverters, would be used where necessary to reduce the potential for impacts.

5.15.8 Rare and Unique Natural Resources

This project, in combination with the current and reasonably foreseeable future projects summarized in Table 5-17, could interact to result in cumulative potential effects to rare and unique natural resources, including federally and/or state protected species and sensitive ecological resources. Cumulative potential effects to federal- or state-protected wildlife species would be similar to those described for non-protected species in Chapter 5.15.7.

Sensitive ecological resources, such as native plant communities, often provide habitat for protected species. These areas would generally be avoided or spanned to the extent possible by this project and the two other transmission line projects and solar projects identified in Table 5-17. In addition, areas proposed for forest harvest would likely be located outside of these areas. As such, cumulative potential effects to these sensitive ecological resources and any protected species inhabiting them are anticipated to be minimal.

The clearing of forested vegetation/habitat associated with this project, when considered with forest clearing associated with proposed forest harvests in the region, could contribute to cumulative potential effects of federally or state protected species that rely on forested habitats, such as northern long-eared bats. Given the abundance of forested cover in the northern part of this project and implementation of restrictions on project construction and/or forest harvesting, cumulative potential effects of protected species inhabiting forested areas anticipated to be minimal.

6 Impacts and Mitigation Measures by Region

There are 25 route alternatives and 15 alignment alternatives that could be used for the project (Map 3-1). These route and alignment alternatives could mitigate potential project impacts. This chapter discusses the potential route and alignment alternative impacts, contrasting them with their equivalent segments of the applicants' proposed route (referred to as "applicants' equivalent"). The discussion here proceeds north to south by geographical regions of the project (Map 3-1).

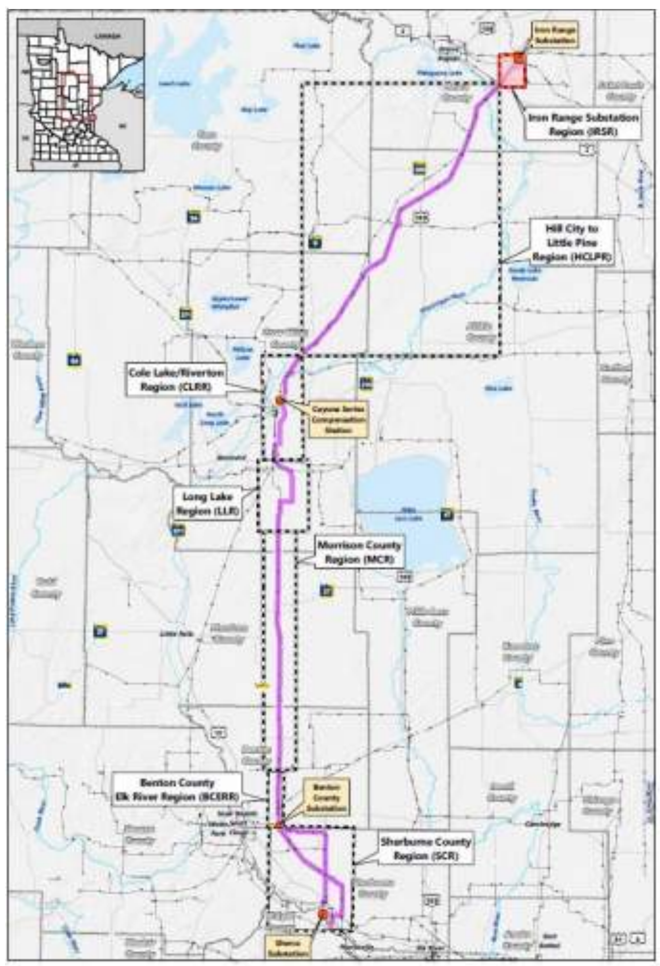
A route alternative is a specifically identified segment that departs from and returns to the applicants' proposed route, and which is routed outside of the applicants' proposed route width. An alignment alternative is an alternative line placement within the applicants' proposed route width. The route width does not change; only the placement (alignment) within the route changes.

For analysis purposes, common start and end points were developed to create a mechanism for comparing relevant routing alternatives against each other. Due to variation in the lengths of the proposed alternatives, in some instances, the start and/or end points add a portion of the applicants' proposed route to the proposed routing alternative.

6.1 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 (Figure 6-1). This region includes the Iron Range Substation, which is the northern project endpoint. In addition to the applicants' proposed route, the region has four route alternatives (A1, A2, A3, and A4) and one alignment alternative (AA15) (Map Book 3A). Chapter 6.1.1 summarizes the potential impacts resulting from construction and operation of the applicants' proposed route in the Iron Range Substation region. Chapter 6.1.2 provides a comparison of the potential impacts resulting from construction and operation of route alternatives A1, A2, A3, A4, and the applicants' equivalent. Chapter 6.1.3 provides a comparison of the potential impacts resulting from construction and operation of alignment alternative AA15 and the applicants' equivalent.

Figure 6-1 Iron Range Substation Region



6.1.1 Applicants' Proposed Route - Iron Range Substation Region

Potential impacts of the applicants' proposed route in the Iron Range Substation region are summarized in Table 6-1 and discussed in Chapters 6.1.1.1 through 6.1.1.5.

Table 6-1 Human and Environmental Impacts – Applicants' Proposed Route, Iron Range Substation Region

Resource	Element	Applicants' Proposed Route
Length (miles)		6.2
Human Settlement	Residences within 0-75 feet (count)	0
	Residences within 75-250 feet (count)	0
	Residences within 250-500 feet (count)	5
	Residences within 500–1,000 feet (count)	9
Land-Based Economies	Agricultural land in 150-foot ROW (acres)	19
Water Resources	Total wetlands in 150-foot ROW (acres)	51
	Forested wetlands in 150-foot ROW (acres)	27
Vegetation	Forested landcover in 150-foot ROW (acres)	81
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	49
	Federal- or state-protected species documented in 150-foot ROW (count)	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	3.2 (51)
	Roadway (miles, percent)	0 (0)
	Field, parcel, or section lines (miles, percent)	2.5 (41)
	Total ROW sharing and paralleling (miles, percent)	5.7 (92)
Estimated Cost	Total estimated cost (2022 dollars in millions)	$34.2

6.1.1.1 Human Settlements

As discussed in Chapter 5.3, potential human settlement impacts are assessed by looking at several evaluative elements: aesthetics, displacement, noise, property values, zoning and land-use compatibility, electronic interference, and cultural values. Proximity to homes, schools, and other human settlement features and the extent of ROW sharing with existing infrastructure are the primary indicators of potential human settlement impacts. Human settlement impacts are minimized by routes that are located aware from homes and that share ROW with existing infrastructure.

Some elements of human settlement, including cultural values, displacement, electronic interference, noise, property values, and zoning and land use, are anticipated to be minimal. These elements are not analyzed or discussed further. Aesthetics, displacement, socioeconomics, and EJCs are the only human settlement elements for which impacts are anticipated to be non-minimal.

6.1.1.1.1 Aesthetics

Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes (Chapter 5.3.1). Determining the relative scenic value or visual importance in any given area depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question. Aesthetic impacts can be minimized by placing the transmission line away from residences (Table 6-2) and by following existing infrastructure ROW (Table 6-3).

The applicants' proposed route was developed to avoid proximity to residences. There are 14 residences within 1,000 feet of the applicants' proposed alignment and the closest residences in the Iron Range Substation region are between 250 and 500 feet of the alignment. With respect to ROW sharing, approximately half of the applicants' proposed route in the Iron Range Substation region would follow an existing transmission line ROW; approximately 92 percent would follow existing infrastructure ROW. Aesthetic impacts are anticipated to be minimal to moderate.

Table 6-2 Iron Range Substation Region Proximity to Residences for Applicants' Proposed Route

Residences, Distance from Anticipated Alignment	Applicants' Proposed Route
Residences within 0-75 feet	0
Residences within 75-250 feet	0
Residences within 250-500 feet	5
Residences within 500-1,000 feet	9
Total Residences within 1,000 feet	14

Table 6-3 Iron Range Substation Region ROW Sharing and Paralleling for Applicants' Proposed Route

Infrastructure	Applicants' Proposed Route miles (percent)
Follows Existing Railroad	0.0 (0)
Follows Existing Roads	0.0 (0)
Follows Existing Transmission Line	3.2 (51)
Total – Follows Transmission Line, Road, or Railroad	3.2 (51)
Follows Field, Parcel, or Section Lines	2.5 (41)
Total – ROW Paralleling and Sharing	5.7 (92)
Total Length of Route Alternative	6.2

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line, and therefore, the sum may be greater than 100 percent.

6.1.1.2 Land-Based Economies

As discussed in Chapter 5.8, impacts on land-based economies are assessed by considering four elements: agriculture, forestry, mining, and recreation and tourism.

Impacts to certain elements of land-based economies, including mining and recreation and tourism, are anticipated to be minimal.

Agriculture and forestry are the only elements of land-based economies for which impacts are anticipated to be non-minimal in this region.

6.1.1.2.1 Agriculture

Project impacts to agriculture within the Iron Range Substation region were evaluated through land use and soil types within the 150-foot ROW of the applicants' proposed route and proposed alternatives (Chapter 5.7.1). Map Book 5C provides an overview of land cover types crossed by the applicants' proposed route. There are approximately 19 acres of agricultural land in the ROW of the applicants' proposed route (17 percent of the ROW in this region). This land consists of cultivated crops and hay/pasture lands.

According to the MDA Organic Farm Directory, no registered organic producers are within the 150-foot ROW (reference (105)). No apiaries are located within the ROW according to the Minnesota Apiary Registry (reference (106)). In addition, no agricultural lands in the ROW are enrolled in the USDA Farm Service Agency (FSA) CREP (reference (107)).

Potential construction and operation-related impacts to agricultural land are summarized in Chapter 5.8.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to agricultural land, as described in Chapter 5.8.1.1.

6.1.1.2.2 Forestry

Impacts to forestry resources within the Iron Range Substation region were primarily assessed by evaluating forestry resources within the 150-foot ROW of the applicants' proposed route (Chapter 5.7.2). Approximately 81 acres of forested land are located within the ROW of the applicants' proposed route (reference (108)); this forested area is comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands (Map Book 5C).

As shown in Table 6-4, there are 6 acres of designated forestry resources within the route ROW, consisting of DNR managed forested land, Forest for the Future program land, and SFIA land. There are no State forests within the ROW in this region.

Table 6-4 Designated Forestry Resources within the 150-foot ROW of the Applicants' Proposed Route

Route	Acres of DNR state forest within 150-foot ROW	Acres of Minnesota School Trust Land[1] within 150-foot ROW	Acres of Forest for the Future[2] land within 150-foot ROW	Acres of Sustainable Forest Incentive Act[3] land within 150-foot ROW
Applicant's Proposed Route	0.0	1.00	5.0	4.5

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated, and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)

1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

2 Minnesota's Forests for the Future Program is a conservation program administered by the DNR to encourage the protection of privately-owned forest lands through conservation easements or land purchases (reference (5)).

3 Minnesota's Sustainable Forest Incentive Act is a conservation program administered by the DNR that provides annual incentive payments to encourage private landowners to keep their wooded areas undeveloped (reference (109)).

Potential impacts to designated forestry resources within the 150-foot ROW of the applicants' proposed route include permanent impacts. Vegetation clearing would include permanently removing trees from the ROW before construction.

Forestry resource impacts may result in negative financial impacts to state-owned forest lands and privately-owned commercial forest lands. As noted in Chapter 5.8.2.1, impacts to forestry resources could be mitigated by prudent routing and siting of staging areas. Where these areas cannot be avoided, commercial foresters and private landowners would be compensated for loss of timber from ROW clearing.

6.1.1.3 Archaeological and Historic Resources

Archaeological and historic architectural resource impacts are assessed by determining the presence of these resources within the project route width (Chapter5.1.1). Map Book 5F provides an overview of archaeological and historic architectural resources in the Iron Range Substation region.

There are two documented historic architectural resources within the applicants' proposed route width (1,000 ft) in the Iron Range Substation region. These include resource IC-TLT-00016, a log barn off of County Road 434, and resource XX-ROD-00176, Trunk Highway 2, which crosses the applicants' proposed route near the southeastern edge of the Iron Range Substation region.

As discussed in Chapter 5.9.3, impacts to these resources would mainly consist of changes in the resource's setting due to placement of the transmission line in proximity. However, the applicants' proposed route would cross resource XX-ROD-00176 (Trunk Highway 2) within an existing transmission line ROW, so no changes to this resource are anticipated as a result of the project. In the vicinity of resource IC-TLT-00016 (the log barn), the applicants' proposed route does not follow an existing transmission line ROW; therefore, route construction in this area could affect the resource setting. However, it appears that a dense tree line surrounds resource IC-TLT-00016, shielding visual impacts of the applicants' proposed route on this resource. No other cultural resources are present within the route width.

6.1.1.4 Natural Environment

6.1.1.4.1 Water Resources

Potential project impacts on water resources are examined by evaluating locations and conditions of watercourses and waterbodies, floodplains, wetlands, and groundwater. Project proximity to water bodies, watercourses, floodplains, wetlands, and groundwater wells and the necessity of crossing these features are the primary indicators of potential water resource impacts. Impacts to two water resource evaluation elements, floodplains and groundwater, are anticipated to be minimal.

Thus, there are two water resource evaluation elements where impacts could be non-minimal: watercourses and waterbodies, and wetlands. This discussion focuses on those elements that are within the ROW or are crossed by the routing alternatives. The number of surface water and wetland crossings is an important consideration when evaluating routes, even though there may be no direct impacts associated with these crossings. The crossings are important because of the potential indirect impacts associated with them (i.e., clearing of vegetation, soil movement). The amount of forested wetland within the ROW is also an important consideration when evaluating routes. Since large-growing woody vegetation would be cleared from the ROW, forested wetlands would be converted to other wetland types, resulting in permanent impacts. Map Book 5G show water resources features in the vicinity of the Iron Range Substation region.

6.1.1.4.1.1 Watercourses and Waterbodies

The applicants' proposed route would cross one watercourse (Swan River) in the Iron Range Substation region. The Swan River is classified as a PWI watercourse pursuant to Minn. Statute 103G.005 and is listed as an impaired water for aquatic consumption. The applicants' proposed route would not cross any waterbodies within the Iron Range Substation region.

It is anticipated that the Swan River would be spanned. No structure placements are anticipated within Iron Range region waterbodies and watercourses, meaning no direct impacts to these resources are anticipated. Indirect resource impact, such as increases in turbidity, could be minimized by using BMPs and by choosing a routing alternative that has relatively fewer waterbody and watercourse crossings.

6.1.1.4.1.2 Wetlands

The NWI wetlands within the ROW of the applicants' proposed route ROW consist mainly of forested wetlands, with some shrub-dominated wetlands and emergent wetland. There are approximately 26.5 acres of forested wetlands within the applicants' proposed route ROW and 24.1 acres of non-forested wetlands. There are no PWI wetlands along the applicants' proposed route in the Iron Range Substation region.

Although wetlands would be spanned to the extent possible, the applicants' proposed route would cross wetland areas wider than 1,000 feet, which may require one or more structures to be placed in a wetland. Structures placement in a wetland would result in permanent impacts. Permanent wetland impacts could also occur if wetlands in the ROW are forested. Forested wetlands would be converted to non-forested wetland types, as trees are not allowed within transmission line rights-of-way. Impacts associated with converting forested wetlands to non-forested wetland types could be minimized by selecting a routing alternative with fewer forested wetlands in the ROW.

6.1.1.4.2 Vegetation

Vegetation impacts were evaluated by examining vegetative landcover within the 150-foot ROW (Chapter 5.10.4.1). Map Book 5C provides an overview of landcover types across the Iron Range Substation region and, Table 6-5 summarizes the landcover types within the applicants' 150-foot ROW within this region. The dominant vegetative landcover in the applicants' 150-foot ROW in this region consists of forest, which represents approximately 72 percent of the ROW. Forest types include forested wetlands and upland deciduous, coniferous, and mixed forest communities.

Table 6-5 Landcover Types in the 150-foot ROW of the Applicants' Proposed Route in the Iron Range Substation Region

Landcover Type	Acres in ROW	Percent of ROW [1]
Forested (upland and wetland)	81	72
Agricultural (cultivated crops and hay/pasture)	19	17
Herbaceous (upland and wetland)	9	8
Shrub/Scrub	3	2
Developed (low-high intensity; open space)	1	1

Source: reference (110)
1 Totals may not sum to 100 percent due to rounding.

As discussed in Chapter 5.10.4.1, the applicants would clear forested vegetation from the 150-foot ROW during construction, and the ROW would be maintained with low-growing vegetation to minimize potential interference with the transmission line. While just over half of the applicants' proposed route in the Iron Range Substation region would parallel an existing transmission line ROW where the forested areas have already been fragmented, the northern part of this route would traverse an extensive forested area that does not parallel an existing ROW, resulting in new forest fragmentation.

Potential construction and operation-related impacts to vegetation are summarized in Chapter 5.10.4.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Chapter 5.10.4.1. Potential impacts to agricultural vegetation and wetlands are discussed Chapters 5.8.1 and 5.10.1.3, respectively.

6.1.1.4.3 Wildlife

Wildlife impacts are primarily assessed by evaluating the presence of wildlife habitat, including areas that are preserved or managed for wildlife habitat, within the 150-foot ROW (Chapter 5.10.5.1 and 5.10.5.2). The applicants' proposed route in the Iron Range Substation region would not traverse any areas that are publicly preserved or managed for wildlife habitat. As discussed in Chapter 6.1.1.4.2, just under three-fourths of the ROW would be converted from forested habitat to open and maintained ROW habitat. In some areas this would occur adjacent to an existing ROW; however, the northern portion of the applicants' proposed route in this region would fragment forested habitat in an area of extensive forest cover. This could adversely impact wildlife species that depend on contiguous forested habitat while possibly benefiting those species that prefer open or edge habitats. In this area and others where the applicants' proposed route does not parallel an existing transmission line, there could be an increased potential for impacts to avian species.

Potential construction and operation-related impacts to wildlife are summarized in Chapter 5.10.5. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife, as described in Chapter 5.10.5.

6.1.1.5 Rare and Unique Natural Resources

Impacts to rare and unique natural resources are primarily assessed by evaluating the presence of federal- and state-protected species within a 1-mile radius of the anticipated alignments and the presence of sensitive ecological resources within the 150-foot ROW (Chapter 5.10). Map Book 5I provides an overview of sensitive ecological resources within the Iron Range Substation region. In order to protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

6.1.1.5.1 Protected Species

According to the NHIS database, no federal- or state-protected species have been documented within 1 mile of the applicants' proposed route in the Iron Range Substation region. Four state special concern species have been documented within 1 mile of the applicants' proposed route in this region (Appendix N).

Formal surveys for protected species have not been conducted for the project; as such, it is possible that additional protected species could be present where suitable habitat is available within the 150-foot ROW. In addition, although not tracked in the NHIS database, it is possible that, given the forested landcover in this region, federally threatened gray wolves and Canada lynx could inhabit areas near the applicants' proposed route. Potential impacts to protected species could occur should they be present within or near the ROW. While more mobile species would leave the area for nearby comparable habitats, non-mobile organisms, such as vascular plants or nesting birds, could be directly impacted.

Potential construction and operation-related impacts to protected species are summarized in Chapter 5.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species, as described in Chapter 5.11.1.3. In addition, the applicants may be required to conduct field surveys for protected species in coordination with the USFWS and/or DNR prior to construction.

6.1.1.5.2 Sensitive Ecological Resources

The 150-foot ROW of the applicants' proposed route would traverse approximately 49 acres of a DNR SBS ranked moderate. As shown on Map Book 5I, the 150-foot ROW of the applicants' proposed route would intersect this SBS in two locations. In one of these locations, and the larger of the two, the applicants' proposed route would traverse the SBS along an existing transmission line ROW, thereby minimizing impacts. However, the other location is in the northern part of the applicants' proposed route, where the anticipated alignment does not parallel any existing rights-of-way and would require new ROW. Both locations would require transmission line structure placement within the SBS, as both locations would cross the SBS for lengths that exceed the maximum span length of 1,000 feet.

Creation of new transmission line rights-of-way through sensitive ecological resources could impact protected species associated with habitats within them. This could occur as a result of habitat conversion or fragmentation or due to the placement of structures and other infrastructure within them.

Potential construction and operation-related impacts to sensitive ecological resources are summarized in Chapter 5.11.2.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to sensitive ecological resources, as described in Chapter 5.11.2.1. In addition, the applicants may be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species within sensitive ecological resources that cannot be avoided.

6.1.2 Route Alternatives A1 through A4 – Iron Range Substation Region

Route alternatives A1 through A4 provide different options to the applicants' proposed route in the northernmost part of the project. Route alternatives A1 and A2 are shifted from state land onto property owned by the applicants. Route alternatives A3 and A4 were shifted to minimize impacts to private property. Potential impacts of route alternatives A1 through A4 and the applicants' equivalent are summarized in Table 6-6 and shown on Map 6-1. These route alternatives do not include any transmission line ROW sharing, paralleling, or double-circuiting.

Table 6-6 Human and Environmental Impacts – Route Alternatives A1-A4, Iron Range Substation Region

Resource	Element	Route Alternative A1	Route Alternative A2	Route Alternative A3	Route Alternative A4	Applicants' Equivalent
Length (miles)		4.7	4.7	4.4	5.2	4.6
Human Settlement	Residences within 0-75 feet (count)	0	0	0	0	0
	Residences within 75-250 feet (count)	3	1	1	0	0
	Residences within 250-500 feet (count)	5	5	2	1	2
	Residences within 500-1,000 feet (count)	6	5	7	3	4
Land-Based Economies	Agricultural land in 150-ft ROW (acres)	20	22	17	12	19
Water Resources	Total wetlands in 150-foot ROW (acres)	30	33	35	48	39
	Forested wetlands in 150-ft ROW (acres)	21	21	25	34	27
Vegetation	Forested landcover in 150-foot ROW (acres)	51	48	55	69	53
Rare and Unique Natural Resources	Sites of Biodiversity in 150-foot ROW (acres)	32	32	32	56	32
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0	0	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	1.3 (27)	1.3 (27)	1.6 (36)	0 (0)	1.6 (35)
	Roadway (miles, percent)	1.0 (21)	1.0 (21)	0 (0)	0.5 (10)	0 (0)
	Field, parcel, or section lines (miles, percent)	2.2 (47)	2.0 (42)	2.2 (49)	4.5 (88)	2.5 (55)
	Total ROW sharing and paralleling (miles, percent)	4.0 (84)	3.5 (74)	3.7 (85)	4.8 (92)	4.1 (89)
Reliability	Crossing of existing transmission lines (count)	0	0	2	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$26.1	$25.9	$28.4[1]	$28.6	$25.4

1 Two specialty structures would be needed to cross an existing transmission line for an estimated additional cost of approximately $ 4 million ($24.7 million base cost)

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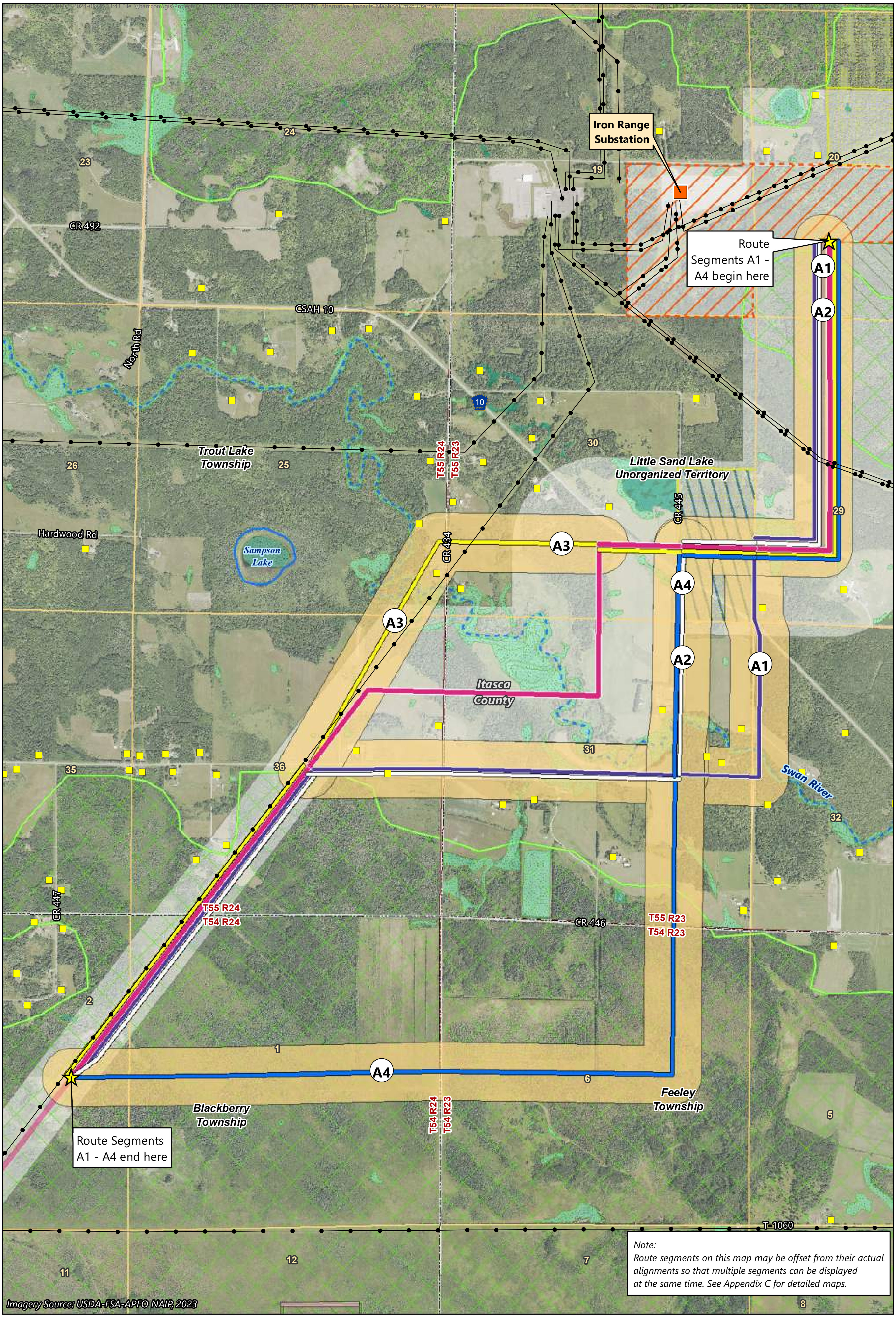


- Route Segment A1
- Route Segment A2
- Route Segment A3
- Route Segment A4
- Applicants' Route A Equivalent
- Route Width
- Route Alternative Width
- Existing Transmission Line
- Iron Range Substation
- Substation Siting Area
- Residence
- PWI Watercourse
- PWI Waterbody
- Native Plant Community
- Forests of the Future Easement
- Other DNR Land

Wetlands

- Non-Forested Wetland
- Forested Wetland

Site of Biodiversity Significance

- Moderate Significance

Feet
0 750 1,500

Map 6-1

ROUTE ALTERNATIVES A1 - A4
Iron Range Substation Region
Northland Reliability Project

6.1.2.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement evaluation elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed in Chapter 5.3, include cultural values, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.1.2.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. The proximity of residences to route alternatives A1 through A4 and the applicants' equivalent are shown in Table 6-7, while ROW paralleling and sharing are shown in Table 6-8.

The applicants' equivalent and route alternative A4 minimize aesthetic impacts by minimizing the project's proximity to residences. Route alternatives A1 and A2 minimize aesthetic impacts by following the greatest amount of existing infrastructure ROW.

Table 6-7 Iron Range Substation Region Proximity of Residences to Route Alternatives A1-A4

Residences, Distance from Anticipated Alignment	Route Alternative A1	Route Alternative A2	Route Alternative A3	Route Alternative A4	Applicants' Equivalent
Residences within 0-75 feet	0	0	0	0	0
Residences within 75-250 feet	3	1	1	0	0
Residences within 250-500 feet	5	5	2	1	2
Residences within 500-1,000 feet	6	5	7	3	4
Total Residences within 1,000 feet	14	11	10	4	6

Table 6-8 Iron Range Substation Region ROW Paralleling and Sharing of Route Alternatives A1-A4

Infrastructure	Route Alternative A1 miles (percent)	Route Alternative A2 miles (percent)	Route Alternative A3 miles (percent)	Route Alternative A4 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Follows Existing Roads	1.0 (21)	1.0 (21)	0 (0)	0.5 (10)	0 (0)
Follows Existing Transmission Line	1.3 (27)	1.3 (27)	1.6 (36)	0 (0)	1.6 (35)
Total – Follows Transmission Line, Road, or Railroad	2.3 (48)	2.3 (48)	1.6 (36)	0.5 (10)	1.6 (35)
Follows Field, Parcel, or Section Lines	2.2 (47)	2.0 (42)	2.2 (49)	4.5 (88)	2.5 (55)
Total – ROW Paralleling and Sharing	4.0 (84)	3.5 (74)	3.7 (85)	4.8 (92)	4.1 (89)
Total Length of Route Alternative	4.7	4.7	4.4	5.2	4.6

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.1.2.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no permanent residences, churches, childcare centers, or schools located within the 150-foot ROW of the applicants' equivalent or route alternatives A1 through A4. However, route alternatives A1 and A2 both have one non-residential building (storage shed, agricultural outbuildings, etc.) located within their 150-foot ROW while A2 and A4 have none (Map 6-1).

The non-residential buildings along project route alternatives A1 or A2 may or may not be displaced. Though buildings are generally not allowed within the transmission line ROW, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For each of the buildings noted, the applicants would need to conduct a site-specific analysis to determine if the building would need to be removed or relocated.

6.1.2.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. For some of the elements of land-based economies, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. There are no mining or recreation and tourism resources within the routing alternative rights-of-way. As a result, impacts to these resources are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter.

6.1.2.2.1 Agriculture

Impacts to agricultural land in the 150-foot ROW of route alternatives A1 through A3 and the applicants' equivalent would be relatively similar (Table 6-9). The total amount of agricultural land in the ROW of each route alternative ranges from 12 to 22 acres. Route alternative A4 would impact the least amount of agricultural land with approximately 12 acres of agricultural lands in the ROW.

Impacts to prime farmland in the ROW of route alternatives A1 through A3 and the applicants' equivalent would also be relatively similar (Table 6-9). The total amount of prime farmland within the ROW of each route alternative ranges from 37 to 66 acres. Route alternative A4 would impact the least amount of prime farmland with 37 acres of prime farmland in the ROW. The amount of farmland of statewide importance within the ROW of each route alternative ranges from 5 to 9 acres.

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of route alternatives A1 through A4 or the applicants' equivalent.

Table 6-9 Agricultural Land within the 150-foot ROW of Route Alternatives A1-A4

	Route Alternative A1	Route Alternative A2	Route Alternative A3	Route Alternative A4	Applicants' Equivalent
Acres of agricultural land within 150-foot ROW	20	22	17	12	19
Acres of Prime Farmland[1] within 150-foot ROW	66	61	54	37	58
Acres of Farmland of Statewide Importance within 150-foot ROW	7	6	9	9	5

Data Sources: references (71), (108)

1 Prime farmland includes areas designated as prime farmland and prime farmland if drained by the NRCS (reference (71)).

6.1.2.2.2 Forestry

Impacts to designated forestry resources in the 150-foot ROW of route alternatives A1, A3, A4, and the applicants' equivalent would be relatively similar (Table 6-10). Forestry land within the ROW of these five routes is between approximately 6 to 10 acres. Route alternative A2 would impact the least amount of designated forestry resources (2 acres) in the ROW.

No state forests are within the ROW of the applicants' equivalent or the alternative routes. However, Minnesota School Trust lands, Forests for the Future program lands, or SFIA lands are within the ROW of all of these five routes (Table 6-10).

Table 6-10 Designated Forestry Resources Within the 150-foot ROW of Route Alternatives A1-A4

Route	Route Alternative A1	Route Alternative A2	Route Alternative A3	Route Alternative A4	Applicants' Equivalent
Acres of DNR state forest within 150-foot ROW	0	0	0	0	0
Acres of Minnesota School Trust Land[1] within 150-foot ROW	0	0	1	1	1
Acres of Forests for the Future[2] land within 150-foot ROW	2	9	5	9	5
Acres of Sustainable Forest Incentive Act[3] land within 150-foot ROW	2	6	4.5	6	4.5

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated, and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)
1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).
2 Minnesota's Forests for the Future Program is a conservation program administered by the DNR to encourage the protection of privately-owned forest lands through conservation easements or land purchases (reference (5)).
3 Minnesota's Sustainable Forest Incentive Act is a conservation program administered by the DNR that provides annual incentive payments to encourage private landowners to keep their wooded areas undeveloped (reference (109)).

Construction of a new transmission line ROW through forested lands would be necessary for all the routing alternatives in the northern part of the region (Map Book 5C), which would result in permanent loss of designated forestry resources. Route alternative A1 would impact the least amount of designated forestry resources in comparison to the other routes.

6.1.2.3 Archaeological and Historic Resources

Six previously documented historic architectural resources and no archaeological sites are located within the 1,000-foot route width of route alternatives A1 through A4 and the applicants' equivalent. The route width of Alternatives A1 and A2 each contain three previously documented historic architectural resources, the most of any of the alternatives (Table 6-11) in this region. As shown on Map Book 5F, some of the same historic architectural resources are located within the route widths of multiple alternatives.

Table 6-11 Historic Architectural Resources within the Route Width of Route Alternatives A1-A4 and the Applicants' Equivalent

Resource Number	Resource Type	NRHP Eligibility	Location
IC-TLT-00012	Log House (moved)	Not evaluated	route alternative A3
IC-TLT-00015	Log Barn	Not evaluated	route alternative A1, route alternative A2
IC-TLT-00016	Log Barn	Not evaluated	applicants' equivalent
IC-UOG-00016	Log Hay Barn	Not evaluated	route alternative A1, route alternative A2
IC-UOG-00017	Frank Gran Farmstead	Listed	route alternative A2 route alternative A4
IC-UOG-00088	Bridge No. 7423 (Marsh Rainbow Arch Bridge)	Eligible	route alternative A1

The applicants' equivalent and route alternatives A3 and A4 each have the potential to impact one historic architectural resource. However, resource IC-TLT-00016 appears to be visually shielded from the applicants' equivalent by a thick tree line whereas both route alternatives A3 and A4 would consist of new transmission line construction adjacent to and visible from resources IC-TLT-00012 and IC-UOG-00017, respectively. Route alternatives A1 and A2 each have the potential to impact three historic architectural resources. It appears that with the exception of resource IC-TLT-00015, which is shielded from view by a tree line, each of the resources within the route width of alternatives A1 and A2 would be visible from and to the new transmission line.

The primary way to minimize impacts on archaeological and historic architectural resources is through careful routing and structure placement, specifically by avoiding known archaeological and historic sites. If they cannot be avoided, impacts to these resources could be mitigated by measures developed in consultation with the SHPO prior to construction. Based on the above discussion, route alternatives A1 and A2 have the potential to impact more historic architectural resources than route alternatives A3, A4, and the applicants' equivalent. In addition, route alternatives A1, A2, and A4 each have the potential to impact an NRHP-listed or -eligible resource. As a result, route alternatives A3 and the applicants' equivalent have the least potential to impact significant cultural resources.

6.1.2.4 Natural Environment

6.1.2.4.1 Water Resources

Floodplain and groundwater impacts are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies, and wetlands. Map Book 5G shows water resources features in the vicinity of the Iron Range Substation region.

6.1.2.4.1.1 Watercourses and Waterbodies

The Iron Range Substation region routing alternatives would cross the Swan River once; there are no other watercourse or waterbody crossing. As previously discussed, the Swan River is classified as a PWI watercourse and is listed as an impaired water for aquatic consumption.

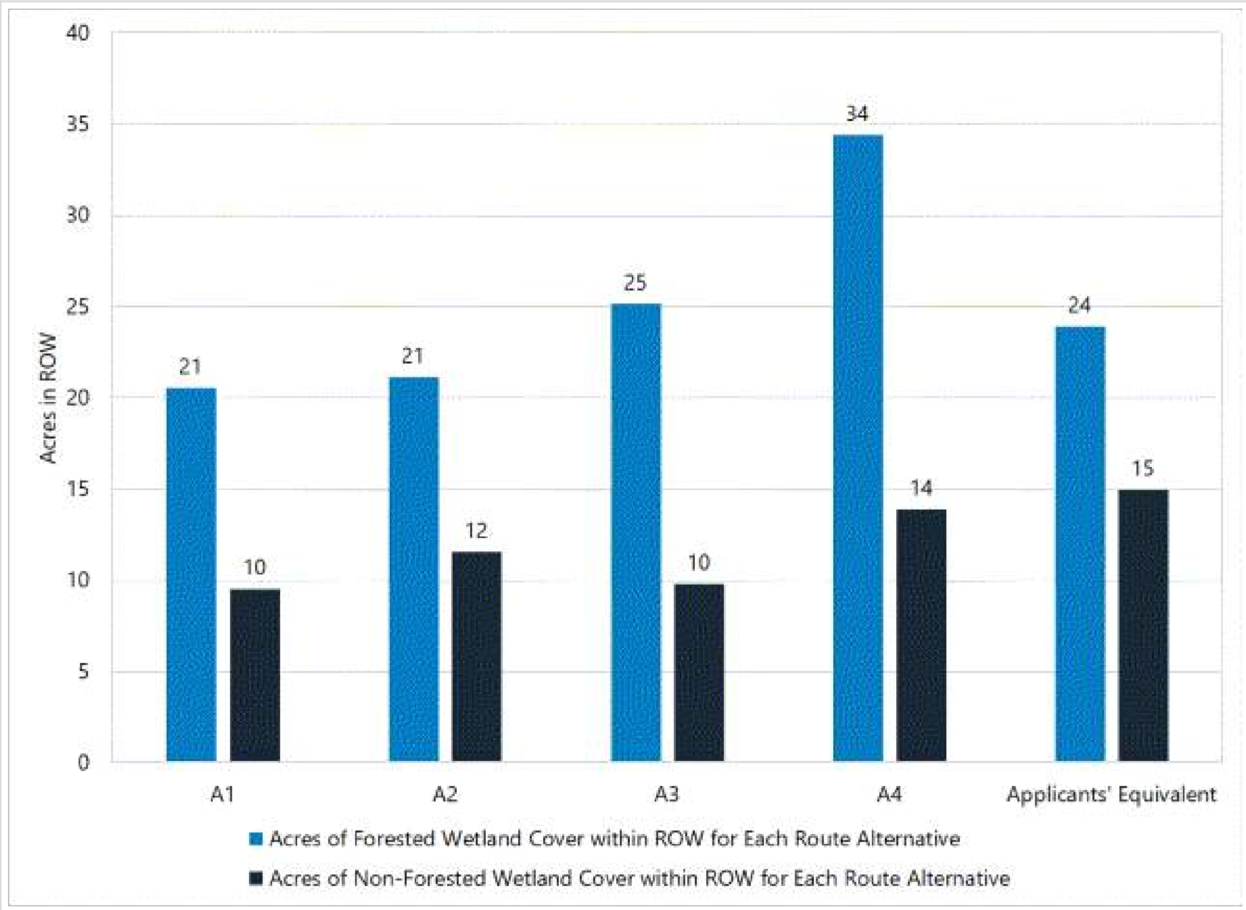
It is anticipated that this watercourse would be spanned. Since no structures are anticipated to be placed within waterbodies and watercourses, no direct impacts to these resources are anticipated. Indirect impacts to these resources, such as increases in turbidity, could be minimized by using BMPs and by choosing a routing alternative that has relatively fewer crossings of waterbodies and watercourses.

6.1.2.4.1.2 Wetlands

Wetlands within the routing alternative rights-of-way consist mainly of forested wetlands with some shrub-dominated wetlands, and emergent wetlands. Figure 6-2 shows the total area of wetland and forested wetland that are present within the ROW of each routing alternative. The applicants' equivalent route has the greatest amount of non-forested wetland within its ROW (15 acres), while the A1 route has the least (10 acres). The A1 route has the least amount of forested wetland within the ROW (21 acres), while the A4 route has the most (34 acres). No PWI wetlands are crossed by the routing alternatives.

Although wetlands would be spanned to the extent possible, all routing alternatives would cross wetland areas wider than 1,000 feet, which may require one or more structures to be placed in a wetland. Placing a structure in a wetland would result in permanent impacts. Permanent impacts to wetlands could also occur if wetlands in the 150-foot ROW are forested. Forested wetlands would be converted to non-forested wetland types, as trees are not allowed within transmission line rights-of-way. Impacts associated with converting forested wetlands to non-forested wetland types could be minimized by selecting a routing alternative with fewer forested wetlands in the ROW. Thus, impacts to forested wetlands could be minimized by selection of the route alternative A1 or A2 or the project.

Figure 6-2 Acres of Wetlands Crossed by Route Alternatives A1-A4

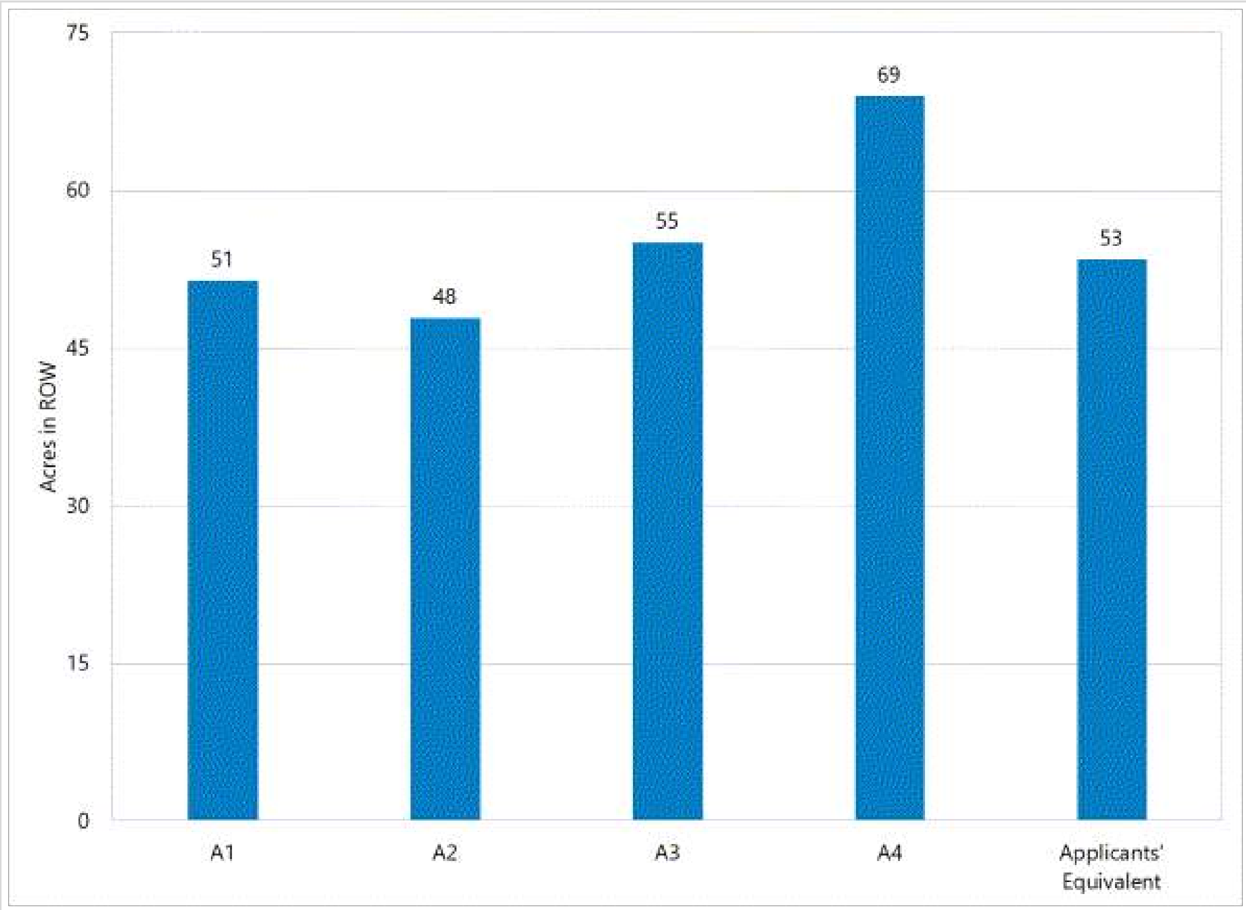


6.1.2.4.2 Vegetation

Impacts to forested vegetation in the 150-foot ROW of route alternatives A1 through A3 and the applicants' equivalent would be relatively similar, with route alternative A2 having slightly less forested vegetation in the 150-foot ROW (Figure 6-3). Route alternative A4 would impact the most forested vegetation in its 150-foot ROW (Figure 6-3). Construction of a new transmission line ROW through the densely forested area would be necessary for all routing alternatives in the northern part of the region, where they are located along the same alignment (Map Book 5C). However, each route alternative would also involve establishment of new rights-of-way in other forested areas, with route alternative A4 resulting in the most amount of new transmission line ROW in forested areas. Route alternative A4 is also the longest of these alternatives and parallels the least amount of transmission line or road rights-of-ways.

Route alternatives A1, A2, A3, and the applicants' equivalent would impact the fewest acres of forested vegetation and would minimize impacts associated with forest fragmentation by using a greater amount of existing transmission line ROW through forested areas.

Figure 6-3 Forested Vegetation in the 150-foot ROW of Route Alternatives A1-A4 and the Applicants' Equivalent



6.1.2.4.3 *Wildlife*

Wildlife habitat impacts would occur for route alternatives A1 though A4 and the applicants' equivalent; however, none of these routing alternatives would traverse areas that are publicly managed or preserved for wildlife. As discussed for vegetation, fragmentation of forested habitat would occur in the northern part of these routing alternatives where they are all located in an area of dense forest without an existing transmission line ROW. Route alternative A4 would require the greatest amount of new transmission line ROW through forested areas. In addition, route alternative A4 is the longest of the Iron Range region alternatives and does not parallel an existing transmission line ROW for any part of its length. As such, the potential for impacts to avian species could be highest with route alternative A4. However, as discussed in Chapter 5.10.5.2, avian impacts can be minimized through use of bird flight diverters.

6.1.2.5 Rare and Unique Natural Resources

From a review of the NHIS database, it was determined that no federal- or state-protected species have been identified within 1 mile of route alternatives A1 through A4 or the applicants' equivalent. All alternatives have four documented state special concern species within 1 mile of each of these routing alternatives (Appendix N).

The 150-foot ROW for route alternatives A1 through A4 and the applicants' equivalent would intersect a DNR SBS ranked "moderate" in two locations. The route alternative A4 ROW would intersect 56 acres, while the other Iron Range alternatives and the applicants' equivalent would intersect 32 acres. As shown on Map 6-1, the 150-foot ROW for route alternatives A1 through A4, as well as the applicants' equivalent, would intersect the site SBS in the same northern location. At this location, the alternatives would require a new transmission line ROW through the SBS to support transmission line structure installation. However, in the other location, the 150-foot ROW of route alternatives A1, A2, A3, and the applicants' equivalent would intersect the SBS along an existing transmission line ROW, thereby minimizing new impacts to the SBS. In contrast, as shown on Map 6-1, route alternative A4 would require a new transmission line ROW through the SBS and placement of transmission line structures within this ROW.

6.1.2.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

Route alternative A3 would require two transmission line crossings, thereby introducing an increased reliability concern. Route alternative A1, A2, A4, and the applicants' equivalent would require no transmission line crossings.

6.1.2.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-6). There is a difference of approximately $3 million between the most expensive and least expensive of these route alternatives, and the applicants' equivalent is anticipated to be the least expensive (approximately $25.4 million).

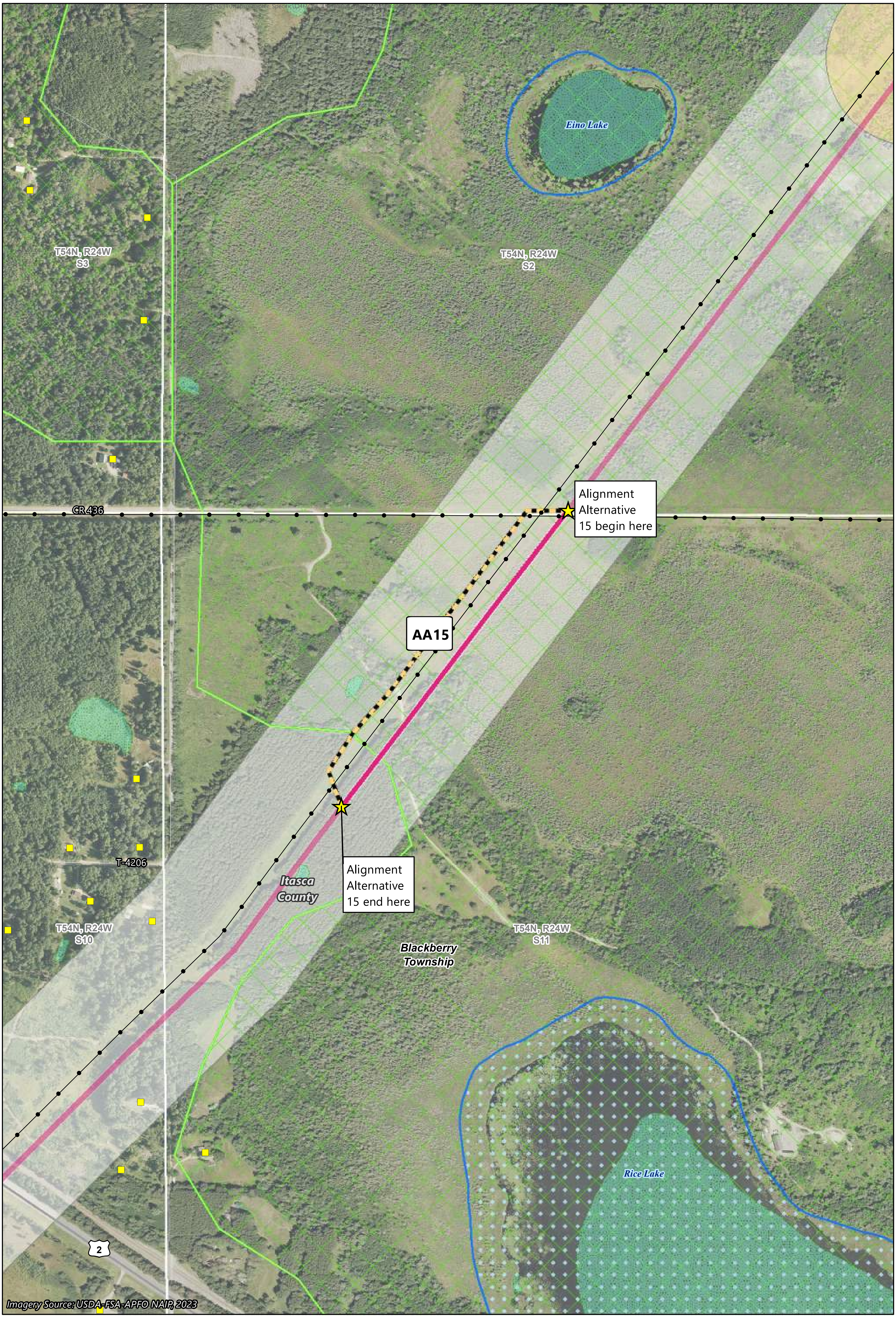
6.1.3 Alignment Alternative AA15 – Iron Range Substation Region

Alignment alternative AA15 provides an alternative placement of the applicants' proposed alignment in the southwest part of the Iron Range Substation region. Alignment alternative AA15 is shifted onto Itasca County tax forfeit land to avoid private property and would parallel an existing transmission line ROW for its entire length. Potential impacts of alignment alternative AA15 and the applicants' equivalent are summarized in Table 6-12 and shown on Map 6-2.

Table 6-12 Human and Environmental Impacts – Alignment Alternative AA15, Iron Range Substation Region

Resource	Element	Alignment Alternative AA15	Applicants' Equivalent
Length (miles)		0.44	0.40
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	0	0
	Residences within 250-500 feet (count)	0	0
	Residences within 500–1,000 feet (count)	0	0
Land-Based Economies	Agricultural land in 150-ft ROW (acres)	0	0
Water Resources	Total wetlands in 150-foot ROW (acres)	5	4
	Forested wetlands in 150-ft ROW (acres)	0	0
Vegetation	Forested landcover in 150-foot ROW (acres)	7[1]	7
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	7	6
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	0.39 (89)	0.40 (100)
	Roadway (miles, percent)	0.00 (0)	0.00 (0)
	Field, parcel, or section lines (miles, percent)	0.03 (6)	0.00 (0)
	Total ROW sharing and paralleling (miles, percent)	0.42 (95)	0.40 (100)
Reliability	Crossing of existing transmission lines (count)	2	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$6.4[2]	$2.2

1 The NLCD indicates forested vegetation is in the ROW; however, the ROW is an existing transmission line ROW that has been cleared and is routinely maintained.
2 Two specialty structures would be needed to cross an existing transmission line for an estimated additional cost of approximately $4 million ($2.3 million base cost).



Alignment Alternative 15
Applicants' AA15 Equivalent
Route Width
Route Alternative Width
Existing Transmission Line

Residence
PWI Waterbody
Shallow Wildlife Lake

Wetlands

Non-Forested Wetland

Site of Biodiversity Significance

Moderate Significance

Feet
0 250 500

Map 6-2

ALIGNMENT ALTERNATIVE AA15
Iron Range Substation Region
Northland Reliability Project

6.1.3.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement evaluation elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed in Chapter 5.3, include cultural values, displacement, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.1.3.1.1 Aesthetics

Alignment alternative AA15 and the applicants' equivalent would have similar, minimal aesthetic impacts, as both follow an existing transmission line ROW for similar lengths (Map 6-2), with no residences located within 1,000 feet of the anticipated alignment for either alternative. ROW paralleling and sharing information for alignment alternative AA15 and the applicants' equivalent is shown in Table 6-13.

Table 6-13 Iron Range Substation Region ROW Paralleling and Sharing for Alignment Alternative AA15

Infrastructure	Alignment Alternative AA15 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0.00 (0)	0.00 (0)
Follows Existing Roads	0.00 (0)	0.00 (0)
Follows Existing Transmission Line	0.39 (89)	0.40 (100)
Total – Follows Transmission Line, Road, or Railroad	0.39 (89)	0.40 (100)
Follows Field, Parcel, or Section Lines	0.03 (6)	0.00 (0)
Total – ROW Paralleling and Sharing	0.42 (95)	0.40 (100)
Total Length of Route Alternative	0.44	0.40

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.1.3.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no agricultural, forestry, or mining resources within the ROW of alignment alternative AA15 or the applicants' equivalent. Additionally, the routing alternatives are not anticipated to have an impact on recreation or tourism opportunities due to an absence of these resources in the project vicinity. As a result, land-based economy impacts in this area are anticipated to be minimal and independent of the route selected and are therefore not discussed further.

6.1.3.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the route width of alignment alternative AA15 or the applicants' equivalent. As a result, cultural resource impacts are anticipated to be minimal and independent of the route selected.

6.1.3.4 Natural Environment

6.1.3.4.1 Water Resources

6.1.3.4.1.1 Watercourses and Waterbodies

Alignment alternative AA15 and the applicants' equivalent would not cross any watercourses or waterbodies. Therefore, Alignment alternative AA15 and the applicants' equivalent would have no impact on watercourses or waterbodies.

6.1.3.4.1.2 Wetlands

Wetlands within the alignment alternative AA15 and the applicants' equivalent rights-of-way consist of shrub dominant wetlands and emergent wetlands. The applicants' equivalent ROW crosses 4 acres of wetland, of which over 2 acres are classified as shrub dominant wetlands, and just under 2 acres are classified as emergent wetlands. The AA15 alignment alternative cross 5 acres of wetland of which nearly half are classified as shrub dominant wetlands with the remaining area classified as emergent wetlands. Map 6-2 shows the wetlands crossed by the alignment alternative AA15.

Wetlands are small enough to be spanned, thereby avoiding structure placement in these areas. Structure placement in a wetland would result in permanent impacts. Since there are no forested wetlands within the AA15 alignment alternative or the applicants' equivalent, there would be no conversion of wetland type.

6.1.3.4.2 Vegetation

Alignment alternative AA15 and the applicants' equivalent would impact similar amounts of forested vegetation (approximately 7 acres), and both would parallel an existing transmission line ROW through forested areas (Map Book 5C). As such, the potential vegetation impacts would be comparable for these alignments.

6.1.3.4.3 Wildlife

Alignment alternative AA15 and the applicants' equivalent would have similar impacts on wildlife and associated habitats, as both would affect comparable areas of forested land. Both alignments would follow an existing transmission line ROW; alignment alternative AA15 would also require a perpendicular crossing of the existing transmission line, which could increase the potential for avian species impacts. However, as discussed in 5.10.5.2, avian impacts can be minimized through use of bird flight diverters.

6.1.3.5 Rare and Unique Natural Resources

From the NHIS database, it was determined that no federal- or state-protected species or state special concern species have been identified within 1 mile of alignment alternative AA15 or the applicants' equivalent. The 150-foot ROW of both alignments would intersect 6 to 7 acres of the SBS ranked moderate and both would do so along an existing transmission line ROW (Map 6-2). Potential impacts to rare and unique natural resources would be comparable for both alignments.

6.1.3.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

Alignment alternative AA15 would require two transmission line crossings, thereby introducing an increased reliability concern. The applicants' equivalent would require no transmission line crossings.

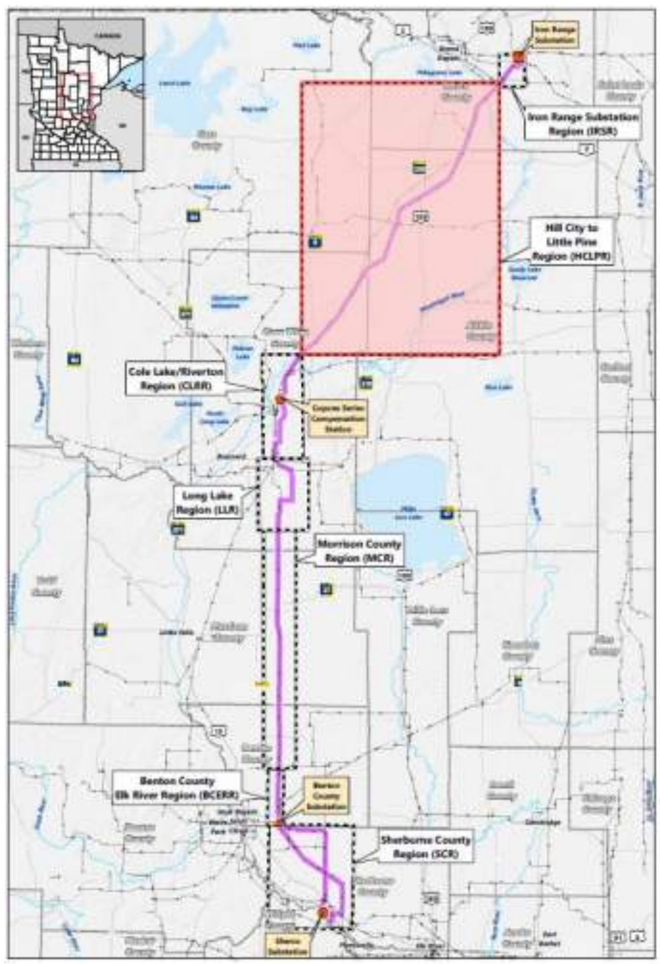
6.1.3.7 Cost

Costs of the route alternatives are generally proportional to length and account for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-12). Alignment alternative AA15 would require two specialty structures to cross an existing transmission line in two separate locations. As a result, the applicants' equivalent (approximately $2 million) would cost approximately $4 million less than alignment alternative AA15 (approximately $6 million).

6.2 Hill City to Little Pine Region

The Hill City to Little Pine region is in Aitkin, Cass, Crow Wing, and Itasca counties. In addition to the applicants' proposed route, the region has two route alternatives (B and C) and three alignment alternatives (AA1, AA2, and AA16) (Map Book 3A). Chapter 6.2.1 summarizes the potential construction and operation impacts of the applicants' proposed route in the Hill City to Little Pine region. Chapter 6.2.2 provides a comparison of the potential construction and operation impacts of route alternative B and the applicants' equivalent. Chapter 6.2.3 provides a comparison of the potential construction and operation impacts from route alternative C and the applicants' equivalent. Chapter 6.2.4 provides a comparison of the potential construction and operation impacts of alignment alternative AA1, AA2, and the applicants' equivalent. Chapter 6.2.5 provides a comparison of the potential construction and operation impacts of alignment alternative AA16 and the applicants' equivalent.

Figure 6-4 Hill City to Little Pine Region



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

Potential impacts of the applicants' proposed route in the Hill City to Little Pine region are summarized in Table 6-14 and discussed in Chapters 6.2.1.1 through 6.2.1.5.

Table 6-14 Human and Environmental Impacts – Applicants' Proposed Route, Hill City to Little Pine Region

Resource	Element	Applicants' Proposed Route
Length (miles)		54.2
Human Settlement	Residences within 0-75 feet (count)	0
	Residences within 75-250 feet (count)	9
	Residences within 250-500 feet (count)	9
	Residences within 500–1,000 feet (count)	40
Land-Based Economies	Agricultural land in 150-foot ROW (acres)	70
Water Resources	Total wetlands in 150-foot ROW (acres)	351
	Forested wetlands in 150-foot ROW (acres)	137
Vegetation	Forested landcover in 150-foot ROW (acres)	658
Wildlife	Wildlife Management Areas in 150-foot ROW (acres)	14
Sensitive Ecological Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	714
	Native Plant Communities in 150-foot ROW (acres)	254
	High Conservation Value Forest in 150-foot ROW (acres)	124
	Federal- or state-protected species documented in 150-foot ROW (count)	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	52.6 (97)
	Roadway (miles, percent)	0 (0)
	Field, parcel, or section lines (miles, percent)	0 (0)
	Total ROW sharing and paralleling (miles, percent)	52.6 (97)
Estimated Cost	Total estimated cost (2022 dollars in millions)	$300.9

6.2.1.1 Human Settlements

As discussed in Chapter 5.3, potential human settlement impacts are assessed by looking at several evaluative elements: aesthetics, displacement, noise, property values, zoning and land-use compatibility, electronic interference, and cultural values. Proximity to homes, schools, and other human settlement features and the extent of ROW sharing with existing infrastructure are the primary indicators of potential human settlement impacts. Human settlement impacts are minimized by routes that are located aware from homes and that share ROW with existing infrastructure.

For some of the human settlement evaluation elements in the Hill City to Little Pine region, project impacts are anticipated to be minimal. For the Hill City to Little Pine region, aesthetics, displacement, and socioeconomics and EJCs are the only human settlement elements for which impacts may be non-minimal.

6.2.1.1.1 Aesthetics

Aesthetic impacts are assessed through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes (Chapter 5.3.1). Determining the relative scenic value or visual importance in any given area depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure ROW.

The proximity of residential buildings to the applicants' proposed route is shown in Table 6-15. Approximately 97 percent of the applicants' proposed route in the Hill City to Little Pine region would parallel existing transmission line ROW (Table 6-16); therefore, on whole, the applicants' proposed route is anticipated to have minimal to moderate aesthetic impacts.

Table 6-15 Hill City to Little Pine Region Proximity of Residences to Applicants' Proposed Route

Residences, Distance from Anticipated Alignment	Applicants' Proposed Route
Residences within 0-75 feet	0
Residences within 75-250 feet	9
Residences within 250-500 feet	9
Residences within 500-1,000 feet	40
Total Residences within 1,000 feet	58

Table 6-16 Hill City to Little Pine Region ROW Sharing and Paralleling of Applicants' Proposed Route

Infrastructure	Applicants' Proposed Route miles (percent)
Follows Existing Railroad	0.0 (0)
Follows Existing Roads	0.0 (0)
Follows Existing Transmission Line	52.6 (97)
Total – Follows Transmission Line, Road, or Railroad	52.6 (97)
Follows Field, Parcel, or Section Lines	0.0 (0)
Total – ROW Paralleling and Sharing	52.6 (97)
Total Length of Route Alternative	54.2

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.2.1.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW for electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no permanent residences, churches, childcare centers, or schools located within the ROW for applicants' proposed route. However, there is one non-residential building (storage shed, agricultural outbuildings, etc.) located within the 150-foot ROW of the applicants' proposed route (Map Book 5A).

This non-residential building may or may not be displaced as a result of the project. Though buildings are generally not allowed within the transmission line ROW, there are instances where the activities taking place in such a building are compatible with the safe operation of the line (e.g., storage, animal production, etc.). The applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.2.1.1.3 Socioeconomics and Environmental Justice

Socioeconomic factors provide an indication of how economic activity affects and is shaped by social processes. Socioeconomic measures indicate how societies progress, stagnate, or regress because of the actions and interactions within and between the local, regional, or global economic scale. Transmission line projects can contribute to growth and progress at the local economic level over time, but generally do not have a significant long-term socioeconomic impact.

The project would improve the socioeconomics of the region through job creation, generation of tax revenue, and providing more reliable electrical service to the surrounding communities. The applicants' proposed route intersects with Macville Township, Wildwood Township, and Little Pine Township; each of which have been identified as communities with EJCs (Chapter 5.3.9). No adverse or permanent impacts to the identified communities with EJCs are anticipated. While the applicants' proposed route does intersect communities with EJCs, these communities are not anticipated to experience disproportionately adverse project impacts, particularly because the project would parallel existing transmission line ROW through these EJCs.

6.2.1.2 Land-Based Economies

As discussed in Chapter 5.8, impacts on land-based economies are assessed by considering four elements: agriculture, forestry, mining, and recreation and tourism. For some of the land-based economy elements considered in the Hill City to Little Pine region, project impacts are anticipated to be minimal. There are no active mining operations within the project ROW in this region. Thus, for the Hill City to Little Pine region, agriculture, forestry, and recreation and tourism are the only land-based economy elements for which impacts are anticipated to be non-minimal.

6.2.1.2.1 Agriculture

Project impacts to agriculture within the Hill City to Little Pine region were evaluated through land use and soil types within the 150-foot ROW of the applicants proposed route and proposed alternatives (Chapter 5.7.1). Map Book 5C provides an overview of land cover types crossed by the applicants' proposed route. Approximately 70 acres of the applicants' proposed route ROW in this region consists of agricultural land comprised of cultivated crops and hay/pasture lands.

According to the MDA Organic Farm Directory, no registered organic producers are located within the 150-foot ROW (reference (105)) of the applicants' proposed route. Additionally, there are no apiaries located within the ROW according to the Minnesota Apiary Registry (reference (106)). Lastly, no agricultural lands within the applicants' preferred alternative ROW are enrolled in the USDA FSA CREP program (reference (107)).

Potential construction and operation-related impacts to agricultural land are summarized in Chapter 5.8.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to agricultural land, as described in Chapter 5.8.1.1.

6.2.1.2.2 Forestry

Forestry impacts within the Hill City to Little Pine region were primarily assessed by evaluating the designated forestry resources within the 150-foot ROW (Chapter 5.8.2). Approximately 658 acres of the ROW of the applicants' proposed route consists of forested land (reference (108)) comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C).

As shown in Table 6-17, the designated forestry resources consist of DNR state forests, Minnesota School Trust Land, Forest for the Future land, and SFIA land.

Table 6-17 Designated Forestry Resources within the 150-foot ROW of the Applicants' Proposed Route

Forestry Resources	Applicants' Proposed Route
Acres of DNR state forest within 150-foot ROW	424
Acres of Minnesota School Trust Land[1] within 150-foot ROW	96
Acres of Forest for the Future[2] land within 150-foot ROW	14
Acres of Sustainable Forest Incentive Act[3] land within 150-foot ROW	19

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)

1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

2 Minnesota's Forests for the Future Program is a conservation program administered by the DNR to encourage the protection of privately-owned forest lands through conservation easements or land purchases (reference (5)).

3 Minnesota's Sustainable Forest Incentive Act is a conservation program administered by the DNR that provides annual incentive payments to encourage private landowners to keep their wooded areas undeveloped (reference (109)).

There are potential impacts to designated forestry resources within the applicants' proposed route ROW. The applicants' proposed route would cross Golden Anniversary State Forest, but it would parallel an existing transmission line through this forest. Vegetation clearing would include permanently removing trees from the ROW before construction.

Designated forestry resource impacts may result in negative financial impacts to state-owned forest lands and privately-owned commercial forest lands. As noted in Chapter 5.8.2.1, designated forestry resource impacts could be mitigated by prudent routing and staging area siting. Where these areas cannot be avoided, commercial foresters and private landowners would be compensated for loss of timber from ROW clearing.

6.2.1.2.3 Recreation and Tourism

Recreation and tourism activities within the Hill City to Little Pine region include outdoor recreational activities and camping opportunities on state managed lands, trails, and scenic byways. Impacts to recreation and tourism from the applicants' proposed route are expected to be minimal where the project parallels existing ROWs.

The applicants' proposed route crosses two scenic byways, three state forests, two WMAs, 11 off-road vehicle use trails, six snowmobile trails, and one water trail (Map Book 5E). All of the recreation and tourism impacts from the applicants' proposed route occur in areas where the 150-foot ROW parallels existing transmission lines, thus, permanent impacts to resources in this area would be minimal due to existing disturbance from and presence of transmission lines.

Temporary impacts because of the applicants' proposed route could include temporary trail closings during construction and temporary interruptions in recreational opportunities within the Birchdale WMA, Crow Wing State Forest, Golden Anniversary State Forest, Hill River State Forest, and Moose Willow WMA (Chapter 5.8.4.1). Although temporary impacts would occur because of this route, they are expected to have a minimal long-term impact on recreation.

6.2.1.3 Archaeological and Historic Resources

Archaeological and historic architectural resource impacts are assessed by determining the presence of these resources within the project route width (Chapter 5.1.1). Map Book 5F provides an overview of archaeological and historic architectural resources in the Hill City to Little Pine region.

There are two archeological resources and nine documented historic architectural resources within the applicants' proposed route width (1,000 ft) in the Hill City to Little Pine region (Table). As discussed in Chapter 5.9.3, impacts to these resources would mainly consists of changes in the resource's setting due to the location of the transmission line placement.

Table 6-18 Cultural Resources within the Route Width of the Applicants' Proposed Route, Hill City to Little Pine Region

Resource Number	Resource Type	NRHP Eligibility
21AK0136	Post-contact artifact scatter, structural ruin	Not evaluated
21AK0137	Precontact single artifact	Not evaluated
AK-MCV-00011	Boyd's Ranch Inn	Not evaluated
IC-BLK-00005	Blackberry Pump Station	Not evaluated
IC-BLK-00008	Eastern Railway/GN/BN/BNSF	Not evaluated
CA-UOG-00088	Soo Line ATV Trail	Not evaluated
XX-ROD-00044	Current TH 169	Not eligible
XX-ROD-00052	Trunk Highway 6	Not eligible
XX-ROD-00176	Trunk Highway 2	Not evaluated
XX-ROD-00181	Trunk Highway 200 / TH 34, TH 81, TH 85, TH 92, TH 116	Not eligible
XX-ROD-00182	Trunk Highway 31 / TH 200, TH 81, TH 85, TH 92, TH 116	Not eligible

The applicants' proposed route would cross resources CA-UOG-00088, XX-ROD-00044, XX-ROD-00052, XX-ROD-00176, XX-ROD-00181, and XX-ROD-00182 within an existing transmission line ROW. Since this transmission line ROW already exists, the project is not expected to alter the resource setting. Therefore, the project will not have an adverse effect on these resources. In the vicinity of IC-BLK-00005 and IC-BLK-00008, the applicants' proposed route follows an existing transmission line ROW. Consequently, no changes in resource setting are anticipated as a result of the project. The applicants' proposed route does not follow an existing transmission line ROW in the vicinity of resources 21AK0136, 21AK0137, and AK-MCV-00011. Ground disturbing activities and the change in setting resulting from the project have the potential to impact these resources if they cannot be avoided. No other cultural resources are present within the route width.

6.2.1.4 Natural Environment

6.2.1.4.1 Water Resources

Potential project impacts on water resources are examined by evaluating locations and conditions of watercourses and waterbodies, floodplains, wetlands, and groundwater. Project proximity to water bodies, watercourses, floodplains, wetlands, and groundwater wells and the necessity of crossing these features are the primary indicators of potential water resource impacts. Impacts to water resource features, floodplains and groundwater, are anticipated to be minimal.

There are two water resource features for which impacts could be non-minimal: watercourses and waterbodies, and wetlands. This discussion focuses on those features located within the ROW or are crossed by the routing alternatives. The number of surface water and wetland crossings is an important consideration when evaluating routes, even though there may be no direct impacts associated with these crossings. The crossings are important because of the potential indirect impacts associated with them (i.e., clearing of vegetation, soil movement). The amount of forested wetland within the ROW is also an important consideration when evaluating routes. Since large-growing woody vegetation would be cleared from the ROW, forested wetlands would be converted to other wetland types, resulting in permanent impacts.

6.2.1.4.1.1 Watercourses and Waterbodies

According to the NHD, the applicants' proposed route would cross 28 watercourses in the Hill City to Little Pine region. Fifteen of these watercourses are classified as public waters, and four of them are classified as impaired, including the Mississippi River, Moose River, an unnamed ditch, and Willow River. The applicants' proposed route would also cross one unnamed NHD waterbody and three public water basins.

It is anticipated that the watercourse and waterbodies are small enough that they would be spanned. Since no structures are anticipated to be placed within waterbodies and watercourses, no direct impacts to these resources are anticipated. Indirect impacts to these resources, such as increases in turbidity, could be minimized by using BMPs and by choosing a route alternative that has relatively fewer crossings of waterbodies and watercourses.

6.2.1.4.1.2 Wetlands

The applicants' proposed route cross approximately 351 acres of NWI. These NWI wetlands consist mainly of forested wetlands (137 acres), emergent wetlands (105 acres), and shrub-dominated wetlands (97 acres). There is one PWI wetland along the applicants' proposed route in the Hill City to Little Pine region.

Although wetlands would be spanned to the extent possible, the applicants' proposed route would cross wetland areas wider than 1,000 feet, which may require one or more structures to be placed in a wetland. Placement of structures in a wetland would result in permanent impacts to that wetland. Permanent impacts to wetlands could also occur if wetlands if the ROW are forested. Forested wetlands would be converted to non-forested wetland types, as trees are not allowed within transmission line rights-of-way. Impacts associated with converting forested wetlands to non-forested wetland types could be minimized by selecting a routing alternative with fewer forested wetlands in the ROW.

6.2.1.4.2 Vegetation

Vegetation impacts were evaluated by examining vegetative landcover within the 150-foot ROW (Chapter 5.10.4.1). Map Book 5C provides an overview of landcover types across the Hill City to Little Pine region, and Table 6-19 summarizes the landcover types within the 150-foot ROW of the applicants' proposed route within this region. The dominant vegetative landcover in the applicants' proposed route 150-foot ROW consists of forest, which represents approximately 67 percent of the ROW. Forest types include forested wetlands and upland deciduous, coniferous, and mixed forest communities.

Table 6-19 Landcover Types in the 150-foot ROW of the Applicants' Proposed Route in the Hill City to Little Pine Region

Landcover Type	Acres in ROW	Percent of ROW[1]
Forested (upland and wetland)	658	67
Herbaceous (upland and wetland)	213	22
Agricultural (cultivated crops and hay/pasture)	70	7
Shrub/Scrub	27	3
Developed (low-high intensity; open space)	13	1
Open Water	5	<1

Source: reference (110).
1 Totals may not sum to 100 percent due to rounding.

As discussed in Chapter 5.10.4.1, the applicants would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation to minimize potential transmission line interference. Approximately 97 percent of the applicants' proposed route in the Hill City to Little Pine region would parallel an existing transmission line ROW where the forested areas have already been fragmented, thereby minimizing new impacts to large areas of contiguous forest.

Potential construction and operation-related impacts to vegetation are summarized in Chapter 5.10.4.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Chapter 5.10.4.1. Potential impacts to agricultural vegetation and wetlands are discussed Chapters 5.8.1 and 5.10.1.3, respectively.

6.2.1.4.3 Wildlife

Wildlife impacts are evaluated through the presence of wildlife habitat, including areas that are publicly preserved or managed for wildlife habitat, within the ROW (Chapter 5.10.5.1 and 5.10.5.2). The applicants' proposed route in the Hill City to Little Pine region would parallel an existing transmission line ROW for 97 percent of its length. Because of this, the ROW of the applicants' proposed route would occur adjacent to an area where wildlife habitat has been previously disturbed, thereby minimizing potential impacts associated with habitat fragmentation. In addition, the potential for impacts to avian species would be minimized by paralleling this existing transmission line ROW.

The applicants' proposed route would traverse approximately 14 acres of two WMAs, including the Moose Willow WMA and the Birchdale WMA. As shown on Map Book 5H, the applicants' proposed route would traverse the edges of these WMAs and would do so while paralleling an existing transmission line ROW, thereby minimizing new impacts to these WMAs.

Potential construction and operation-related impacts to wildlife are summarized in Chapter 5.10.5. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife, as described in Chapter 5.10.5.

6.2.1.5 Rare and Unique Natural Resources

Impacts to rare and unique natural resources are primarily assessed by evaluating the presence of federal- and state-protected species within a 1-mile radius of the anticipated alignments and the presence of sensitive ecological resources within the 150-foot ROW (Chapter 5.10). Map Book 5I provides an overview of sensitive ecological resources within the Hill City to Little Pine region. Please note that in order to protect federally and state-protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

6.2.1.5.1 Protected Species

Using the NHIS database, it was determined that one federal and five state-protected species have been documented within 1 mile of the applicants' proposed route in the Hill City to Little Pine region, as summarized in Table 6-20. In addition, several state special concern species have been documented within 1 mile of the applicants' proposed route in this region (Appendix N).

Table 6-20 Federal- or State-Protected Species Documented in the Natural Heritage Information System Database – Applicants' Proposed Route in the Hill City to Little Pine Region

Scientific Name	Common Name	Type	State Status	Documented Records within ROW, Route Width, or 1 Mile
Utricularia purpurea	Purple-flowered bladderwort	Vascular plant	Endangered	1 Mile
Botrychium angustisegmentum	Narrow triangle moonwort	Vascular plant	Threatened	1 Mile
Botrychium oneidense	Blunt-lobed grapefern	Vascular plant	Threatened	1 Mile
Cardamine pratensis	Cuckoo flower	Vascular plant	Threatened	Route width
Poa paludigena	Bog bluegrass	Vascular plant	Threatened	Route width
Myotis septentrionalis	Northern long-eared bat	Bat	Special concern (federally endangered)	1 Mile

None of the federally or state protected species identified in Table 6-20 have been documented within the applicants' proposed route ROW; however, two state threatened vascular plant species have been documented within the 1,000-foot route width. Formal protected species surveys have not been conducted for the project; as such, it is possible that these species or additional protected species could be present where suitable habitat is available within the ROW. In addition, although not tracked in the NHIS database, it is possible that, given the forested landcover in this region, federally threatened gray wolves and Canada lynx could inhabit areas near the applicants' proposed route. Potential protected species impacts could occur should they be present within or near the ROW. While more mobile species would leave the area for nearby comparable habitats, non-mobile organisms, such as vascular plants or nesting birds, could be directly impacted.

Potential construction and operation-related impacts to protected species are summarized in Chapter 5.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species, as described in Chapter 5.11.1.3. In addition, the applicants may be required to conduct field surveys for protected species in coordination with the USFWS and/or DNR prior to construction.

6.2.1.5.2 Sensitive Ecological Resources

The applicants' proposed route ROW in the Hill City to Little Pine region would traverse several sensitive ecological resources, including approximately 714 acres of SBS, 254 acres of native plant communities, and 124 acres of High Conservation Value Forest (Table 6-21; Map Book 5I). As shown on Map Book 5I, with the exception of one SBS ranked moderate in the central part of the region, the applicants' proposed route ROW in the Hill City to Little Pine region would cross these sensitive ecological resources while paralleling an existing transmission line ROW. As a result, new impacts associated with forest/habitat fragmentation would be minimized. However, several of these sensitive ecological resources are too large to span and would therefore require the placement of transmission line structures within them.

Table 6-21 Sensitive Ecological Resources in the ROW of the Applicants' Proposed Route – Hill City to Little Pine Region

Sensitive Ecological Resource	Area within ROW of Applicants' Proposed Route
Sites of Biodiversity Significance	714 total acres; 400 acres ranked high; 256 acres ranked moderate; 58 acres ranked below
Native Plant Communities	254 total acres; 2 acres have a conservation status of S1 or S2; conservation status of remaining acres is S3-S5
High Conservation Value Forest	124 acres

Potential construction and operation-related impacts to sensitive ecological resources are summarized in Chapter 5.11.2.15.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to sensitive ecological resources, as described in Chapter 5.11.2.1. In addition, the applicants may be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species within sensitive ecological resources that cannot be avoided.

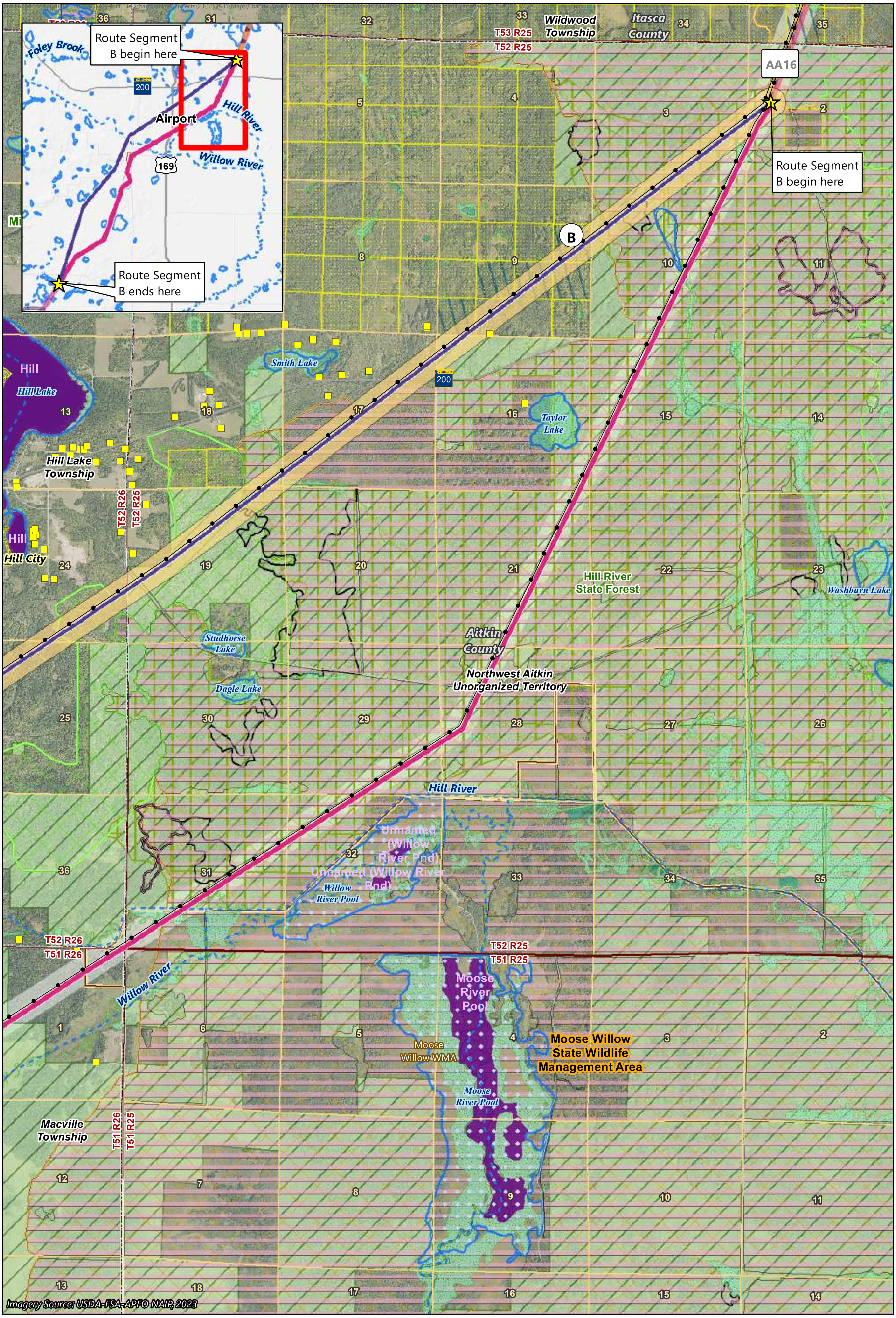
6.2.2 Route Alternative B – Hill City to Little Pine Region

Route alternative B provides an alternative to the applicants' proposed route in the central part of the Hill City to Little Pine region. Route alternative B shifts west from the applicants' proposed route in an effort to reduce impacts to natural resources. Route alternative B would parallel an existing transmission line ROW for its entire length. A portion of route alternative B is adjacent to the Hill City/Quadna Mountain Airport. Potential impacts of route alternative B and the applicants' equivalent are summarized in Table 6-22 and shown on Map 6-3 through Map 6-6.

Table 6-22 Human and Environmental Impacts – Route Alternative B, Hill City to Little Pine Region

Resource	Element	Route Alternative B	Applicants' Equivalent
Length (miles)		26.4	27.0
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	1	3
	Residences within 250-500 feet (count)	14	2
	Residences within 500–1,000 feet (count)	14	18
Transportation	Airports within 1 mile (count)	1	0
Land-Based Economies	Agricultural land in 150-foot ROW (acres)	7	29
Water Resources	Total wetlands in 150-foot ROW (acres)	190	150
	Forested wetlands in 150-foot ROW (acres)	104	56
Vegetation	Forested landcover in 150-foot ROW (acres)	376	349
Wildlife	Wildlife Management Area in 150-foot ROW (acres)	0	13
Sensitive Ecological Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	199	308
	Native Plant Communities in 150-foot ROW (acres)	145	139
	High Conservation Value Forest in 150-foot ROW (acres)	32	123
	Candidate Old Growth Stand in 150-foot ROW (acres)	9	0
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	26.4 (100)	25.4 (94)
	Roadway (miles, percent)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	0 (0)	0 (0)
	Total ROW sharing and paralleling (miles, percent)	26.4 (100)	25.4 (94)
Reliability	Crossing of existing transmission lines (count)	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$146.4[1]	$149.9

1 Significant engineering would be needed to develop the specialty structures required near the Hill City-Quadna Airport to lower structure heights to less than 80 feet as well as the specific ROW needs to accommodate the lower structures. At this time there is no way to estimate these structure costs.



- Route Segment B
- Applicants' Route B Equivalent
- Route Width
- Route Alternative Width
- Existing Transmission Line
- Residence
- PWI Watercourse
- PWI Waterbody
- Shallow Wildlife Lake
- Native Plant Community
- High Conservation Value Forest
- Forests of the Future Easement
- Wildlife Management Area
- State Forest
- Other DNR Land
- Municipal Boundary

Lakes of Biological Significance
- Outstanding Significance

Wetlands
- Non-Forested Wetland
- Forested Wetland

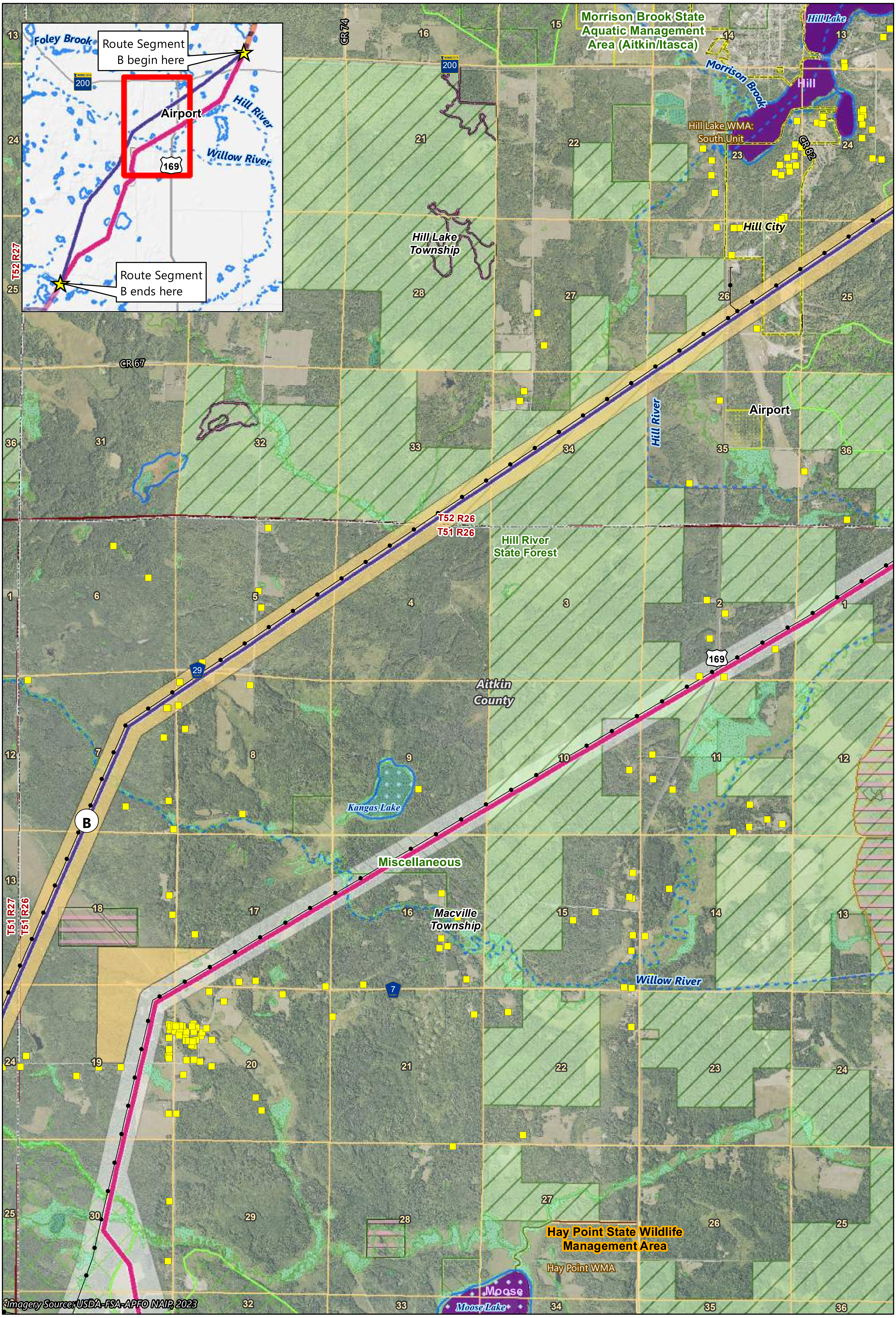
Forest Inventory Old Growth
- Designated Old Growth
- Candidate Old Growth

Site of Biodiversity Significance
- High Significance
- Moderate Significance

Feet
0 1,500 3,000

Map 6-3

ROUTE ALTERNATIVE B (PART 1)
Hill City to Little Pine Region
Northland Reliability Project



Route Segment B
Applicants' Route B Equivalent
Route Width
Route Alternative Width
Existing Transmission Line
Residence
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Native Plant Community
Wildlife Management Area
State Forest
Aquatic Management Area
Other DNR Land
Municipal Boundary

Lakes of Biological Significance

Outstanding Significance

Wetlands

Non-Forested Wetland
Forested Wetland

Forest Inventory Old Growth

Designated Old Growth

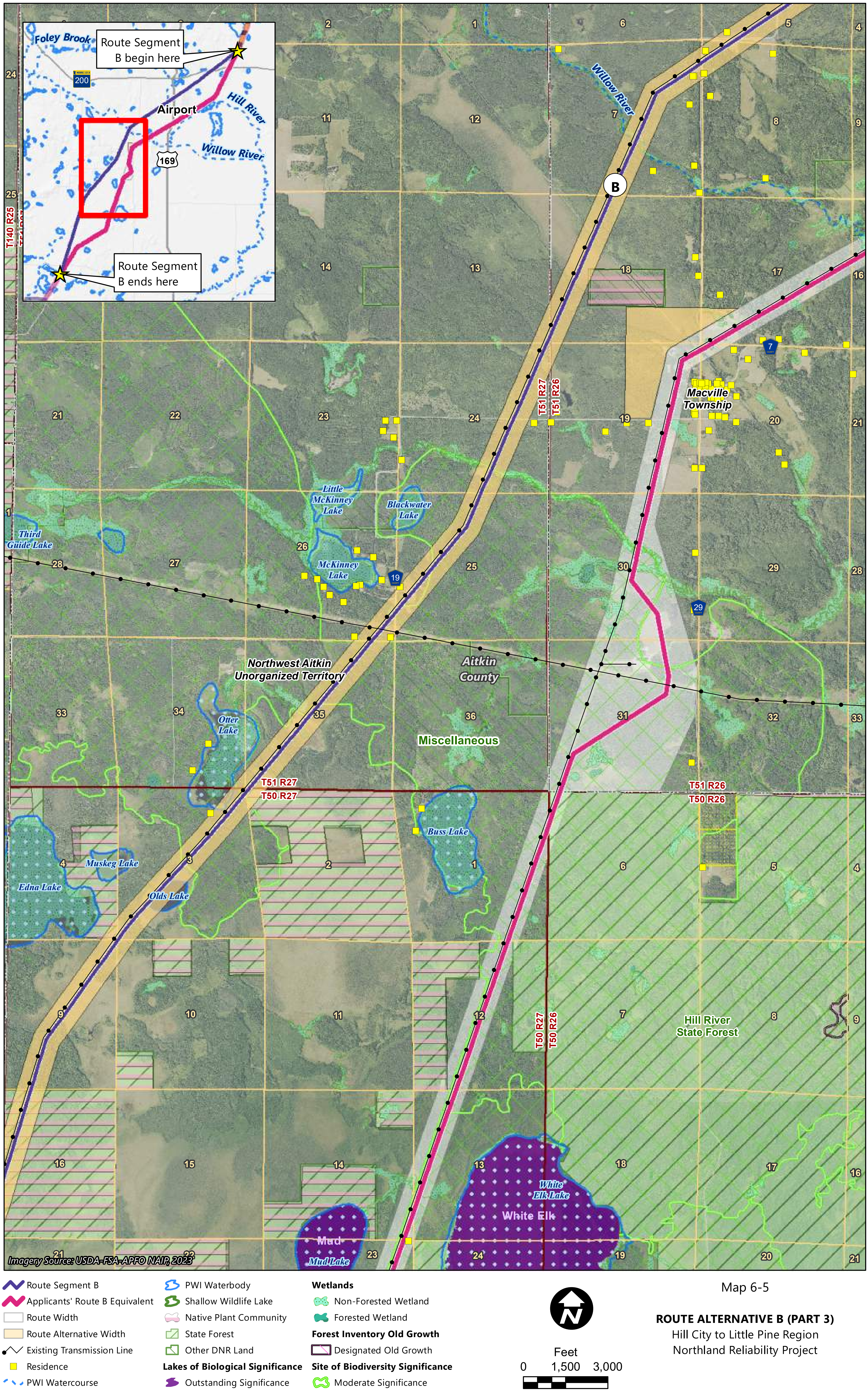
Site of Biodiversity Significance

High Significance
Moderate Significance

Feet
0 1,500 3,000

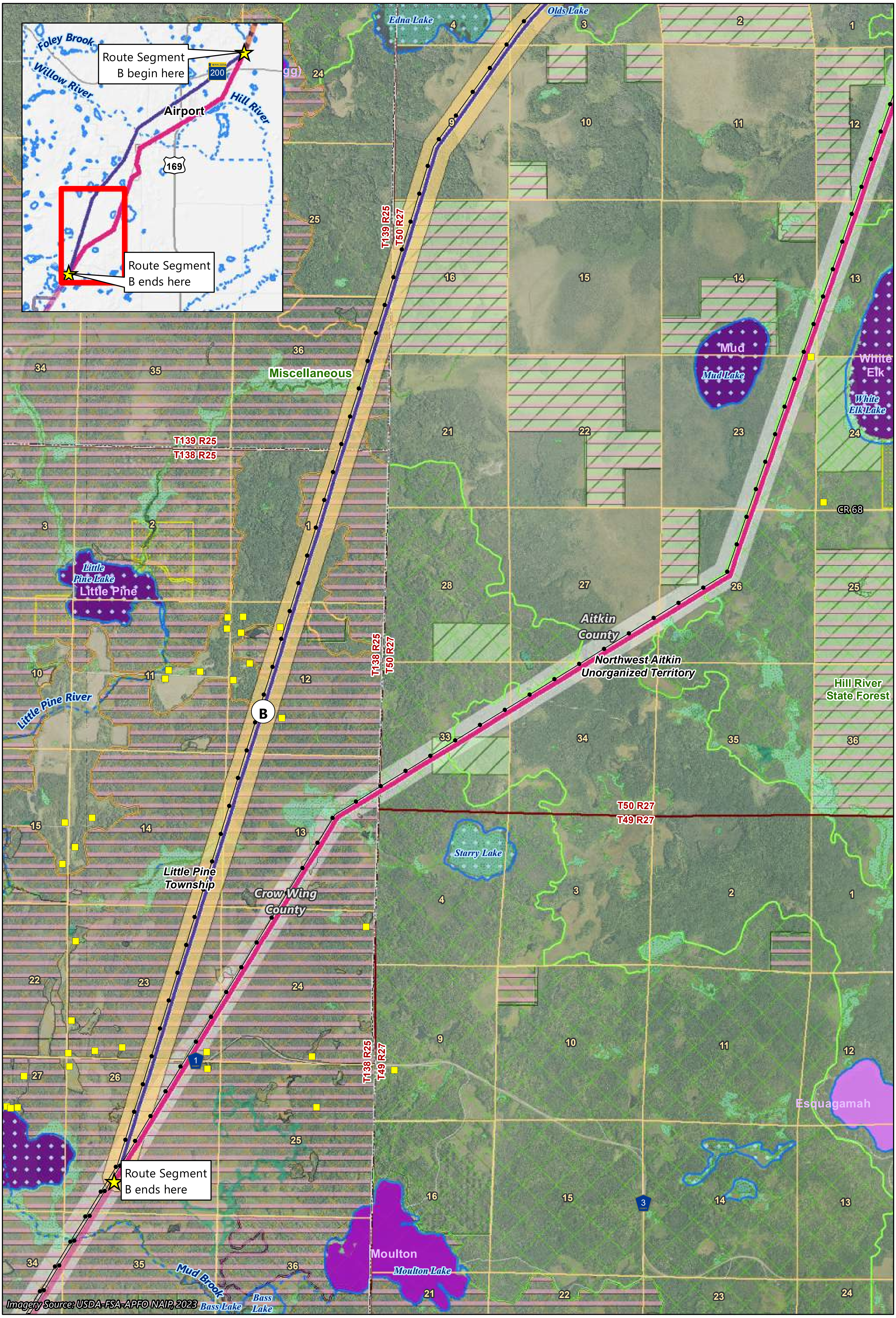
Map 6-4

ROUTE ALTERNATIVE B (PART 2)
Hill City to Little Pine Region
Northland Reliability Project



Map 6-5

ROUTE ALTERNATIVE B (PART 3)
Hill City to Little Pine Region
Northland Reliability Project



Route Segment B
Applicants' Route B Equivalent
Route Width
Route Alternative Width
Existing Transmission Line
Residence
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Native Plant Community
State Conservation Easement
State Forest
Other DNR Land

Lakes of Biological Significance
Outstanding Significance
High Significance
Moderate Significance

Wetlands
Non-Forested Wetland
Forested Wetland

Forest Inventory Old Growth
Designated Old Growth

Site of Biodiversity Significance
High Significance
Moderate Significance

Feet
0 1,500 3,000

Map 6-6

ROUTE ALTERNATIVE B (PART 4)
Hill City to Little Pine Region
Northland Reliability Project

6.2.2.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed in Chapter 5.3, include cultural values, displacement, electronic interference, noise, property values, and zoning and land use.

6.2.2.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternative B is shown in Table 6-23, while ROW paralleling and sharing are shown in Table 6-24.

While the applicants' equivalent has fewer residences within 500 feet, both route alternative B and the applicants' equivalent would follow a similar amount of existing infrastructure ROW. Route alternative B would parallel an existing transmission line for the entirety of its alignment while the applicants' equivalent would parallel existing transmission line ROW for most (94 percent) of its alignment. Overall, the route alternatives would have similar aesthetic impacts to the area.

Table 6-23 Hill City to Little Pine Region Proximity of Residences to Route Alternative B

Residences, Distance from Anticipated Alignment	Route Alternative B	Applicants' Equivalent
Residences within 0-75 feet	0	0
Residences within 75-250 feet	1	3
Residences within 250-500 feet	14	2
Residences within 500-1,000 feet	14	18
Total Residences within 1,000 feet	29	23

Table 6-24 Hill City to Little Pine Region ROW Sharing and Paralleling of Route Alternative B

Infrastructure	Route Alternative B miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0.0. (0)	0.0. (0)
Follows Existing Roads	0.0. (0)	0.0. (0)
Follows Existing Transmission Line	26.4 (100)	25.4 (94)
Total – Follows Transmission Line, Road, or Railroad	26.4 (100)	25.4 (94)
Follows Field, Parcel, or Section Lines	0.0. (0)	0.0. (0)
Total – ROW Paralleling and Sharing	26.4 (100)	25.4 (94)
Total Length of Route Alternative	26.4	27.0

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.2.2.1.2 Socioeconomics and Environmental Justice

Socioeconomic factors provide an indication of how economic activity affects and is shaped by social processes. Socioeconomic measures indicate how societies progress, stagnate, or regress because of the actions and interactions within and between the local, regional, and global economic scale. Transmission line projects can contribute to growth and progress at the local level over time, but generally do not have a significant long-term socioeconomic impact.

The project would improve the socioeconomics of the region through the creation of jobs, generation of tax revenue, and providing more reliable electrical service to the surrounding communities. Route alternative B intersects with Macville Township, Beulah Township, Little Pine Township, and the city limits of Hill City; all of which have been identified as communities with EJCs. No adverse or permanent impacts to the identified communities with EJCs are anticipated. While route alternative B does intersect communities with EJCs, these communities are not anticipated to experience disproportionately adverse impacts from the project, particularly because the project would parallel existing transmission line ROW in these communities.

6.2.2.2 Transportation

Potential transportation impacts are assessed by looking at various elements of transportation and public services as outlined in Chapter 5.4. In general, impacts to transportation services are anticipated to be minimal and independent of the route selected.

6.2.2.2.1 Airports

One public airport is located within 1 mile of route alternative B. The northern end of the Hill City/Quadna Mountain Airport runway is approximately 1,300 feet southeast of route alternative B and is therefore located within safety zone C. However, in this area, route alternative B parallels an existing transmission line that is also located within safety zone A. Route alternative B would need to be constructed with specialty structures no more than 80 feet in height in the vicinity (0.5 to 1 mile) of the Hill City/Quadna Mountain Airport to meet the public airport clearance requirements. It is assumed that structures placed in the vicinity of the airport would match the height of the structures located along the existing transmission line that is also adjacent to the airport.

6.2.2.3 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no active mining operations within the ROW's of either route alternative B or the applicants' equivalent. Therefore, potential project impacts to mining would be minimal and independent of the route selected.

6.2.2.3.1 Agriculture

Agricultural land impacts differ between the 150-foot ROW of route alternative B and the applicants' equivalent. Route alternative B has 7 acres of agricultural land in its ROW, while the applicants' equivalent has 29 acres of agricultural land in its ROW (Map Book 5C).

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of the route alternative or the applicants' equivalent.

6.2.2.3.2 Forestry

Forestry impacts within the Hill City to Little Pine region were primarily assessed by evaluating the designated forestry resources within the 150-foot ROW of each route alternative (Chapter 5.8.2). Approximately 376 acres of the route alternative B ROW consists of forested land while 349 acres of the applicants' equivalent ROW consists of forested land (reference (108)) comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C).

As shown in Table 6-25, the designated forestry resources consist of DNR state forests, Minnesota School Trust Land, Forest for the Future land, and SFIA land.

Table 6-25 Designated Forestry Resources within the 150-foot ROW of Route Alternative B

Forestry Resource	Route Alternative B	Applicants' Equivalent
Acres of DNR state forest within 150-foot ROW	207	329
Acres of Minnesota School Trust Land[1] within 150-foot ROW	54	59
Acres of Forests for the Future[2] land within 150-foot ROW	13	0
Acres of Sustainable Forest Incentive Act[3] land within 150-foot ROW	22	0

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated, and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)

1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

2 Minnesota's Forests for the Future Program is a conservation program administered by the DNR to encourage the protection of privately-owned forest lands through conservation easements or land purchases (reference (5)).

3 Minnesota's Sustainable Forest Incentive Act is a conservation program administered by the DNR that provides annual incentive payments to encourage private landowners to keep their wooded areas undeveloped (reference (109)).

Both route alternative B and the applicants' equivalent could impact designated forestry resources, including land within Hill River State Forest, within their respective 150-foot ROW; however, route alternative B encompasses fewer acres of forested lands within its ROW. Forestry resource impacts would include permanent tree removal from the ROW before construction.

6.2.2.3.3 Recreation and Tourism

Recreation and tourism activities within the Hill City to Little Pine region include recreational and camping opportunities on state managed lands, trails, and scenic byways. Recreation and tourism impact from the applicants' equivalent are expected to be minimal where it parallels existing ROWs.

Route alternative B crosses one state forest, three off-road vehicle use trails and, five snowmobile trails. The applicants' equivalent crosses one WMA, one state forest, nine off-road vehicle use trails, and five snowmobile trails (Map Book 5E). Recreation and tourism resource impacts for both route alternative B and the applicants' equivalent occur where the routes parallel existing transmission lines. Consequently, permanent impacts on these resources in these areas would be minimal.

Temporary impacts could include temporary trail closings during construction and temporary interruptions in recreational opportunities within Hill River State Forest and Moose Willow WMA (Chapter 5.8.4.1). Although route alternative B and the applicants' equivalent will have temporary impacts on recreation, they are expected to be minimal.

6.2.2.4 Archaeological and Historic Resources

Five previously documented historic architectural resources and archaeological sites are located within the 1,000-foot route width of route alternative B and seven are within the applicants' equivalent (Table 6-26). As shown on Map Book 5F, some of the same historic architectural resources are located within the route width for both route alternative B and the applicants' equivalent.

Table 6-26 Cultural Resources within the Route Width of Alternative B and the Applicants' Equivalent

Resource Number	Resource Type	NRHP Eligibility	Location
21AK0136	Post-contact artifact scatter, structural ruin	Not evaluated	applicants' equivalent
21AK0137	Precontact single artifact	Not evaluated	applicants' equivalent
AK-MCV-00011	Boyd's Ranch Inn	Not evaluated	applicants' equivalent
AK-UOG-00015	ca. 1982 residence	Not eligible	route alternative B
CA-UOG-00088	Soo Line ATV Trail	Not evaluated	route alternative B, applicants' equivalent
XX-ROD-00044	Current TH 169	Not eligible	route alternative B, applicants' equivalent
XX-ROD-00181	Trunk Highway 200 / TH 34, TH 81, TH 85, TH 92, TH 116	Not eligible	route alternative B, applicants' equivalent
XX-ROD-00182	Trunk Highway 31 / TH 200, TH 81, TH 85, TH 92, TH 116	Not eligible	route alternative B, applicants' equivalent

The applicants' equivalent route and route alternative B would have similar and minimal to no affect to resources CA-UOG-00088, XX-ROD-00044, XX-ROD-00181, XX-ROD-00182, which each represent linear resources crossed by existing transmission lines. Route alternative B has the potential to affect historic architectural resource AK-UOG-00015. However, a thick tree line appears to visually shield this resource from the route, and it has previously been determined ineligible for the NRHP. The applicants' equivalent route may affect resources 21AK0136, 21AK0137, AK-MCV-00011 as described and discussed in Chapter 6.2.1.3.

The primary means to minimize archaeological and historic architectural resource impacts is prudent routing or structure placement (i.e., avoiding known archaeological and historic resources). If they cannot be avoided, impacts to these resources could be mitigated by measures developed in consultation with the SHPO prior to construction. Analysis indicates that the applicants' equivalent route has the potential to impact more cultural resources than route alternative B.

6.2.2.5 Natural Environment

6.2.2.5.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project, as described in Chapter 6.2.1.4.1. This route alternative comparison discussion addresses watercourses and waterbodies, and wetlands. Map 6-3 through Map 6-6 shows the water resources along route alternative B.

6.2.2.5.1.1 Watercourses and Waterbodies

Table 6-27 identifies the number of watercourses and waterbodies crossed by route alternative B and the applicants' equivalent. The applicants' equivalent would cross more NHD streams and one more PWI stream than route alternative B. In addition, all of route alternative B and most of the applicants' equivalent would follow an existing transmission line ROW; due to this, neither would require new watercourse or waterbody crossings.

Table 6-27 Watercourses and Waterbodies Crossed by Route Alternative B and the Applicants' Equivalent

Resources	Route Alternative B	Applicants' Equivalent
Number of NHD streams crossings	11	14
Number of impaired streams crossings	3	3
Number PWI stream crossings	6	7
Number of NHD lake crossings	1	1
Number of impaired lake crossings	0	0
Number of PWI basin crossings	1	0
Number of PWI wetland crossings	0	0

6.2.2.5.1.2 *Wetlands*

Table 6-22 identifies the amount of wetlands present within the ROW for both route alternative B and the applicants' equivalent. Route alternative B would cross more acres of forested wetland than the applicants' equivalent. However, the applicants' equivalent would cross more acres of non-forested wetland. The route alternative B would also have 14 wetland crossings over 1,000 feet whereas the applicants' equivalent would have 12 wetland crossings over 1,000 feet. Crossings longer than 1,000 feet generally cannot be spanned and require placement of one or more poles in wetland area.

6.2.2.5.2 Vegetation

The ROW of both route alternative B and the applicants' equivalent would impact forested vegetation, with route alternative B impacting slightly more forested vegetation (376 acres) than the applicants' equivalent (349 acres). Both route alternatives would minimize impacts associated with forested fragmentation by paralleling an existing transmission line ROW, with route alternative B paralleling one for its entire length and the applicants' equivalent paralleling one for 94 percent of its length. Forested vegetation impacts from the two route alternatives would be relatively similar.

6.2.2.5.3 Wildlife

Wildlife habitat impacts would occur for both route alternative B and the applicants' equivalent because of forested habitat removal within each of the respective rights-of-way. Wildlife habitat impacts would be relatively similar for both route alternatives, with the applicants' equivalent impacting less forested habitat and route alternative B paralleling an existing transmission line ROW for slightly more of its length. The applicants' equivalent ROW would traverse the edge of the Moose Willow WMA, while route alternate B would avoid the WMA (Map 6-3 through Map 6-6). However, impacts to the WMA from the applicants' equivalent would be minimized by paralleling an existing transmission line ROW in this area. The potential impacts to wildlife and associated habitat from route alternative B and the applicants' equivalent would be relatively similar.

6.2.2.6 Rare and Unique Natural Resources

According to the NHIS database, one federal and three state protected species have been documented within 1 mile of route alternative B and the applicants' equivalent; however, none of these species have been documented within the ROW of either route alternative (Appendix N). Several state special concern species have been documented within 1 mile of route alternative B and the applicants' equivalent, two of which have been documented within the ROW of the applicants' equivalent; state special concern species are summarized in Appendix N. In general, habitat is comparable between route alternative B and the applicants' equivalent; as such, it is anticipated that potential impacts to protected species would be comparable.

The route alternative B and the applicants' equivalent rights-of-way would traverse several sensitive ecological resources (Map 6-3 through Map 6-6). The ROW of both route alternatives would intersect SBS ranked high and moderate, with the ROW of the applicants' equivalent intersecting the most SBS acreage (Table 6-28). The ROW of both route alternatives would intersect native plant communities, with alternative B intersecting slightly more acreage, including native plant communities that have a conservation status of S1 or S2 (Table 6-28). The ROW of both route alternatives would intersect areas designated as High Conservation Value Forest, with the applicants' equivalent intersecting significantly more acreage than route alternative B. However, the ROW of route alternative B would intersect two parts of the High Conservation Value Forest that are designated candidate old growth stands, while the applicants' equivalent would not intersect any candidate old growth stands.

Table 6-28 Sensitive Ecological Resources in the ROW of Route Alternative B and the Applicants' Equivalent

Sensitive Ecological Resource	Area within ROW of Route Alternative B	Area within ROW of Applicants' Equivalent
Sites of Biodiversity Significance	199 total acres; 135 acres ranked high; 64 acres ranked moderate	308 total acres; 181 acres ranked high; 127 acres ranked moderate
Native Plant Communities	145 total acres; 10 acres have a conservation status of S1 or S2; conservation status of remaining acres is S3-S5	139 acres - conservation status S3-S5
High Conservation Value Forest	32 acres	123 acres
Candidate Old Growth Stand	9 acres	0 acres

As noted above, route alternative B would parallel an existing transmission line ROW for its entire length and the applicants' equivalent would parallel an existing transmission line ROW for 94 percent of its length. Except for a portion of one SBS ranked moderate, which the applicants' equivalent would traverse in a new ROW, both route alternatives would traverse sensitive ecological resources within or adjacent to areas that have been previously disturbed by transmission line rights-of-way, which would minimize impacts to these resources.

6.2.2.7 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.2.2.8 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-22). Costs are similar between route alternative B ($146 million) and the applicants' equivalent ($149 million). Route alternative B may require additional engineering to develop the specialty structures needed to keep structure heights to less than 80 feet in proximity of the Hill City/Quadna Mountain Airport. Each circuit may need a separate structure, thereby increasing the overall ROW width in proximity of the airport.

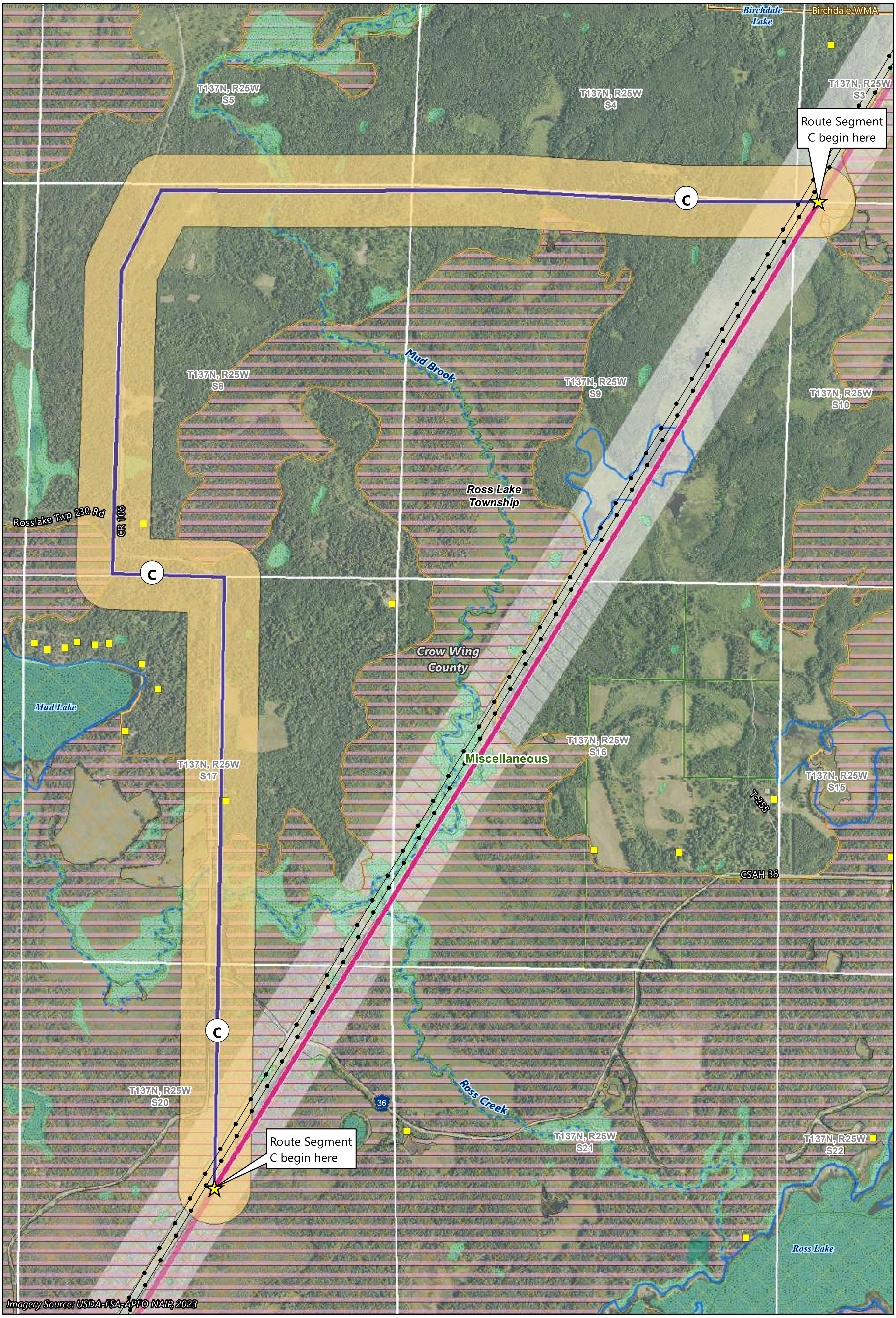
6.2.3 Route Alternative C – Hill City to Little Pine Region

Route alternative C provides a different option to the applicants' equivalent in the southwestern part of the Hill City to Little Pine region. Route alternative C shifts west from the applicants' equivalent to reduce public water crossings. Route alternative C does not include any transmission line ROW sharing or paralleling, or double-circuiting. Potential impacts of route alternative C and the applicants' equivalent are summarized in Table 6-29 and shown on Map 6-7.

Table 6-29 Human and Environmental Impacts – Route Alternative C, Hill City to Little Pine Region

Resource	Element	Route Alternative C	Applicants' Equivalent
Length (miles)		4.6	3.0
Human Settlement	Residences within 0-75 feet (count)	1	0
	Residences within 75-250 feet (count)	0	0
	Residences within 250-500 feet (count)	1	0
	Residences within 500–1,000 feet (count)	2	0
Land-Based Economies	Agricultural land in 150-foot ROW (acres)	5	1
Water Resources	Total wetlands in 150-foot ROW (acres)	11	28
	Forested wetlands in 150-foot ROW (acres)	6	6
Vegetation	Forested landcover in 150-foot ROW (acres)	57	29
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	18	26
	Native Plant Communities in 150-foot ROW (acres)	13	18
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	0.0. (0)	3.0 (100)
	Roadway (miles, percent)	4.3 (93)	0.0. (0)
	Field, parcel, or section lines (miles, percent)	4.6 (100)	0.0. (0)
	Total ROW sharing and paralleling (miles, percent)	4.6 (100)	3.0 (100)
Reliability	Crossing of existing transmission lines (count)	2	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$31.8[1]	$16.7

1 Two specialty structures would be needed to cross an existing transmission line for an estimated additional cost of approximately $4 million. In addition, three heavy-angle structures would be needed for an additional cost of approximately $740,000 per structure ($24.9 million base cost).



Route Segment C
Applicants' Route C Equivalent
Route Width
Route Alternative Width
Existing Transmission Line
Residence
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Native Plant Community
Wildlife Management Area
Other DNR Land

Wetlands

Non-Forested Wetland
Forested Wetland

Site of Biodiversity Significance

High Significance

N

Feet
0 600 1,200

Map 6-7

ROUTE ALTERNATIVE C
Hill City to Little Pine Region
Northland Reliability Project

6.2.3.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some aspects of the project, impacts on human settlement are expected to be minimal and independent of the selected route. Therefore, these elements are not discussed in this Chapter. These resources, which are discussed exclusively in Chapter 5.3, include cultural values, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.2.3.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternative C is shown in Table 6-30, while ROW paralleling and sharing are shown in Table 6-31.

No residences are located within 1,000 feet of the applicants' equivalent, while four residences are located within 1,000 feet of route alternative C. The applicants' equivalent also follows slightly more infrastructure ROW than route alternative C. Thus, on whole, the applicants' equivalent best minimizes aesthetic impacts in this area of the project.

Table 6-30 Hill City to Little Pine Region Proximity of Residences to Route Alternative C

Residences, Distance from Anticipated Alignment	Route Alternative C	Applicants' Equivalent
Residences within 0-75 feet	1	0
Residences within 75-250 feet	0	0
Residences within 250-500 feet	1	0
Residences within 500-1,000 feet	2	0
Total Residences within 1,000 feet	4	0

Table 6-31 Hill City to Little Pine Region ROW Sharing and Paralleling of Route Alternative C

Infrastructure	Route Alternative C miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0.0. (0)	0.0. (0)
Follows Existing Roads	4.3 (93)	0 (0)
Follows Existing Transmission Line	0 (0)	3.0 (100)
Total – Follows Transmission Line, Road, or Railroad	4.3 (93)	3.0 (100)
Follows Field, Parcel, or Section Lines	4.6 (100)	0 (0)
Total – ROW Paralleling and Sharing	4.6 (100)	3.0 (100)
Total Length of Route Alternative	4.6	3.0

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.2.3.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW, for safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no churches, childcare centers, or schools located within the 150-foot ROW of route alternative C or the applicants' equivalent. However, there is one permanent residence and two non-residential buildings (storage shed, agricultural outbuildings, etc.) located within the 150-foot ROW of the route alternative C.

The one residential building and the two non-residential buildings in route alternative C may or may not be displaced by the project. Though buildings are generally not allowed within the 150-foot transmission line ROW, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., animal production). For each of the buildings noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.2.3.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no active mining operations within either the route alternative C or the applicants' equivalent rights-of-way. Therefore, potential project impacts to mining would be minimal and independent of the route selected.

6.2.3.2.1 Agriculture

Agricultural land impacts in the 150-foot ROW of both route alternative C and the applicants' equivalent differ. The route alternative C ROW would impact the most amount agricultural land (5 acres) while the applicants' equivalent ROW would impact the least agricultural land (less than 1 acre).

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of route alternative C or the applicants' equivalent.

6.2.3.2.2 Forestry

Forestry impacts within the Hill City to Little Pine region were primarily assessed by evaluating the designated forestry resources within the 150-foot ROW (Chapter 5.8.2). Approximately 57 acres of the route alternative C ROW consist of forested land, while 29 acres of the applicants' equivalent ROW consist of forested land (reference (108)) comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C).

The only designated forestry resources in this area are Minnesota School Trust Lands. There are 18 acres of Minnesota School Trust Lands within the applicants' equivalent route ROW; there are no designated forestry resources within the route alternative C ROW.

Only the applicants' equivalent route would have potential impacts to designated forestry resources within the 150-foot ROW. Therefore, route alternative C would minimize impacts to designated forestry resources. Forestry resource impacts would include permanently removing trees from the ROW before construction.

6.2.3.2.3 Recreation and Tourism

Recreation and tourism activities within the Hill City to Little Pine region include outdoor recreation activities and camping opportunities on state managed lands, trails, and scenic byways. Since project transmission line construction and operation generally has minimal permanent and temporary impacts to trails, recreation and tourism in this region, overall impacts are expected to be minimal where the project parallels existing ROWs.

Route alternative C does not contain any recreational resources within its ROW but does border an off-road vehicle use trail for a portion of the route. The applicants' equivalent likewise does not have any recreational resources within its ROW. Route Alternative C would result in permanent and temporary impacts which would include increased noise from construction and reduced aesthetic value. Although permanent and temporary impacts would occur because of this route, they are expected to have minimal recreation impact.

6.2.3.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the alternative C or the applicants' equivalent route width. As a result, cultural resource impacts are anticipated to be minimal and independent of the route selected.

6.2.3.4 Natural Environment

6.2.3.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-7 shows the water resources along route alternative C.

6.2.3.4.1.1 Watercourses and Waterbodies

Table 6-32 identifies the number of watercourses and waterbodies crossed by route alternative C and the applicants' equivalent respectively. The applicants' equivalent would cross more NHD streams and PWI streams than route alternative C. Route alternative C would parallel an existing roadway for majority of the route length which would reduce the impact associated with new crossings.

Table 6-32 Waterbodies and Watercourses Crossed by Route Alternative C and Applicants' Equivalent

Resources	Route Alternative C	Applicants' Equivalent
Number of NHD streams crossings	2	5
Number of impaired streams crossings	0	0
Number PWI stream crossings	2	3
Number of NHD lake crossings	0	0
Number of impaired lake crossings	0	0
Number of PWI basin crossings	0	0

6.2.3.4.1.2 Wetlands

Table 6-29 identifies the acreage of wetlands located within the rights-of-way for both route alternative C and the applicants' equivalent, respectively. Route alternative C and the applicants' equivalent would cross nearly the same amount of forested wetlands; however, the applicants' equivalent would cross more non-forested wetlands. The route alternative C would not have any wetland crossing over 1,000 feet, and the applicants' equivalent would have three wetland crossings over 1,000 feet.

6.2.3.4.2 Vegetation

The ROW of both route alternative C and the applicants' equivalent would impact forested vegetation, with route alternative C impacting almost twice as much (57 acres) as the applicants' equivalent (29 acres). Both route alternatives would minimize impacts to forest fragmentation by paralleling existing rights-of-way; with the applicants' equivalent paralleling an existing transmission line ROW for its entire length and route alternative C paralleling an existing road corridor for approximately 93 percent of its length. The applicants' equivalent would minimize impacts to forested vegetation.

6.2.3.4.3 Wildlife

Wildlife habitat impacts would occur for route alternative C and the applicants' equivalent as a result of removal of forested habitat in the ROW; however, neither route alternative would traverse areas that are managed or preserved for wildlife. By impacting less forested vegetation and paralleling an existing transmission line ROW for its entire length, the applicants' equivalent would have less impact on wildlife habitat than route alternative C. Route alternative C would also minimize the potential habitat fragmentation impacts by paralleling an existing road corridor for approximately 93 percent of its length. Route alternative C would increase impact potential to avian species by establishing a new transmission line ROW. However, as discussed in Chapter 5.10.5.2, avian impacts can be minimized through use of bird flight diverters. The potential wildlife habitat impacts would be greater for route alternative C than the applicants' equivalent.

6.2.3.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federal- or state-protected species have been documented within 1 mile of route alternative C or the applicants' equivalent. Two state special concern species have been documented within 1 mile of route alternative C, while no state special concern species have been documented within 1 mile of the applicants' equivalent; state special concern species are summarized in Appendix M. In general, habitat is comparable between route alternative C and the applicants' equivalent; as such, it is anticipated that potential protected species impacts would be comparable with the exception of avian species. While the applicants' equivalent parallels an existing transmission line ROW for its entire length, route alternative C parallels a road corridor for 93 percent of its length but does not parallel an existing transmission line ROW. As a result, route alternative C could pose an increased threat to federally or state protected avian species by establishing a new transmission line ROW. As discussed in Chapter 5.10.5.2, these impacts can be minimized through use of bird flight diverters.

The ROW of route alternative C and the applicants' equivalent would traverse several sensitive ecological resources (Map 6-7). The ROW of both route alternatives would intersect SBS ranked high and native plant communities, with the ROW of the applicants' equivalent intersecting slightly more acres of both (Table 6-33). The applicants' equivalent would parallel an existing transmission line through these sensitive ecological resources, while route alternative C follows a road corridor for 93 percent of its length and may require establishing a new ROW through a portion of these resources.

Table 6-33 Sensitive Ecological Resources in the 150-foot ROW of Route Alternative C and the Applicants' Equivalent

Sensitive Ecological Resource	Area within ROW of Route Alternative C	Area within ROW of Applicants' Equivalent
Sites of Biodiversity Significance	18 acres - ranked high	26 acres - ranked high
Native Plant Communities	13 total acres; 0.5 acres have a conservation status of S1 or S2; conservation status of remaining acres is S3-S5	18 acres - conservation status S3-S5

6.2.3.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

Route alternative C would require two transmission line crossings, thereby introducing an increased reliability concern. The applicants' equivalent would require no transmission line crossings.

6.2.3.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-29). Route alternative C would require two specialty structures to cross an existing transmission line in two separate locations. It would also require three heavy-angle structures, which cost more than three times that of a tangent structure. As a result, route alternative C costs nearly twice as much (approximately $32 million) as the applicants' equivalent (approximately $17 million).

6.2.4 Alignment Alternatives AA1 and AA2 – Hill City to Little Pine Region

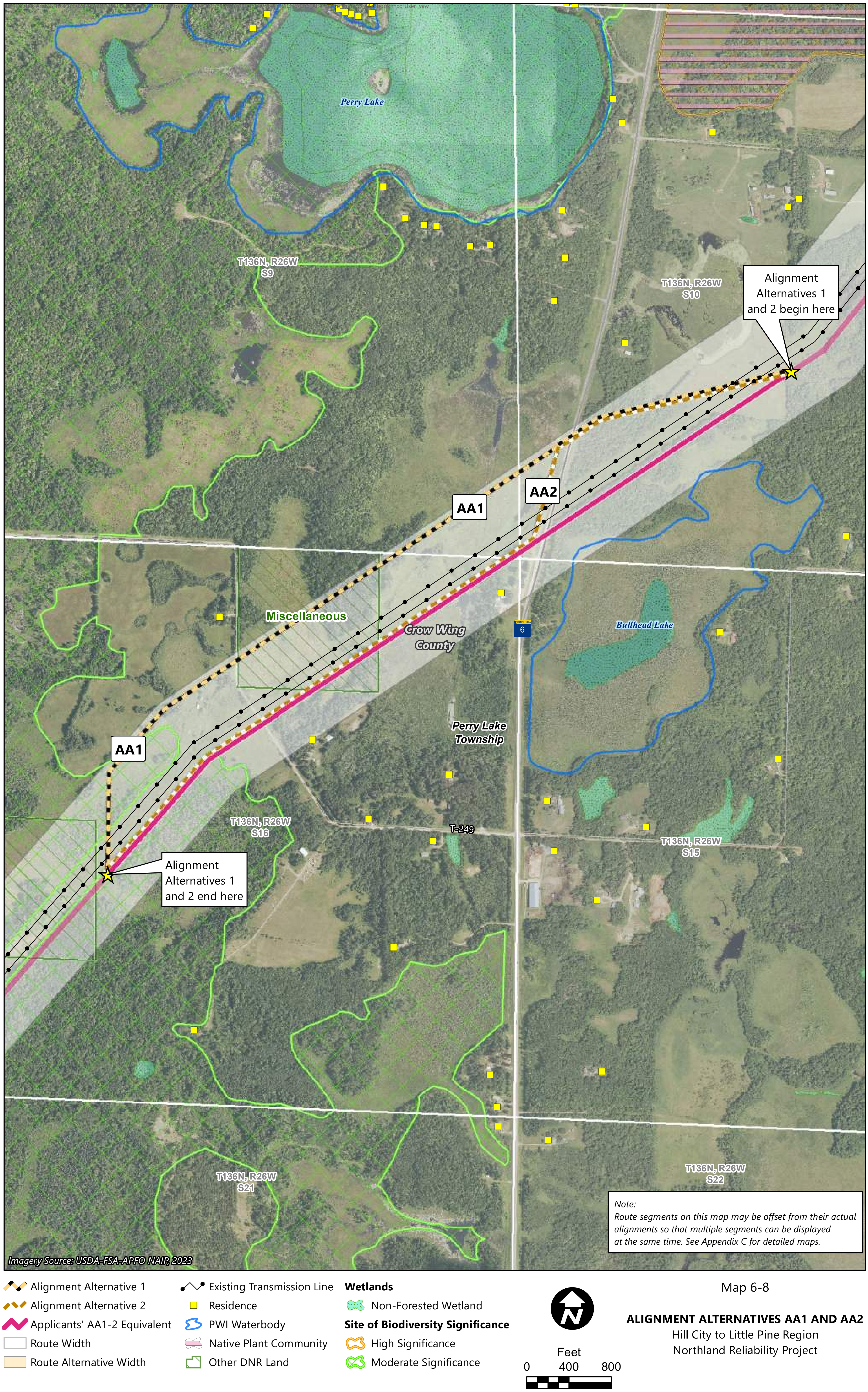
Alignment alternative AA1 and AA2 provide an alternative placement to the applicants' proposed alignment in the southwest part of the Hill City to Little Pine region. Both alignment alternatives are shifted west to avoid private property. These alignment alternatives do not include any transmission line ROW sharing, paralleling, or double-circuiting. Potential impacts of alignment alternative AA1, AA2, and the applicants' equivalent are summarized in Table 6-34 and shown on Map 6-8.

Table 6-34 Human and Environmental Impacts – Alignment Alternatives AA1 and AA2, Hill City to Little Pine Region

Resource	Element	Alignment Alternative AA1	Alignment Alternative AA2	Applicants' Equivalent
Length (miles)		1.6	1.6	1.5
Human Settlement	Residences within 0-75 feet (count)	0	0	0
	Residences within 75-250 feet (count)	0	1	1
	Residences within 250-500 feet (count)	1	1	1
	Residences within 500–1,000 feet (count)	2	1	0
Land-Based Economies	Agricultural land in 150-foot ROW (acres)	7	7	6
Water Resources	Total wetlands in 150-foot ROW (acres)	16	12	11
	Forested wetlands in 150-foot ROW (acres)	2	4	3
Vegetation	Forested landcover in 150-foot ROW (acres)	10	12	12
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	3	4	4
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	0 (0)	1 (61)	1.5 (100)
	Roadway (miles, percent)	0 (0)	0.2 (11)	0 (0)
	Field, parcel, or section lines (miles, percent)	0.2 (11)	0.2 (11)	0 (0)
	Total ROW sharing and paralleling (miles, percent)	0.2 (11)	1.2 (72)	1.5 (100)
Reliability	Crossing of existing transmission lines (count)	2	2	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$14.5[1]	$14.4[2]	$8.5

1 Two specialty structures would be needed to cross an existing transmission line for an estimated additional cost of approximately $4 million. In addition, two heavy-angle structures would be needed for an additional cost of approximately $740,000 per structure ($8.8 million base cost).

2 Two specialty structures would be needed to cross an existing transmission line for an estimated additional cost of approximately $4 million. In addition, two heavy-angle structures would be needed for an additional cost of approximately $740,000 per structure ($8.6 million base cost).



Map 6-8

ALIGNMENT ALTERNATIVES AA1 AND AA2

Hill City to Little Pine Region

Northland Reliability Project

6.2.4.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed solely in Chapter 5.3, include cultural values, displacement, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.2.4.1.1 Aesthetics

Aesthetic impacts differ among the routing alternatives. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternatives AA1, AA2, and the applicants' equivalent are shown in Table 6-35, while ROW paralleling and sharing are shown in Table 6-36.

A similar number of residences are located within 1,000 feet of alignment alternatives AA1, AA2, and the applicants' equivalent. Alignment alternative AA1 does not parallel any existing infrastructure and, therefore, would have the greatest aesthetic impact. The applicants' equivalent would minimize aesthetic impacts more than the other alignment alternatives by paralleling more existing infrastructure ROW.

Table 6-35 Hill City to Little Pine Region Proximity of Residences to Alignment Alternatives AA1 and AA2

Residences, Distance from Anticipated Alignment	Alignment Alternative AA1	Alignment Alternative AA2	Applicants' Equivalent
Residences within 0-75 feet	0	0	0
Residences within 75-250 feet	0	1	1
Residences within 250-500 feet	1	1	1
Residences within 500-1,000 feet	2	1	0
Total Residences within 1,000 feet	3	3	2

Table 6-36 Hill City to Little Pine Region ROW Sharing and Paralleling of Alignment Alternatives AA1 and AA2

Infrastructure	Alignment Alternative AA1 miles (percent)	Alignment Alternative AA2 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0.2 (11)	0 (0)
Follows Existing Transmission Line	0 (0)	1 (61)	1.5 (100)
Total – Follows Transmission Line, Road, or Railroad	0 (0)	1.2 (72)	1.5 (100)
Follows Field, Parcel, or Section Lines	0.2 (11)	0.2 (11)	0 (0)
Total – ROW Paralleling and Sharing	0.2 (11)	1.2 (72)	1.5 (100)
Total Alignment of Route Alternative	1.6	1.6	1.5

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line, and therefore, the sum may be greater than 100 percent.

6.2.4.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no active mining operations or recreation and tourism opportunities within the rights-of-way of alignment alternative AA1 or AA2 or the applicants' equivalent. Therefore, potential project impacts to mining and recreation and tourism would be minimal and independent of the route selected.

6.2.4.2.1 Agriculture

Agricultural land impacts within the 150-foot ROW of alignment alternatives AA1 and AA2 and the applicants' equivalent are similar. The applicants' equivalent has the least amount of agricultural land in its ROW (6 acres). Alignment alternative AA1 and AA2 impact a similar amount of agricultural lands within their rights-of-way, totaling approximately 7 acres each.

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of the alignment alternatives or the applicants' equivalent.

6.2.4.2.2 Forestry

Forestry impacts within the Hill City to Little Pine region were primarily assessed by evaluating the designated forestry resources within the 150-foot ROW (Chapter 5.8.2). Forested land comprises approximately 10 acres of the ROW of alignment alternative AA1, 12 acres of the ROW of alignment alternative AA2, and 12 acres of the ROW of the applicants' equivalent (reference (108)). The forested land is comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C).

As shown in Table 6-37, designated forestry resources within the 150-foot ROW of the route alternatives only consist of Minnesota School Trust Land.

Table 6-37 Designated Forestry Resources within the 150-foot ROW of Alignment Alternatives AA1 and AA2

Forestry Resources	Alignment Alternative AA1	Alignment Alternative AA2	Applicants' Equivalent
Acres of DNR state forest within 150-foot ROW	0	0	0
Acres of Minnesota School Trust Land[1] within 150-foot ROW	6	3	3
Acres of Forest for the Future[2] land within 150-foot ROW	0	0	0

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated, and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)
1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).
2 Minnesota's Forests for the Future Program is a conservation program administered by the DNR to encourage the protection of privately-owned forest lands through conservation easements or land purchases (reference (5)).

All of the routing alternatives would have potential impacts to designated forestry resources within the 150-foot ROW, although, alignment alternative AA2 and the applicants' equivalent would minimize impacts to forestry resources compared to alignment alternative AA1. Impacts to forestry resources would include permanently removing trees from the ROW before construction.

6.2.4.3 Archaeological and Historic Resources

One previously documented historic architectural resource is located within the 1,000-foot route width of alignment alternatives AA1, AA2, and the applicants' equivalent (Table 6-38; Map Book 5F).

Table 6-38 Cultural Resources within the Route Width of Alternative Alignment AA1, AA2, and the Applicants' Equivalent

Resource Number	Resource Type	NRHP Eligibility	Location
XX-ROD-00052	Trunk Highway 6	Not eligible	alternative alignment AA1, alternative alignment AA2, applicants' equivalent

The applicants' equivalent and alignment alternatives AA1 and AA2 would each cross historic architectural resource XX-ROD-00052 (Trunk Highway 6). The applicants' equivalent would cross this resource within an existing transmission line ROW; therefore, no changes in setting or affects to the resource are anticipated. Alignment alternative AA1 would cross resource XX-ROD-00052 in a new location, thereby introducing a new visual impact to the resource. Alignment alternative AA2 would parallel resource XX-ROD-00052, which would also introduce a new visual impact to the resource. However, as resource XX-ROD-00052 has been previously determined not eligible for the NRHP, impacts to this resource are anticipated to be minimal and independent of the route selected.

6.2.4.4 Natural Environment

6.2.4.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the project route selected. This routing alternative comparison discussion addresses watercourses and waterbodies, and wetlands. Map 6-8 shows the water resources along alternative alignment AA1, AA2 and the applicants' equivalent.

6.2.4.4.1.1 Watercourses and Waterbodies

Alignment alternative AA1, alignment alternative AA2, and the applicant's equivalent would not cross any watercourses or waterbodies.

6.2.4.4.1.2 Wetlands

Table 6-34 identifies the acreage of wetlands crossed by alternative alignment AA1, AA2, and the applicants' equivalent. Alternative alignment AA1 would cross more non-forested wetland than alternative alignment AA2 and applicants' equivalent. However, alternative alignment AA2 would cross more forested wetlands than alternative alignment AA1 and the applicants' equivalent. Alignment alternative AA1 would have two wetland crossings over 1,000 feet. Alternative alignment AA2 and the applicants' equivalent does not have any wetland crossings over 1,000 feet.

6.2.4.4.2 Vegetation

The ROW of alignment alternatives AA1, AA2, and the applicants' equivalent would all impact similar amounts of forested vegetation (10 to 12 acres). The applicants' equivalent would minimize impacts associated with forest fragmentation because it would parallel an existing transmission line ROW for its entire length.

6.2.4.4.3 Wildlife

Wildlife habitat impacts would occur for alignment alternatives AA1, AA2, and the applicants' equivalent as a result of removal of forested habitat in the ROW; however, neither alignment alternative or the applicants' equivalent would traverse areas that are managed or preserved for wildlife. Alignment alternatives AA1 and AA2 would fragment wildlife habitat and would also require establishing a small segment of new transmission line that would run perpendicular to the existing transmission line, thereby increasing the potential for avian species impacts. By paralleling an existing transmission line ROW for its entire length, the applicants' equivalent would have the least amount of impact on wildlife habitat.

6.2.4.5 Rare and Unique Natural Resources

From the NHIS database, no federal- or state-protected species or state special concern species have been documented within 1 mile of alignment alternatives AA1, AA2, or the applicants' equivalent. Both alignment alternatives AA1 and AA2 could pose an increased threat to federally or state protected avian species as a result of establishing a new transmission line rights-of-way and/or a new perpendicular transmission line alignment.

The ROW of alignment alternatives AA1, AA2, and the applicants' equivalent would all intersect an SBS ranked moderate (Map 6-8). Alignment alternative AA1 would impact approximately 3 acres of the SBS, while AA2 and the applicants' equivalent would intersect approximately 4 acres of SBS. Alignment alternative AA2 and the applicants' equivalent would intersect the SBS while paralleling a previously disturbed transmission line ROW, while AA1 would require a new ROW through the SBS (Map 6-8).

6.2.4.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

Alignment alternatives AA1 and AA2 would each require two transmission line crossings, thereby introducing an increased reliability concern for these two alignment alternatives. The applicants' equivalent would require no transmission line crossings.

6.2.4.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-34). Alignment alternatives AA1 and AA2 would each require two specialty structures to cross an existing transmission line in two separate locations. They would also each require two heavy-angle structures, which cost more than three times that of a tangent structure. As a result, the applicants' equivalent (approximately $8 million) is less expensive than both alignment alternatives AA1 and AA2 (approximately $14 million).

6.2.5 Alignment Alternative AA16 – Hill City to Little Pine Region

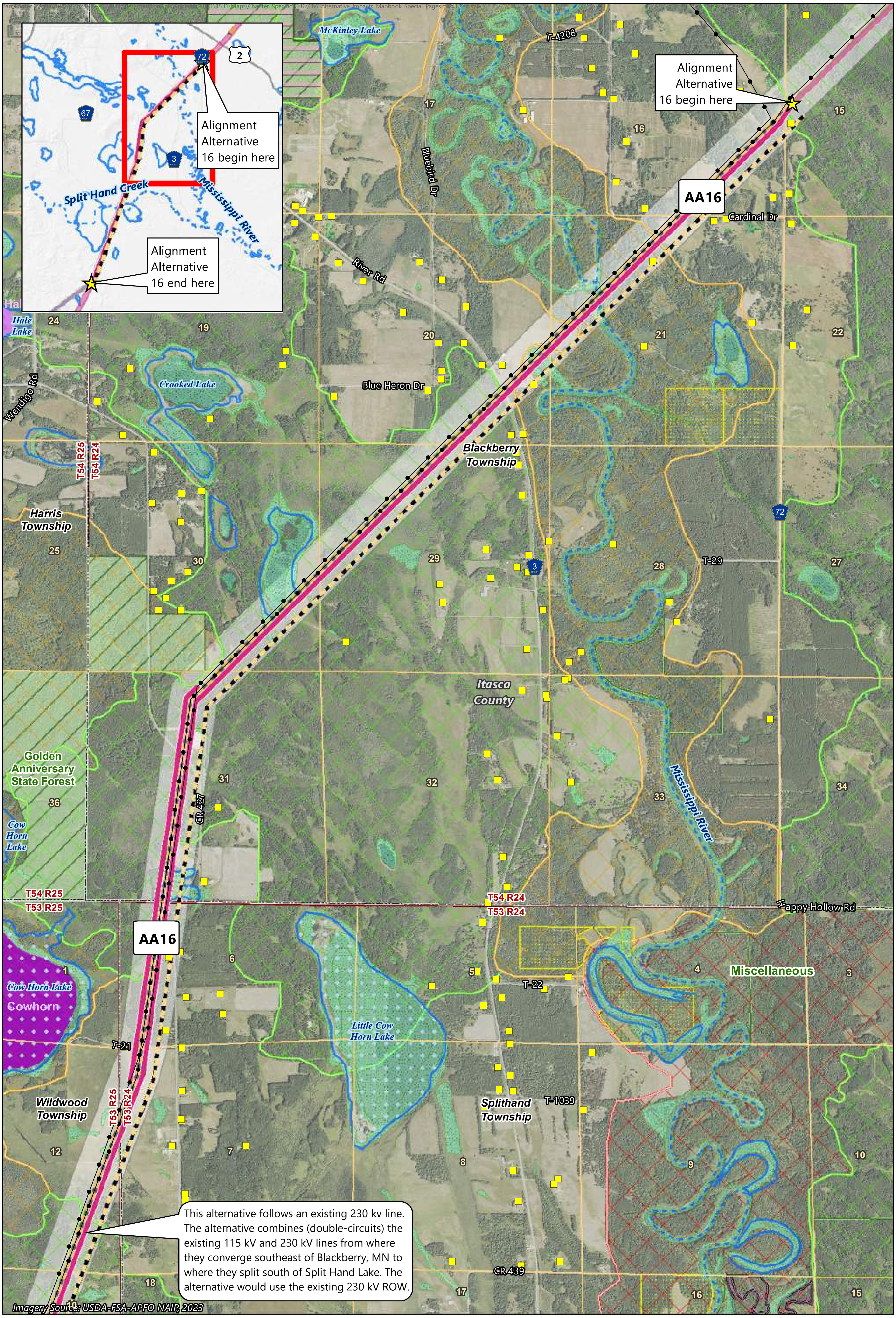
Alignment alternative AA16 provides an alternative placement of the applicants' proposed alignment in the northeastern corner of the Hill City to Little Pine region. Alignment alternative AA16 would consist of double-circuiting two existing transmission lines to allow alignment alternative AA16 to use that existing ROW. Potential impacts of alignment alternative AA16 and the applicants' equivalent are summarized in Table 6-39 and shown on Map 6-9 and Map 6-10.

Table 6-39 Human and Environmental Impacts – Alignment Alternative AA16, Hill City to Little Pine Region

Resource	Element	Alignment Alternative AA16	Applicants' Equivalent
Length (miles)		11.0	12.7
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	1	4
	Residences within 250-500 feet (count)	8	5
	Residences within 500–1,000 feet (count)	14	17
Land-Based Economies	Agricultural land in 150-foot ROW (acres)	26	20
Water Resources	Total wetlands in 150-foot ROW (acres)	94	87
	Forested wetlands in 150-foot ROW (acres)	43	8
Vegetation	Forested landcover in 150-foot ROW (acres)	70[1]	151
Sensitive Ecological Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	195	227
	Native Plant Communities in 150-foot ROW (acres)	2	9
	High Conservation Value Forest in 150-foot ROW (acres)	5	5
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	11.0 (100)	12.7 (100)
	Roadway (miles, percent)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	0 (0)	0 (0)
	Total ROW sharing and paralleling (miles, percent)	11.0 (100)	12.7 (100)
Reliability	Crossing of existing transmission lines (count)	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$106-$119[2]	$70.6

1 The NLCD indicates forested vegetation is in the ROW; however, the ROW is an existing transmission line ROW that has been cleared and is routinely maintained.

2 Double-circuiting the existing transmission lines in order to place the proposed route within existing ROW would add between $45-$58 million to alignment alternative AA16 (base cost of $59.3 million)



Alignment Alternative 16
Applicants' AA16 Equivalent
Route Width
Route Alternative Width
Existing Transmission Line
Residence
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Native Plant Community
State Conservation Easement
State Forest
Other DNR Land

Lakes of Biological Significance

High Significance
Moderate Significance

Wetlands

Non-Forested Wetland

Forest Inventory Old Growth

Designated Old Growth

Site of Biodiversity Significance

Outstanding Significance
High Significance
Moderate Significance

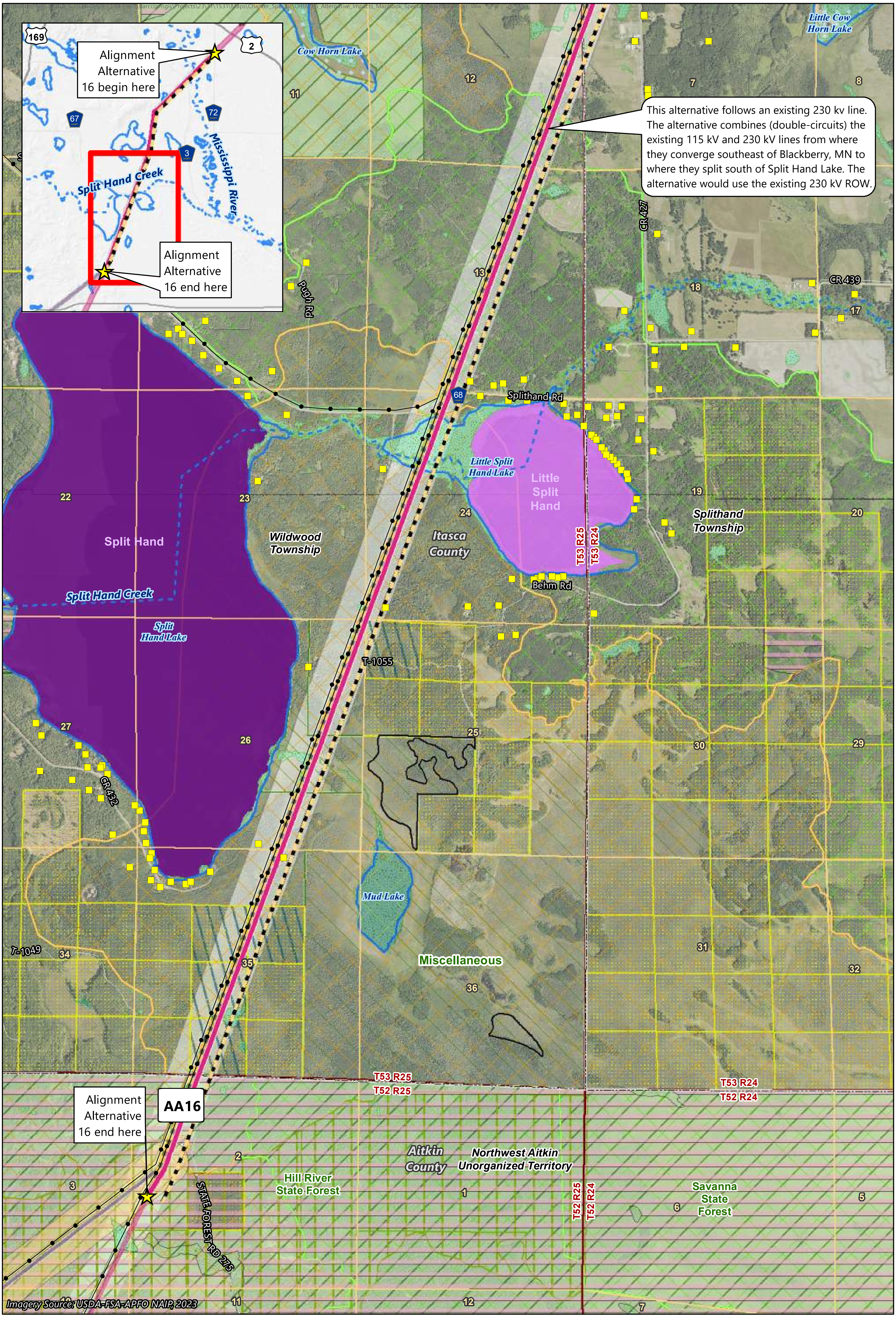
Feet
0 1,000 2,000

Map 6-9

ALIGNMENT ALTERNATIVE AA16 (PART 1)

Hill City to Little Pine Region

Northland Reliability Project



- Alignment Alternative 16
- Applicants' AA16 Equivalent
- Route Width
- Route Alternative Width
- Existing Transmission Line
- Residence
- PWI Watercourse
- PWI Waterbody
- Shallow Wildlife Lake
- Native Plant Community
- High Conservation Value Forest
- Forests of the Future Easement
- State Forest
- Other DNR Land

Lakes of Biological Significance

- Outstanding Significance
- Moderate Significance

Wetlands

- Non-Forested Wetland
- Forested Wetland

Forest Inventory Old Growth

- Candidate Old Growth

Site of Biodiversity Significance

- High Significance
- Moderate Significance

Feet

0 1,000 2,000

Map 6-10

ALIGNMENT ALTERNATIVE AA16 (PART 2)

Hill City to Little Pine Region

Northland Reliability Project

6.2.5.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, discussed exclusively in Chapter 5.3, include cultural values, electronic interference, noise, property values, and zoning and land use.

6.2.5.1.1 Aesthetics

Aesthetic impacts differ among the routing alternatives. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to alignment alternative AA16 are shown in Table 6-40, while ROW paralleling and sharing are shown in Table 6-41.

Alignment alternative AA16 would consist of double-circuiting two existing transmission lines to allow the proposed route to use that existing ROW, while the applicants' equivalent would parallel existing transmission line ROW. The applicants' equivalent has slightly more homes in proximity than alignment alternative AA16. Alignment alternative AA16 and the applicants' equivalent both follow existing transmission lines for their entire length. Alignment alternative AA16 and the applicants' equivalent would have similar aesthetic impacts.

Table 6-40 Hill City to Little Pine Region Proximity of Residences to Alignment Alternative AA16

Residences, Distance from Anticipated Alignment	Alignment Alternative AA16	Applicants' Equivalent
Residences within 0-75 feet	0	0
Residences within 75-250 feet	1	4
Residences within 250-500 feet	8	5
Residences within 500-1,000 feet	14	17
Total Residences within 1,000 feet	23	26

Table 6-41 Hill City to Little Pine Region ROW Sharing and Paralleling of Alignment Alternative AA16

Infrastructure	Alignment Alternative AA16 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)
Follows Existing Transmission Line	11.0 (100)	12.7 (100)
Total – Follows Transmission Line, Road, or Railroad	11.0 (100)	12.7 (100)
Follows Field, Parcel, or Section Lines	0 (0)	0 (0)
Total – ROW Paralleling and Sharing	11.0 (100)	12.7 (100)
Total Length of Alignment Alternative	11.0	12.7

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.2.5.1.2 Displacement

For electrical safety code and maintenance reasons, residences or other buildings are typically not allowed within the transmission line ROW due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no permanent residences, churches, childcare centers, or schools located within the 150-foot ROW of alignment alternative AA16. However, two non-residential buildings (storage shed, agricultural outbuildings, etc.) are located within the 150-foot ROW of the applicants' equivalent.

These non-residential buildings may or may not be displaced because of the applicants' equivalent. Though buildings are generally not allowed with the transmission line ROW, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For each of the buildings noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.2.5.1.3 Socioeconomics and Environmental Justice

Socioeconomic factors provide an indication of how economic activity affects and is shaped by social processes. Socioeconomic measures indicate how societies progress, stagnate, or regress because of the actions and interaction within and between the local, regional, or global economic scale. Transmission line projects can contribute to growth and progress at the local level over time, but generally do not have a significant long-term socioeconomic impact.

The project would improve the socioeconomics of the region through the creation of jobs, generation of tax revenue, and providing more reliable electrical service to the surrounding communities. Alignment alternative AA16 intersects with Wildwood Township, which has been identified as a community with EJCs; however, no adverse or permanent impacts to this area are anticipated. While alignment alternative AA16 does intersect a community with EJCs, this community is not anticipated to experience disproportionately adverse impacts as a result of the project, particularly because the project would parallel an existing transmission line for its entire length near this community.

6.2.5.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no active mining operations within either of the alignment alternative AA16 or the applicants' equivalent rights-of-way. Therefore, potential project impacts to mining would be minimal and independent of the route selected.

6.2.5.2.1 Agriculture

Agricultural land impacts differ between alternative alignment AA16 and the applicants' equivalent. Alignment alternative AA16's ROW would impact no new agricultural land; though AA16 crosses agricultural land, it would be located within an existing transmission ROW. The applicants' equivalent would impact 20 acres of agricultural land within its ROW.

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of alignment alternative AA16 or the applicants' equivalent.

6.2.5.2.2 Forestry

Forestry impacts within the Hill City to Little Pine region were primarily assessed by evaluating the forestry resources within the 150-foot ROW (Chapter 5.8.2) of each route alternative. Forested land comprises approximately 70 acres of the ROW of alignment alternative AA16 and 151 acres of the ROW of the applicants' equivalent (reference (108)). The forested land is comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C). However, it is important to note that while the NLCD indicates forested vegetation is in the alignment alternative AA16 ROW, this ROW consists of an existing transmission line ROW that has been cleared and is routinely maintained.

As shown in Table 6-42, the designated forestry resources within the 150-foot ROW of the alignment alternatives consist of DNR state forest land, Minnesota School Trust land, Forests for the Future program land, and SFIA land.

Table 6-42 Designated Forestry Resources within the 150-foot ROW of Alignment Alternative AA16

Forestry Resources	Alignment Alternative AA16	Applicants' Equivalent
Acres of DNR state forest within 150-foot ROW	82	98
Acres of Minnesota School Trust Land[1] within 150-foot ROW	5	5
Acres of Forests for the Future[2] land within 150-foot ROW	14	14
Acres of Sustainable Forest Incentive Act[3] land within 150-foot ROW	20	19

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)

1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

[2] Minnesota's Forests for the Future Program is a conservation program administered by the DNR to encourage the protection of privately-owned forest lands through conservation easements or land purchases (reference (5)).

[3] Minnesota's Sustainable Forest Incentive Act is a conservation program administered by the DNR that provides annual incentive payments to encourage private landowners to keep their wooded areas undeveloped (reference (109)).

The applicants' equivalent would have significantly more impacts to forestry resources than alignment alternative AA16. Though both routing alternatives have designated forestry resources within their 150-foot rights-of-way based on GIS analysis, AA16 follows an existing transmission line ROW that has been cleared for forestry resources and is maintained as such.

6.2.5.2.3 Recreation and Tourism

Recreation and tourism activities within the Hill City to Little Pine region include outdoor recreational activities and camping opportunities on state managed lands, trails, and scenic byways. Since transmission line construction and operation generally has minimal permanent and temporary impacts to trails, project-related recreation and tourism impacts in this region are expected to be minimal where it parallels existing ROWs.

Alignment alternative AA16 and the applicants' equivalent both cross two scenic byways, two state forests, one off-road vehicle use trail, and one water trail. Alignment alternative would be collocated, while the applicants' equivalent parallels an existing transmission line ROW, thus, permanent impacts to resources in this area would be minimal. Temporary impacts from alignment alternative AA16 and the applicant's equivalent could include construction-related temporary trail closings as well as temporary interruptions in recreational opportunities within Golden Anniversary State Forest and Hill River State Forest. Although temporary impacts would occur because of project construction, they are expected to have a minimal long-term impact on recreation.

6.2.5.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the route width of alignment alternative AA16 or the applicants' equivalent. As a result, project impacts to cultural resources are anticipated to be minimal and independent of the route selected.

6.2.5.4 Natural Environment

6.2.5.4.1 Water Resources

Floodplain and groundwater impacts are anticipated to be minimal and independent of the project route selected. This routing alternative comparison discussion addresses watercourses, waterbodies, and wetlands. Map 6-9 and Map 6-10 show the water resources along alternative alignment AA16 and the applicants' equivalent.

6.2.5.4.1.1 Watercourses and Waterbodies

Table 6-43 identifies the number of watercourses and waterbodies crossed by alternative alignment AA16 and the applicants' equivalent. Alternative alignment AA16 would have two PWI basin crossings over 1,000 feet which would require structures placed within the waterbodies; the applicants' equivalent would present only one waterbody crossing over 1,000 feet. However, alternative alignment AA16 would reduce disturbance to watercourses and waterbodies by following an existing transmission line ROW.

Table 6-43 Watercourses and Waterbodies Crossed by the Alternative Alignment AA16 and the Applicants Equivalent

Resources	Alternative Alignment AA16	Applicants' Equivalent
Number of NHD stream crossings	5	5
Number of impaired stream crossings	1	1
Number PWI stream crossings	4	4
Number of NHD lake crossings	1	1
Number of impaired lake crossings	0	0
Number of PWI basin crossings	3	3

6.2.5.4.1.2 Wetlands

Table 6-39 identifies the wetland acreage crossed by alternative alignment AA16 and the applicants' equivalent. Alternative alignment AA16 would cross more non-forested and forested wetlands than the applicants' equivalent. Alignment alternative AA16 would have seven wetland crossings over 1,000 feet and the applicants' equivalent would have six wetland crossings over 1,000 feet.

6.2.5.4.2 Vegetation

The alignment alternative AA16 ROW would not impact forested vegetation because it would be follow an existing transmission line ROW (Map Book 5C). While the NLCD data indicates that forested vegetation is present in the ROW, it has all been cleared previously and maintained to low-stature vegetation for the existing transmission line. The applicants' equivalent ROW would impact approximately 151 acres of forested vegetation (Map Book 5C). No impacts associated with forested fragmentation would occur for alignment alternative AA16 or the applicants' equivalent. Because it would be located within an existing ROW, alignment alternative AA16 would best minimize forest vegetation impacts.

6.2.5.4.3 *Wildlife*

The alignment alternative AA16 ROW would not impact wildlife habitat because it would follow an existing transmission line ROW. The applicants' equivalent would require forest vegetation and associated wildlife habitat removal in its ROW. Neither alternative pass-through area that are managed or preserved for wildlife. Wildlife habitat fragmentation or increased impact potential to avian species would not occur for either alternative. Potential wildlife habitat impacts would be greater for the applicants' equivalent due to the loss of forested habitat.

6.2.5.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federal protected species have been documented within 1 mile of alignment alternative AA16 or the applicants' equivalent. Two state threatened vascular plant species have been documented within 1 mile of both alternatives (Appendix N). In addition, several state special concern species have been documented within 1 mile of each alternative (Appendix N). While no protected species have been documented within the ROW of either alignment alternative, AA16 consists of a routinely maintained/disturbed ROW, while the applicants' equivalent would require disturbance to and removal of potentially suitable habitat for protected species.

Alignment alternative AA16 ROW and the applicants' equivalent would intersect several sensitive ecological resources, including SBS ranked high, moderate, and below, native plant communities, and areas designated as High Conservation Value Forest (Table 6-44, Map 6-9 and Map 6-10). Alignment alternative AA16 would be co-located with the existing transmission line and as such, would traverse these resources within an existing ROW where disturbance to these resources has already occurred. While the applicants' equivalent would minimize sensitive ecological resource impacts by paralleling an existing transmission line ROW, impacts associated with vegetation clearing or structure placement would still occur.

Table 6-44 Sensitive Ecological Resources in the ROW of Alignment Alternative AA16 and the Applicants' Equivalent

Sensitive Ecological Resource	Area within ROW of AA16	Area within ROW of Applicants' Equivalent
Sites of Biodiversity Significance	195 total acres; 73 acres ranked high; 74 acres ranked moderate; 48 acres ranked below	227 total acres; 74 acres ranked high; 95 acres ranked moderate; 58 acres ranked below
Native Plant Communities	2 acres - conservation status S3-S5	9 acres - conservation status S3-S5
High Conservation Value Forest	5 acres	5 acres

6.2.5.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these alignment alternatives.

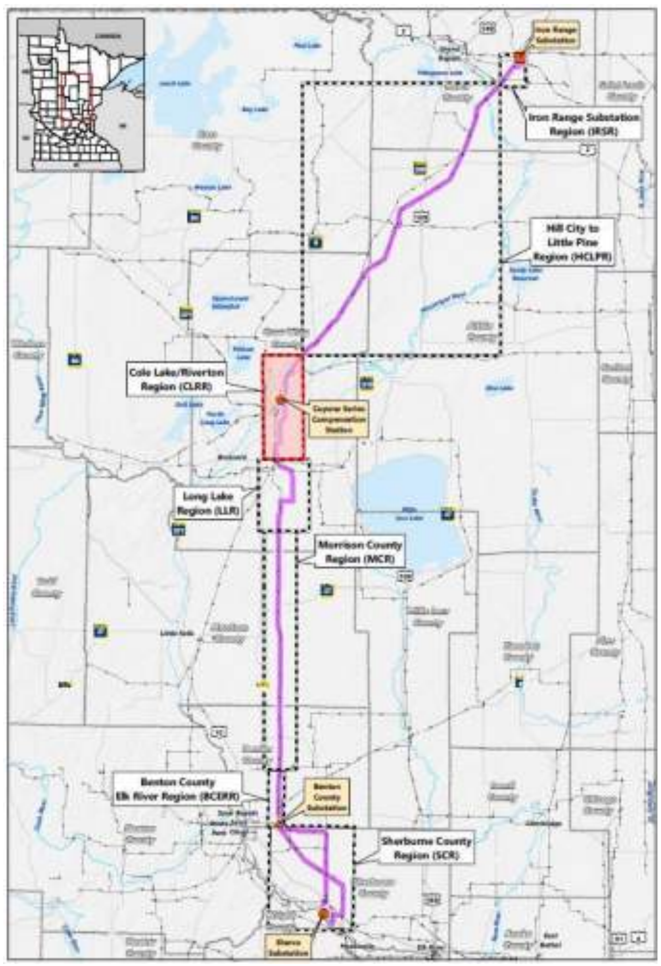
6.2.5.7 Cost

Routing alternative costs are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-39). Although the base cost of alignment alternative AA16 (approximately $60 million) is less than the applicants' equivalent (approximately $70 million), alignment alternative AA16 would require double-circuiting two existing lines in order to route the project within existing ROW of one of the lines to be double-circuited. New double-circuit structures and alignment would therefore add significant cost (approximately $45 million to $58 million) to alignment alternative AA16 (total cost between approximately $106 and $1119 million), making the applicants' equivalent the less expensive alternative.

6.3 Cole Lake-Riverton Region

The Cole Lake-Riverton region is located in Crow Wing County, just south of the Hill City to Little Pine region (Figure 6-5). In addition to the applicants' proposed route, the region has eight route alternatives (D3, E1, E2, E3, E4, E5, F, and G) and seven alignment alternatives (AA3, AA4, AA6, AA7, AA8, AA9, and AA10) (Map Book 3A). Chapter 6.3.1 summarizes the potential impacts resulting from construction and operation of the applicants' proposed route in the Cole Lake-Riverton region. Chapters 6.3.1 through 6.3.9 are dedicated to a comparison of potential project construction and operation impacts. Chapter 6.3.2 discusses route alternative D3, alignment alternatives AA4 and AA6, and the applicants' equivalent. Chapter 6.3.3 discusses alignment alternative AA3 and the applicants' equivalent. Chapter 6.3.4 discusses route alternatives E1, E2, E3, E4, E5, and the applicants' equivalent. Chapter 6.3.5 discusses route alternative F and the applicants' equivalent. Chapter 6.3.6 discusses route alternative G and the applicants' equivalent. Chapter 6.3.5 discusses route alternative F and the applicants' equivalent. Chapter 6.3.7 discusses alignment alternative AA7 and the applicants' equivalent. Chapter 6.3.8 discusses alignment alternative AA8, AA9, and the applicants' equivalent. Chapter 6.3.9 discusses alignment alternative AA10 and the applicants' equivalent.

Figure 6-5 Cole Lake-Riverton Region



6.3.1 Applicants' Proposed Route - Cole Lake-Riverton Region

Potential impacts of the applicants' proposed route in the Cole Lake-Riverton region are summarized in Table 6-45 and discussed in Chapters 6.3.1.1 through 6.3.1.5.

Table 6-45 Human and Environmental Impacts – Applicants' Proposed Route, Cole Lake-Riverton Region

Resource	Element	Applicants' Proposed Route
Length (miles)		17.7
Human Settlement	Residences within 0-75 feet (count)	1
	Residences within 75-250 feet (count)	2
	Residences within 250-500 feet (count)	13
	Residences within 500–1,000 feet (count)	33
Land-Based Economies	Agricultural land in 150-foot ROW (acres)	26
Water Resources	Total wetlands in 150-foot ROW (acres)	111
	Forested wetlands in 150-foot ROW (acres)	21
Vegetation	Forested landcover in 150-foot ROW (acres)	208
Wildlife	Shallow Wildlife Lake in 150-foot ROW (acres)	6
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	115
	Native Plant Communities in 150-foot ROW (acres)	18
	Lake of Biological Significance in 150-foot ROW (acres)	2
	Federal- or state-protected species documented in 150-foot ROW (count)	1
ROW Sharing and Paralleling	Transmission line (miles, percent)	8.8 (50)
	Roadway (miles, percent)	0 (0)
	Field, parcel, or section lines (miles, percent)	8.5 (48)
	Total ROW sharing and paralleling (miles, percent)	15.4 (87)
Estimated Cost	Total estimated cost (2022 dollars in millions)	$90.4

6.3.1.1 Human Settlements

As discussed in Chapter 5.3, potential human settlement are assessed by looking at several evaluative human settlement elements: aesthetics, displacement, noise, property values, zoning and land-use compatibility, electronic interference, and cultural values. Proximity to homes, schools, and other human settlement features and the extent of ROW sharing with existing infrastructure are the primary potential human settlement impact indicators. Human settlement impacts are minimized by routes located away from homes and share a ROW with existing infrastructure.

For some of the human settlement elements in the Cole Lake-Riverton region, project impacts are anticipated to be minimal. For the Cole Lake-Riverton region, aesthetics and displacement are the only human settlement elements for which impacts are anticipated to be non-minimal.

6.3.1.1.1 Aesthetics

Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes (Chapter 5.3.1). Determining the relative scenic value or visual importance in any given area depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Project aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure ROW. The proximity of residences is shown in Table 6-46. More than three quarters of the applicants' proposed route in the Cole Lake-Riverton region would parallel an existing transmission line ROW, as shown in Table 6-47.

The proposed Cuyuna Series Compensation Station has one residence within its siting area, and one residence immediately adjacent to the eastern border of the siting area (Map Book 5A). There are a number of residences to the south of the southern boundary, and several of them have a buffer of trees between the siting area and the compensation station. The siting area is located within a region containing several existing transmission lines, so project-related aesthetic impacts are expected to be limited.

Table 6-46 Cole Lake-Riverton Region Proximity of Residences to Applicants' Route

Residences, Distance from Anticipated Alignment	Applicants' Proposed Route
Residences within 0-75 feet	1
Residences within 75-250 feet	2
Residences within 250-500 feet	13
Residences within 500-1,000 feet	33
Total Residences within 1,000 feet	49

Table 6-47 Cole Lake-Riverton Region ROW Sharing and Paralleling of Applicants' Route

Infrastructure	Applicants' Proposed Route miles (percent)
Follows Existing Railroad	0 (0)
Follows Existing Roads	0 (0)
Follows Existing Transmission Line	8.8 (50)
Total – Follows Transmission Line, Road, or Railroad	8.8 (50)
Follows Field, Parcel, or Section Lines	8.5 (48)
Total – ROW Paralleling and Sharing	15.4 (87)
Total Length of Route Alternative	17.7

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line, and therefore, the sum may be greater than 100 percent.

6.3.1.1.2 Displacement

Residences or other buildings are typically not allowed within the ROW of a transmission line for electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no churches, childcare centers, or schools located within the 150-foot ROW for the applicants' proposed route alternative. However, there is one permanent residence and one non-residential building (storage shed, agricultural outbuildings, etc.) located within the 150-foot ROW of the applicants' proposed alternative.

The one residential building located within the 150-foot ROW of the applicants' proposed route could be displaced because of the project; similarly, the non-residential building may or may not be displaced. Though buildings are generally not allowed with the transmission line ROW, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., animal production). For each of the buildings noted here, the applicants would need to conduct a site-specific analysis to determine if the building would require displacement.

There are no churches, childcare centers, or schools located in the siting are for the applicants' proposed Cuyuna Series Compensation Station. There is one permanent residence and one non-residential building (storage shed, agricultural outbuildings, etc.) located within the siting area that could be displaced because of the project. They are in the southwestern corner of the siting area. The applicants would need to conduct a site-specific analysis, as these buildings may not need to be displaced because of the project.

6.3.1.1.3 Socioeconomics and Environmental Justice

Socioeconomic factors provide an indication of how economic activity affects and is shaped by social processes. Socioeconomic measures indicate how societies progress, stagnate, or regress because of the actions and interactions at the local, regional, or global economic scale. Transmission line projects can contribute to growth and progress at the local level over time, but generally do not have a significant long-term socioeconomic impact.

The project would improve the socioeconomics of the region through the creation of jobs, generation of tax revenue, and providing more reliable electrical service to the surrounding communities. The applicants' proposed route intersects with the city limits of Trommald and Riverton, both of which have been identified as communities with EJCs. The proposed Cuyuna Series Compensation Station will be located in Irondale Township and is part of the same EJC as the city of Trommald. No adverse or permanent impacts to the identified communities with EJCs are anticipated. While the applicants' proposed route does intersect communities with EJCs, these communities are not anticipated to experience disproportionately adverse impacts as a result of the project.

6.3.1.2 Land-Based Economies

As discussed in Chapter 5.8, impacts on land-based economies are assessed by considering four elements: agriculture, forestry, mining, and recreation and tourism. For some of the land-based economy elements in the Cole Lake-Riverton region, project impacts are anticipated to be minimal. There are no active mining operations within applicants' proposed route ROW in this region. Thus, potential impacts to agriculture, forestry, and recreation and tourism are the only elements of land-based economies for which impacts are anticipated to be non-minimal.

Project impacts to agriculture within the Cole Lake-Riverton region were evaluated through land use and soil types within the 150-foot ROW of the applicants proposed route and proposed alternatives (Chapter 5.7.1). Map Book 5C provides an overview of land cover types crossed by the applicants' proposed route. Approximately 26 acres of the applicants' proposed route ROW (8 percent of the 150-foot ROW) consists of agricultural land comprised of cultivated crops and hay/pasture lands within this region (Table 6-45).

According to the MDA Organic Farm Directory, no registered organic producers are within the ROW (reference (105)). No apiaries are located within the ROW according to the Minnesota Apiary Registry (reference (106)). In addition, no agricultural lands are enrolled in the USDA FSA CREP within the 150-foot ROW (reference (107)).

Potential construction and operation-related impacts to agricultural land are summarized in Chapter 5.8.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to agricultural land, as described in Chapter 5.8.1.1.

6.3.1.2.1 Forestry

Forestry impacts within the Cole Lake-Riverton region were assessed through an evaluation of designated forestry resources within the 150-foot ROW (Chapter 5.8.2). Approximately 208 acres of the applicants' proposed route ROW consist of forested land (reference (108)) comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C).

As shown in Table 6-4, the designated forestry resources consist of DNR state forests and Minnesota School Trust Land.

Table 6-48 Designated Forestry Resources within the 150-foot ROW of the Applicants' Proposed Route

Forestry Resources	Applicants' Proposed Route
Acres of DNR state forest within 150-foot ROW	82
Acres of Minnesota School Trust Land[1] within 150-foot ROW	24
Acres of Forests for the Future[2] land within 150-foot ROW	0

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)

1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

2 Minnesota's Forests for the Future Program is a conservation program administered by the DNR to encourage the protection of privately-owned forest lands through conservation easements or land purchases (reference (5)).

There are moderate potential impacts to designated forestry resources within the applicants' proposed route ROW. Vegetation clearing would include permanent tree removal from the ROW before construction.

These physical forestry resource impacts may result in negative financial impacts to state-owned forest lands and privately-owned commercial forest lands. As noted in Chapter 5.8.2.1, impacts to forestry resources could be mitigated by prudent routing and siting of staging areas. Where these areas cannot be avoided, commercial foresters and private landowners would be compensated for clearing-related timber loss in the ROW.

6.3.1.2.2 Recreation and Tourism

Recreation and tourism activities within the Cole Lake-Riverton region include outdoor recreational activities and camping opportunities on state managed lands, trails, and scenic byways. Since transmission line construction and operation generally has minimal permanent and temporary impacts to trails, recreation, and tourism, project impacts in this region are expected to be minimal where it parallels existing ROWs.

The applicants' proposed route crosses a scenic byway, Crow Wing State Forest, a hiking trail, an off-road vehicle-use trail, a snowmobile trail, and a water trail (Map Book 5E). Most of the trail crossings in the applicants' proposed route occur in areas where the route parallels existing transmission lines, thus, permanent impacts to resources in this area would be minimal. Most of the applicants' proposed route that cross through Crow Wing State Forest parallels existing transmission lines, with the exception of a portion of the route north of River Road. This portion of the route could create permanent impacts including an increase in noise and a reduction in aesthetic value. Temporary impacts because of the applicants' proposed route could include construction-related trail closings and temporary interruptions in recreational opportunities within the Crow Wing State Forest (Chapter 5.8.4.1). Although temporary impacts in this region would occur because of this route, they are expected to have a minimal impact on recreation.

6.3.1.2.3 Cuyuna Series Compensation Station

For the Cuyuna Series Compensation Station Siting Area, recreation and tourism are the only land-based economy elements with non-minimal impacts. There are no agricultural lands, forestry resources, or active mines within the siting area. As a result, there are no potential impacts to agriculture, forestry, or mining within the Cuyuna Series Compensation Station Siting Area.

The Cuyuna Series Compensation Station siting area features an off-road vehicle-use trail that traverses its western edge (Photo 6-1). Construction in the siting area would result in permanent impacts to recreation and tourism opportunities. Permanent siting area impacts would include trail fragmentation and possible trail relocation, an increase in noise and a reduction in aesthetic value (Chapter 5.7.4.1).

Photo 6-1 View of Off-Road Vehicle-Use Trail in the Cuyuna Series Compensation Station Siting Area

6.3.1.3 Archaeological and Historic Resources

Archaeological and historic architectural resource impacts are assessed by determining the presence of these resources within the project route width (Chapter 5.1.1). Map Book 5F provides an overview of archaeological and historic architectural resources in the Cole Lake-Riverton region.

There are five historic architectural resources and one archaeological site within the route width (1,000 ft) of the applicants' proposed route in the Cole Lake-Riverton region (Table 6-49). As discussed in Chapter 5.9.3, impacts to these resources would consist of changes in the resource's setting due to a new transmission line placement in proximity to the resource.

Table 6-49 Cultural Resources within the Route Width of the Applicants' Proposed Route, Cole Lake-Riverton Region

Resource Number	Resource Type	NRHP Eligibility
21CWy	Rabbit River Mission (Precontact artifact scatter)	Not evaluated
CW-IRN-00001	Farmstead	Not evaluated
CW-XXX-00001	Cuyuna Iron Range Historic Mining Landscape District	Eligible
XX-ROD-00153	Trunk Highway 210	Not Eligible
XX-RRD-NPR007	RR ROW between LS&M/StP&D main line at Carlton, and ND State Line at Moorhead (Duplicate Recordation)	Eligible
XX-RRD-NPR021	RR ROW between LS&M/StP&D main line at Carlton, and ND State Line at Moorhead (Duplicate Recordation)	Eligible

As XX-ROD-00153 is not eligible for the NRHP and, therefore, cannot be adversely affected by the project, it is not discussed further. Of the remaining cultural resources located within the applicants' proposed route width, historic architectural resources XX-RRD-NPR007 / XX-RRD-NPR021, CW-XXX-00001, and CW-IRN-00001 are susceptible to impacts. The route applicants' proposed route width would cross each of these resources in a brand-new location, which may alter that resource's setting, feeling, appearance, and/or association. Archaeological site 21Cwy may also be impacted by the project if it is present within the ground disturbance footprint. Ground-disturbing activities and the changes in setting resulting from the project have the potential to impact these resources if they cannot be avoided.

6.3.1.3.1 Cuyuna Series Compensation Station

Two documented cultural resources are located within the Cuyuna Series Compensation Station Siting Area. These include archaeological sites 21CWx and 21CWy (Table 6-50). Ground-disturbing activities resulting from the Cuyuna Series Compensation Station construction have the potential to impact these resources if they cannot be avoided by the project.

Table 6-50 Cultural Resources within the Cuyuna Series Compensation Station Siting Area

Resource Number	Resource Type	NRHP Eligibility
21Cwx	Precontact Earthwork	Not evaluated
21CWy	Rabbit River Mission (Precontact artifact scatter)	Not evaluated

6.3.1.4 Natural Environment

6.3.1.4.1 Water Resources

Potential project impacts on water resources are examined by evaluating locations and conditions of watercourses and waterbodies, floodplains, wetlands, and groundwater. Project proximity to water bodies, watercourses, floodplains, wetlands, and groundwater wells and the necessity of crossing these features are the primary indicators of potential water resource impacts. Impacts to two elements of water resources, floodplains and groundwater, are anticipated to be minimal.

There are two water resource features where project impacts could be non-minimal: watercourses and waterbodies, and wetlands. This discussion focuses on those water resource features within the ROW or are crossed by the routing alternatives. The number of surface water and wetland crossings is an important consideration when evaluating routes, even though there may be no direct impacts associated with these crossings. The crossings are important because of the potential indirect impacts associated with them (i.e., clearing of vegetation, soil movement). The amount of forested wetland within the ROW is also an important consideration when evaluating routes. Since large-growing woody vegetation would be cleared from the ROW, forested wetlands would be converted to other wetland types, resulting in permanent impacts. Map Book 5G shows the water resources along applicants proposed route.

6.3.1.4.1.1 Watercourses and Waterbodies

According to the NHD, the applicants' proposed route would cross eight watercourses in the Cole Lake-Riverton region. Six of these watercourses are classified as public waters, two of which are also classified as impaired streams, the Mississippi River and an unnamed creek. The applicants proposed route would also cross three NHD waterbodies and two public water basins.

Within the Cuyuna Series Compensation Station siting area there is one stream, the Rabbit River, and one unnamed public water basin. The Rabbit River is located along the southeast corner of the siting area and is also classified as a public water. There are no impaired streams or lakes within the Cuyuna Series Compensation Station siting area.

It is anticipated that these watercourse and waterbodies are of such size that they could be spanned and avoided during the compensation station siting process. Since no structure placement is anticipated within waterbodies and watercourses, no direct impacts to these resources are expected. Indirect impacts to these resources, such as increases in turbidity, could be minimized by using BMPs and by choosing a route alternative that has relatively fewer crossings of waterbodies and watercourses.

6.3.1.4.1.2 Wetlands

The applicants proposed route cross approximately 111 acres of NWI wetlands in the Cole Lake-Riverton region. The NWI wetlands consist mainly of shrub wetlands (57 acres), emergent wetlands (22 acres), and forested wetlands (21 acres). The remaining area consists of 11 acres of ponded, riverine, and lacustrine wetlands. There is one PWI wetland in the ROW of the applicants' proposed route in the Cole Lake-Riverton region.

The Cuyuna Series Compensation Station siting area contains approximately 38 acres of NWI wetlands. The NWI wetlands consist mainly of scrub shrub wetlands (14 acres), forested wetlands (11 acres), riverine wetlands (9 acres). The remaining area consists of 4 acres of emergent wetland and ponded wetland. The Cuyuna Series Compensation Station would be sited to avoid disturbance to wetlands.

Although wetlands would be spanned to the extent possible, the applicants' proposed route would cross nine wetland areas wider than 1,000 feet, which may require one or more structures to be placed in a wetland. Structures placement in a wetland would result in permanent impacts. Permanent impacts could also occur if wetlands in the ROW are forested. Forested wetlands would be converted to non-forested wetland types, as trees are not allowed within transmission line rights-of-way. Impacts associated with converting forested wetlands to non-forested wetland types could be minimized by selecting a route alternative with fewer forested wetlands in the ROW.

6.3.1.4.2 Vegetation

Vegetation impacts were evaluated by examining vegetative landcover within the 150-foot ROW (Chapter 5.10.4.1). Map Book 5C provides an overview of vegetative cover in the Cole Lake-Riverton region, and Table 6-51Table 6-5 summarizes the assessment region landcover types within the applicants' proposed route ROW and Cuyuna Series Compensation Station siting area. The dominant vegetative landcover in the applicants' proposed route in this region consists of forest, which represents approximately 65 percent of the ROW. Similarly, forest is the dominant vegetative landcover type in the Cuyuna Series Compensation Station siting area, representing approximately 84 percent of the landcover. Forest types include forested wetlands and upland deciduous, coniferous, and mixed forest communities.

Table 6-51 Landcover Types in the 150-foot ROW of the Applicants' Proposed Route in the Cole Lake-Riverton Region and Cuyuna Series Compensation Station Siting Area

Landcover Type	Acres in ROW	Percent of ROW[1]	Acres in Siting Area	Percent of Siting Area[1]
Forested (upland and wetland)	208	65	525	84
Herbaceous (upland and wetland)	67	21	64	10
Agricultural (cultivated crops and hay/pasture)	26	8	11	2
Shrub/Scrub	9	3	11	2
Developed (low-high intensity; open space)	8	3	13	2
Open Water	4	1	0	0
Barren Land	0	0	1	<1

Source: reference (110)
1 Totals may not sum to 100 percent due to rounding.

As discussed in Chapter 5.10.4.1, the applicants would clear forested vegetation from the ROW during construction, and then maintained with low-growing vegetation to minimize potential transmission line interference. The applicants' proposed route does not parallel any existing road ROW and would parallel an existing transmission line ROW for approximately 50 percent of its length in the Cole Lake-Riverton region. As such, the applicants' proposed route would require the construction of transmission line ROW where existing ROW is not present, resulting in the fragmentation of forested areas. Transmission line ROWs traverse the Cuyuna Series Compensation Station siting area; however, areas of unfragmented forest are also present within the siting area. Forest area fragmentation could occur from Cuyuna Series Compensation Station construction, depending on where it is built within the siting area.

Potential construction and operation-related impacts to vegetation are summarized in Chapter 5.10.4.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Chapter 5.10.4.1. Potential impacts to agricultural vegetation and wetlands are discussed Chapters 5.8.1 and 5.10.1.3, respectively.

6.3.1.4.3 Wildlife

Wildlife impacts are primarily assessed by evaluating the presence of wildlife habitat, including areas that are preserved or managed for that purpose, within the ROW (Chapter 5.10.5.1 and 5.10.5.2). The applicants' proposed route does not parallel any existing road ROW and would parallel an existing transmission line ROW for approximately 50 percent of its length in the Cole Lake-Riverton region. Transmission line ROWs traverse the Cuyuna Series Compensation Station siting area; however, unfragmented forest habitat areas exist. The construction of a new transmission line ROW, and the presence of the Cuyuna Series Compensation Station within the siting area, would result in wildlife habitat fragmentation. In addition, construction of a new transmission line ROW could increase the potential for impacts to avian species. However, as discussed in Chapter 5.10.5.2, avian impacts can be minimized through use of bird flight diverters.

The applicants' proposed route would traverse the edge of Mud Lake, a DNR-identified shallow wildlife lake (Map Book 5H). However, potential wildlife impacts associated with the shallow lake would be minimized because the applicants' proposed route would parallel an existing transmission line ROW in this area. The applicants' proposed route ROW would not traverse any other areas that are preserved or managed for wildlife habitat.

Potential construction and operation-related wildlife impacts are summarized in Chapter 5.10.5. Several measures could be implemented to avoid, minimize, or mitigate wildlife impacts, as described in Chapter 5.10.5.

6.3.1.5 Rare and Unique Natural Resources

Impacts to rare and unique natural resources are primarily assessed by evaluating the presence of federal- and state-protected species within a 1-mile radius of the anticipated alignments and the presence of sensitive ecological resources within the 150-foot ROW (Chapter 5.10). Map Book 5I provides an overview of sensitive ecological resources within the Cole Lake-Riverton region. Please note that in order to protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

6.3.1.5.1 Protected Species

According to the NHIS database, no federally protected species have been documented within 1 mile of the applicants' proposed route in the Cole Lake-Riverton region. As summarized in Table 6-52, seven state protected species have been documented within 1 mile of the applicants' proposed route in this region. In addition to the species listed in Table 6-52, several state special concern species have been documented within 1 mile of the applicants' proposed route in this region (Appendix N).

Table 6-52 Federal- or State-Protected Species Documented in the Natural Heritage Information System Database – Applicants' Proposed Route in the Cole Lake-Riverton Region

Scientific Name	Common Name	Type	State Status	Documented Records within ROW, Route Width, or 1 Mile
Botrychium ascendens	Upswept moonwort	Vascular plant	Endangered	1 Mile
Botrychium lineare	Slender moonwort	Vascular plant	Endangered	1 Mile
Botrychium spathulatum	Spatulate moonwort	Vascular plant	Endangered	1 Mile
Juglans cinerea	Butternut	Vascular plant	Endangered	1 Mile
Utricularia purpurea	Purple-flowered bladderwort	Vascular plant	Endangered	1 Mile
Botrychium oneidense	Blunt-lobed grapefern	Vascular plant	Threatened	1 Mile
Emydoidea blandingii	Blanding's turtle	Turtle	Threatened	ROW

As noted in Table 6-52, one state-protected species, the Blanding's turtle, has been documented within the applicants' proposed route ROW; this species was also documented in the northwest corner of the Cuyuna Series Compensation Station siting area. Formal protected species surveys have not been conducted for the project; as such, it is possible that these species or additional protected species could be present where suitable habitat is available within the ROW or the Cuyuna Series Compensation Station siting area. Potential protected species impacts could occur should they be present within or near the ROW. While more mobile species would leave the area for nearby comparable habitats, non-mobile organisms, such as vascular plants or nesting birds, could be directly impacted.

Potential construction and operation-related protected species impacts are summarized in Chapter 5.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species, as described in Chapter 5.11.1.3. In addition, the applicants may be required to conduct field surveys for protected species in coordination with the USFWS and/or DNR prior to construction.

6.3.1.5.2 Sensitive Ecological Resources

The applicants' proposed route ROW in the Cole Lake-Riverton region would traverse several sensitive ecological resources, including SBS, native plant communities, and a Lake of Biodiversity Significance (Table 6-53; Map Book 5I). As shown on Map Book 5I, the applicants' proposed route ROW would parallel an existing transmission line ROW while traversing the edge of Mud Lake, a DNR Lake of Biodiversity Significance; as noted above, this lake is also a DNR-identified shallow wildlife lake. The applicants' proposed route ROW would also parallel an existing transmission line ROW through the SBS ranked moderate but would require a new transmission line ROW through the SBS ranked high and the native plant communities located within this SBS.

Impacts to protected species potentially associated with the Lake of Biological Significance and SBS ranked moderate would be minimized by paralleling existing transmission line ROWs. However, as shown on Map Book 5I, almost the entire Cuyuna Series Compensation Station siting area is located within the SBS ranked moderate. Creation of new ROWs through sensitive ecological resources could impact protected species associated with habitats within them. This could occur as a result of habitat conversion or fragmentation or due to the placement of structures and other infrastructure within them.

Table 6-53 Sensitive Ecological Resources in the ROW of the Applicants' Proposed Route – Cole Lake-Riverton Region

Sensitive Ecological Resource	Area within ROW of Applicants' Proposed Route
Sites of Biodiversity Significance	115 total acres; 22 acres ranked high; 93 acres ranked moderate
Native Plant Communities	18 acres - conservation status S3-S5
Lake of Biological Significance	2 acres - ranked outstanding

Potential construction and operation-related impacts to sensitive ecological resources are summarized in Chapter 5.11.2.1 and 5.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to sensitive ecological resources, as described in Chapter 5.11.2.1. In addition, the applicants may be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species within sensitive ecological resources that cannot be avoided.

6.3.2 Route Alternative D3, Alignment Alternatives AA4 and AA6 - Cole Lake-Riverton Region

Route alternative D3 and alignment alternatives AA4 and AA6 provide different options to the applicants' proposed route in the northeastern part of the Cole Lake-Riverton region. Route alternative D3 is shifted east and south of the applicants' proposed route in an effort to reduce potential adverse aesthetic, land use, and property value impacts. Route alternative D3 does not include any ROW sharing, paralleling, or double-circuiting.

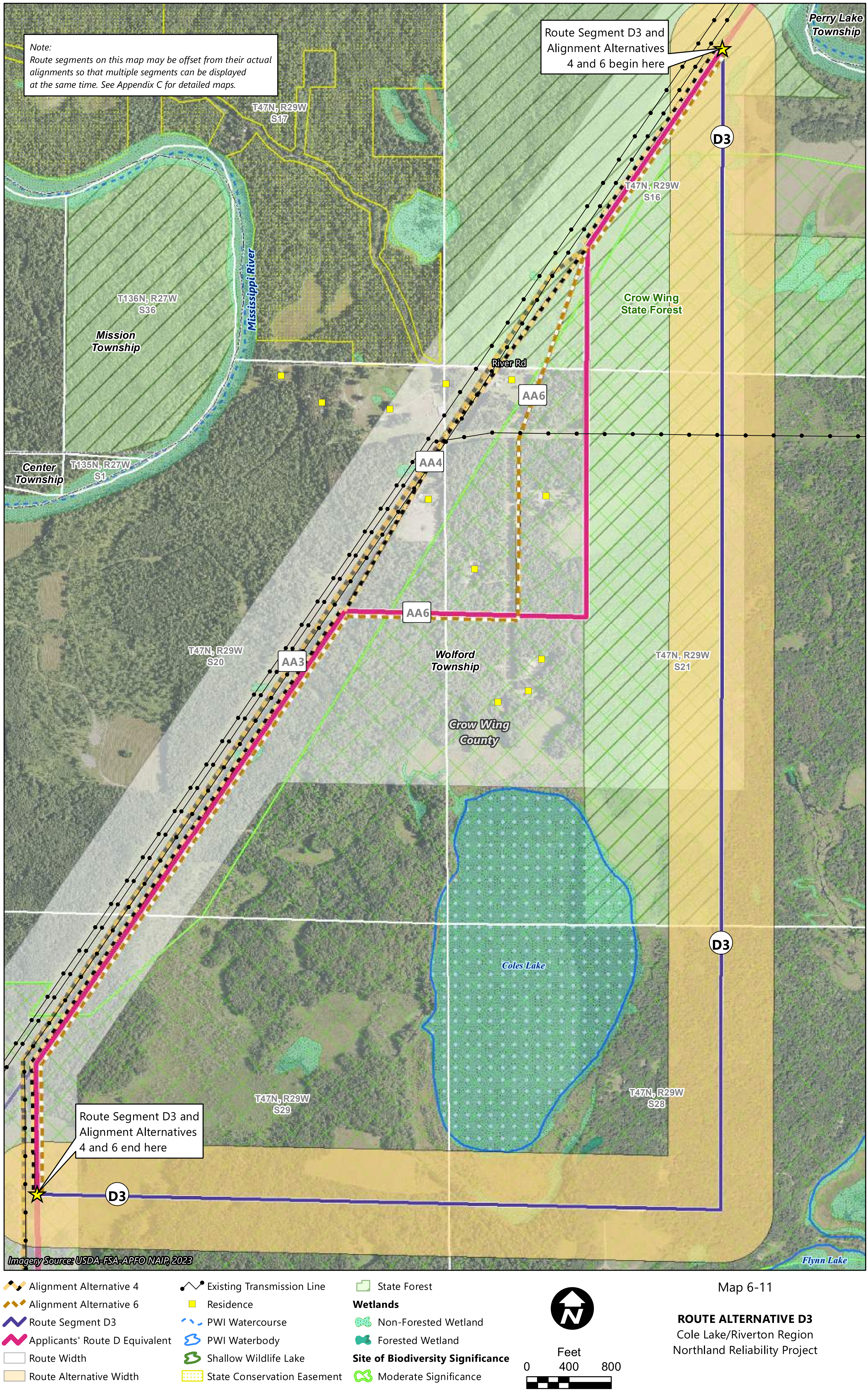
Alignment alternative AA4 is shifted west of the applicants' alignment and would entail double-circuiting two existing transmission lines, which would then allow placement of alignment alternative AA4 within existing transmission line ROW. Alignment alternative AA6 is shifted west of the applicants' alignment to reduce impacts to natural resources. Alignment alternative AA6 does not include any ROW sharing or paralleling, or double-circuiting. Potential impacts of the alternatives and the applicants' equivalent are summarized in Table 6-54 and shown on Map 6-11 and Map 6-12.

Table 6-54 Human and Environmental Impacts – Route Alternatives D3, AA4, and AA6, Cole Lake-Riverton Region

Resource	Element	Route Alternative D3	Alignment Alternative AA4	Alignment Alternative AA6	Applicants' Equivalent
Length (miles)		3.3	2.4	2.6	2.8
Human Settlement	Residences within 0-75 feet (count)	0	0	0	0
	Residences within 75-250 feet (count)	0	2	1	0
	Residences within 250-500 feet (count)	0	1	3	3
	Residences within 500–1,000 feet (count)	0	2	4	3
Land-Based Economies	Agricultural land in 150-ft ROW	<1	7	2	2
Water Resources	Total wetlands in 150-foot ROW (acres)	21	3	3	6
	Forested wetlands in 150-ft ROW (acres)	6	0	0	<1
Vegetation	Forested landcover in 150-foot ROW (acres)	49	28[1]	36	39
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	57	6	19	23
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	0 (0)	2.4 (100)	1.7 (63)	1.7 (60)
	Roadway (miles, percent)	0 (0)	0 (0)	0.4 (17)	0 (0)
	Field, parcel, or section lines (miles, percent)	3.3 (100)	0.2 (8)	0.7 (25)	0.9 (31)
	Total ROW sharing and paralleling (miles, percent)	3.3 (100)	2.4 (100)	2.1 (80)	2.3 (84)
Reliability	Crossing of existing transmission lines (count)	0	0	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$18.4	$55.6-$66.5[2]	$14.7	$15.3

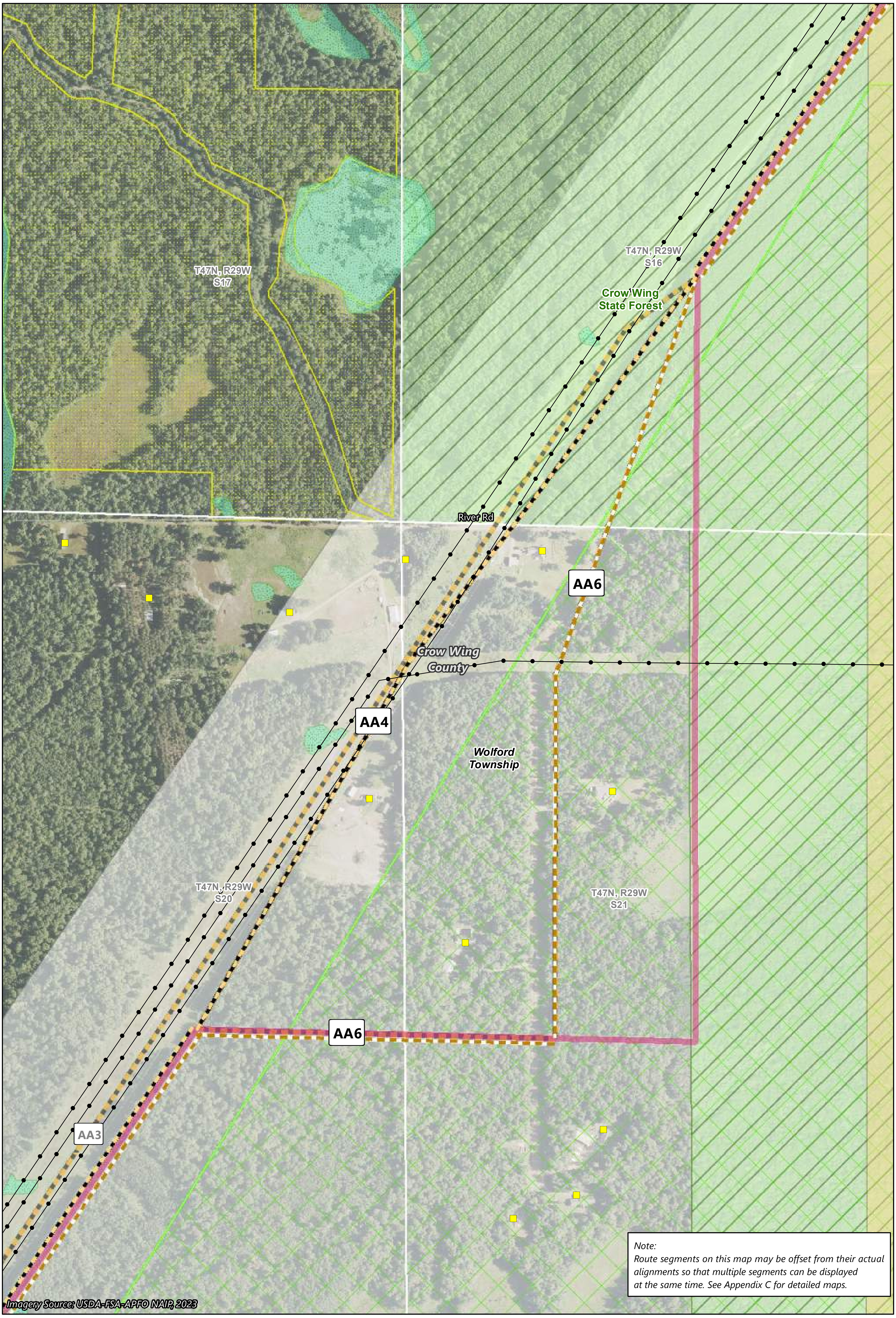
1 The NLCD indicates forested vegetation is in the ROW; however, the ROW is an existing transmission line ROW that has been cleared and is routinely maintained.

2 Cost is driven by the need to reconfigure three existing transmission lines with this alignment alternative (base cost of $13.5 million)



Map 6-11

ROUTE ALTERNATIVE D3
Cole Lake/Riverton Region
Northland Reliability Project



Alignment Alternative 4
Alignment Alternative 6
Route Width
Route Alternative Width
Existing Transmission Line

Residence
State Conservation Easement
State Forest

Wetlands

Non-Forested Wetland

Site of Biodiversity Significance

Moderate Significance

N

Feet
0 200 400

Map 6-12

ALIGNMENT ALTERNATIVES AA4 AND AA6

Cole Lake/Riverton Region

Northland Reliability Project

6.3.2.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements, discussed in Chapter 5.3. For some of the human settlement evaluation elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed exclusively in Chapter 5.3, include cultural values, displacement, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.3.2.1.1 Aesthetics

Aesthetic impacts differ among the routing alternatives. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternatives D3, AA4, AA6, and the applicants' equivalent are shown in Table 6-55, while ROW paralleling and sharing are shown in Table 6-56.

No residences are located within 1,000 feet of route alternative D3. Alignment alternative AA4 and the applicants' equivalent have a similar number of residences within 1,000 feet (5 and 6, respectively). Alignment alternative AA6 has 8 residences within 1,000 feet.

Route alternative D3 follows no existing infrastructure ROW, though it would follow field, parcel, and/or section lines for its entirety. Approximately 79 percent of route alternative AA6 would follow existing infrastructure ROW, compared to 60 percent of the applicants' equivalent. Alignment alternative AA4 would entail double-circuiting two existing transmission lines, which would then allow placement of alignment alternative AA4 within existing transmission line ROW, minimizing aesthetic impacts to a greater extent than the other routing alternatives.

Table 6-55 Cole Lake-Riverton Region Proximity of Residences to Route Alternative D3, AA4, and AA6

Residences, Distance from Anticipated Alignment	Route Alternative D3	Alignment Alternative AA4	Alignment Alternative AA6	Applicants' Equivalent
Residences within 0-75 feet	0	0	0	0
Residences within 75-250 feet	0	2	1	0
Residences within 250-500 feet	0	1	3	3
Residences within 500-1,000 feet	0	2	4	3
Total Residences within 1,000 feet	0	5	8	6

Table 6-56 Cole Lake-Riverton Region ROW Sharing and Paralleling of Route Alternative D3, AA4 and AA6

Infrastructure	Route Alternative D3 miles (percent)	Alignment Alternative AA4 miles (percent)	Alignment Alternative AA6 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)	0.4 (17)	0 (0)
Follows Existing Transmission Line	0 (0)	2.4 (100)	1.7 (63)	1.7 (60)
Total – Follows Transmission Line, Road, or Railroad	0 (0)	2.4 (100)	2.1 (79)	1.7 (60)
Follows Field, Parcel, or Section Lines	3.3 (100)	0.2 (8)	0.7 (25)	0.9 (31)
Total – ROW Paralleling and Sharing	3.3 (100)	2.4 (100)	2.1 (80)	2.3 (84)
Total Length of Route Alternative	3.3	2.4	2.6	2.8

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.3.2.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no active mining operations within the ROW of either the route alternatives or the applicants' equivalent. Therefore, potential project impacts to mining would be minimal and independent of the route selected.

6.3.2.2.1 Agriculture

Agricultural land impacts differ between the 150-foot ROW of route alternative D3, alignment alternatives AA4 and AA6, and the applicants' equivalent. Alignment alternative AA4 would impact the least amount of agricultural land as it follows an existing transmission line ROW; the agricultural land in the ROW has already been impacted. Route alternative D3 would impact the least amount of new agricultural land within the ROW, affecting just 1 acre. According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of the route alternatives or the applicants' equivalent.

The entirety of alignment alternative AA4 parallels an existing transmission line where the agricultural areas have already been impacted. Nearly 80 percent of alignment alternative AA6 and just over 60 percent of the applicants' equivalent would share ROW with existing infrastructure; however, none of route alternative D3 parallel existing infrastructure.

6.3.2.2.2 Forestry

Forestry impacts within the Cole Lake-Riverton region were assessed by evaluating the designated forestry resources within the 150-foot ROW (Chapter 5.8.2). Forested land within each of the proposed route or alignment rights-of-way includes 49 acres of the route alternative D3 ROW; 28 acres of the alignment alternative AA4 ROW; 36 acres of the alignment alternative AA6 ROW; and 39 acres of the applicants’ equivalent ROW (reference (108)). However, it is important to note that while the NLCD indicates forested vegetation is in the alignment alternative AA4 ROW, this ROW consists of an existing transmission line ROW that has been cleared and is routinely maintained. The forested land in this region is comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands (Map Book 5C). Route alternative D3, alignment alternatives AA4 and AA6, and the applicants’ equivalent all cross through Crow Wing State Forest.

As shown in Table 6-57, the designated forestry resources within the route alternative rights-of-way consist of DNR state forest land and Minnesota School Trust Land. There is no Forests for the Future land within the ROW of any of the route alternatives.

Table 6-57 Designated Forestry Resources within the 150-foot ROW of Route Alternative D3 and Alignment Alternatives AA4, and AA6 Route

	Route Alternative D3	Alignment Alternative AA4	Alignment Alternative AA6	Applicants' Equivalent
Acres of DNR state forest within 150-foot ROW	61	45	48	50
Acres of Minnesota School Trust Land[1] within 150-foot ROW	18	13	12	18

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)
1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

Alignment alternative AA4 would have significantly fewer impacts on forestry resources than other routing alternatives. This is because AA4 follows an existing transmission line ROW that has been cleared of trees and is maintained in this condition.

6.3.2.2.3 Recreation and Tourism

Recreation and tourism activities within the Cole Lake-Riverton region include outdoor recreational activities and camping opportunities on state managed lands, various trails, and scenic byways. Since transmission line construction and operation generally has minimal permanent and temporary impacts to trails, recreation, and tourism, project impacts in this region are expected to be minimal where it parallels existing ROWs.

The route alternatives and applicants’ equivalent route traverses Crow Wing State Forest and have minimal trail crossings (Map Book 5E). Trail crossings among the route alternatives occur in areas where the alternatives parallel existing transmission lines; thus, permanent impacts to resources in this area would be minimal. Both alignment alternative AA4 and AA6 parallel existing transmission lines, reducing introduction of permanent impacts to recreational opportunities in Crow Wing State Forest. By comparison, route alternative D4 does not parallel an existing transmission line where it crosses Crow Wing State Forest, which could result in new permanent impacts including an increase in noise and a reduction in aesthetic value. The applicants’ equivalent in this area also has route portions which do not parallel an existing transmission line, which could result in new permanent impacts, but would be less impactful than route alternative D4 due to less state forest land crossed. Temporary impacts as a result of all route alternatives and applicants’ equivalent could include trail closings during construction and temporary interruptions in recreational opportunities within the Crow Wing State Forest (Chapter 5.8.4.1).

Although temporary impacts would occur, they are expected to have a minimal long-term impact on recreation.

6.3.2.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the route width of route alternatives D3, AA4, AA6, or the applicants' equivalent. As a result, impacts to cultural resources are anticipated to be minimal and independent of the route selected.

6.3.2.4 Natural Environment

6.3.2.4.1 Water Resources

Floodplains and groundwater impacts are anticipated to be minimal and independent of the project route selected. This route alternative comparison discussion addresses watercourses, waterbodies, and wetlands. Map 6-11 shows the water resources along route alternative D3, alternative alignments AA4 and AA6, and the applicants' equivalent.

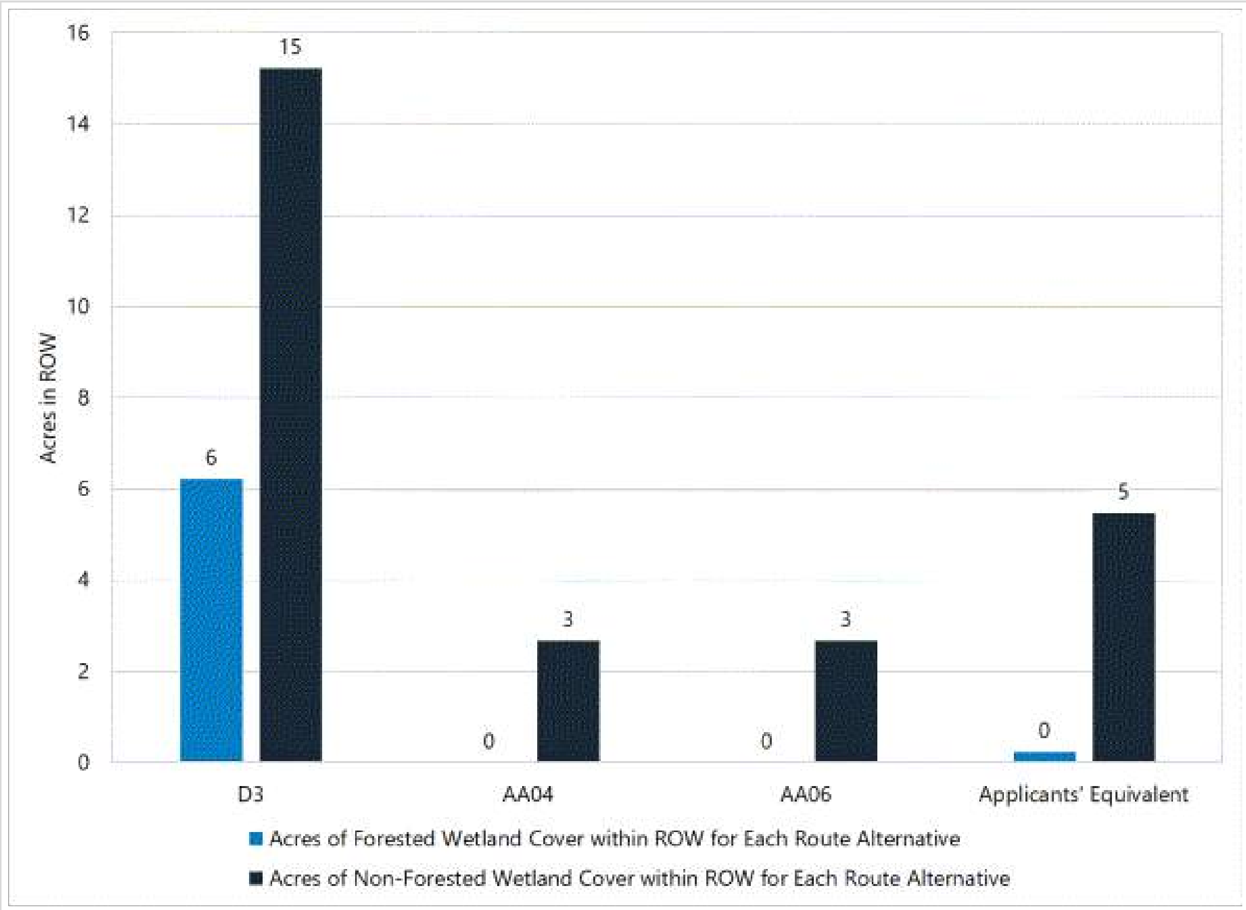
6.3.2.4.1.1 Watercourses and Waterbodies

Route alternative D3 and alignment alternatives AA4 and AA6 and the applicants' equivalent would not cross any watercourses or waterbodies. There would be no direct or indirect impacts to watercourses or waterbodies.

6.3.2.4.1.2 Wetlands

Figure 6-6 identifies the wetland acreage crossed by route alternative D3, alignment alternative AA4, alignment alternative AA6, and the applicants' equivalent. Route alternative D3 would cross more forested and non-forested wetland than alignment alternative AA4, alignment alternative AA6, and the applicants' equivalent. Route alternative D3 would also have two wetland crossings over 1,000 feet in length, which cannot be spanned. Alignment AA4, alignment alternative AA6 and the applicants' equivalent would not have any crossing over 1,000 feet.

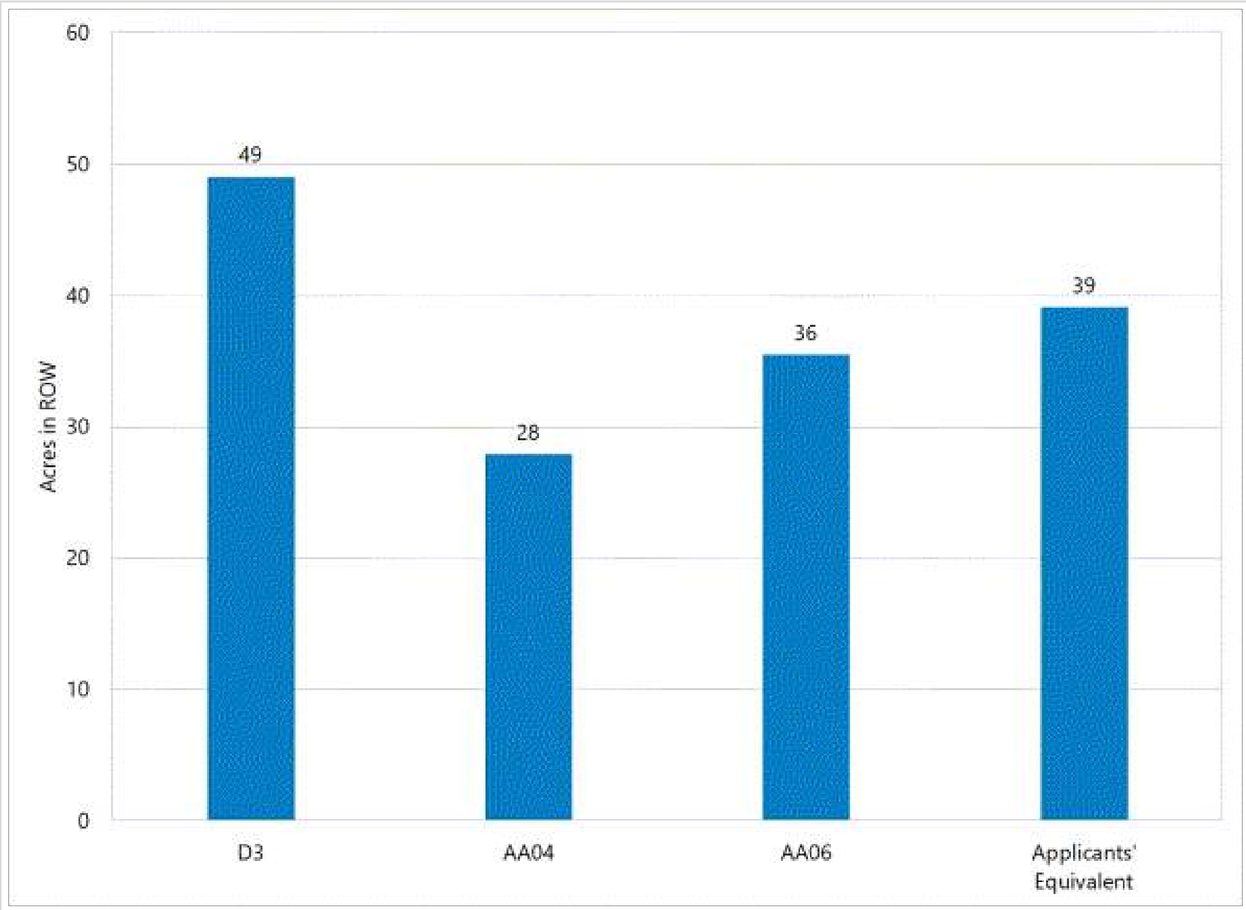
Figure 6-6 Acres of Wetlands Crossed by Route Alternative D3, Alignment Alternatives AA4 and AA6, and the Applicants' Equivalent



6.3.2.4.2 Vegetation

Forested vegetation impacts in the route alternative D3, alignment alternatives AA4 and AA6, and the applicants' equivalent rights-of-way would vary, with route alternative D3 having the most impact on forested vegetation and alignment alternative AA4 impacting the least amount of forested vegetation (Figure 6-7). Alignment alternative AA4 follows an existing transmission line ROW for its entire length, thereby minimizing impacts associated with forest fragmentation. Alignment alternative AA6 and the applicants' equivalent would minimize impacts associated with forest fragmentation by paralleling existing transmission line and/or road rights-of-way for 80 percent and 60 percent of their lengths, respectively. Route alternative D3 would result in the most forest fragmentation, as it is the longest route alternative and does not parallel an existing transmission line or road corridor for any of its length (Map Book 5C).

Figure 6-7 **Forested Vegetation in the 150-foot ROW of Route Alternative D3, Alignment Alternatives AA4 and AA6, and the Applicants' Equivalent**



6.3.2.4.3 Wildlife

Wildlife habitat impacts would occur for route alternative D3, alignment alternatives AA4 and AA6, and the applicants' equivalent; however, none of these alternatives would traverse areas that are publicly managed or preserved for wildlife. Alignment alternative AA4 would have the least amount of impact on habitat fragmentation or impacts to avian species because it follows an existing transmission line ROW for its entire length. Alignment alternative AA6 and the applicants' equivalent would minimize habitat fragmentation by paralleling existing transmission line and/or road rights-of-way for 80 and 60 percent of their lengths, respectively. Route alternative D3 would result in the most habitat fragmentation because it is the longest and does not parallel any existing rights-of-way. Route alternative D3 would have the most wildlife habitat impacts, while alignment alternative AA4 would have the least amount of wildlife habitat impacts.

6.3.2.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federally protected species have been documented within 1 mile of route alternative D3, alignment alternatives AA4 and AA6, or the applicants' equivalent. Two state protected species have been documented within 1 mile of all four route alternatives, neither of which have been documented within the ROW or route width of these alternatives (Appendix N). Two state special concern species have been documented within 1 mile of all four route alternatives (Appendix N).

The route alternative D3, alignment alternatives AA4 and AA6, and the applicants' equivalent rights-of-way would all intersect a DNR SBS ranked moderate, with the route alternative D3 ROW intersecting the most SBS acres (Table 6-58). As shown on Map 6-13, not only would route alternative D3 traverse the most SBS acres, but it would also require the construction of a new transmission line ROW through it, including transmission line structure placement. Alignment alternatives AA6 and the applicants' equivalent would also require new transmission line ROW and structure placement within the SBS, but less than route alternative D3. Alignment alternative AA4 would follow an existing transmission line ROW through the SBS, thereby minimizing new impacts to the SBS.

6.3.2.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these routing alternatives.

6.3.2.7 Cost

Costs of the routing alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-54). The costs of all routing alternatives, except AA4 are similar. Route alternative D is relatively more expensive due to its length. Alignment alternative AA4, is approximately three to four times more expensive than other routing alternatives due to the double-circuiting of existing lines to make room for along existing transmission line ROW.

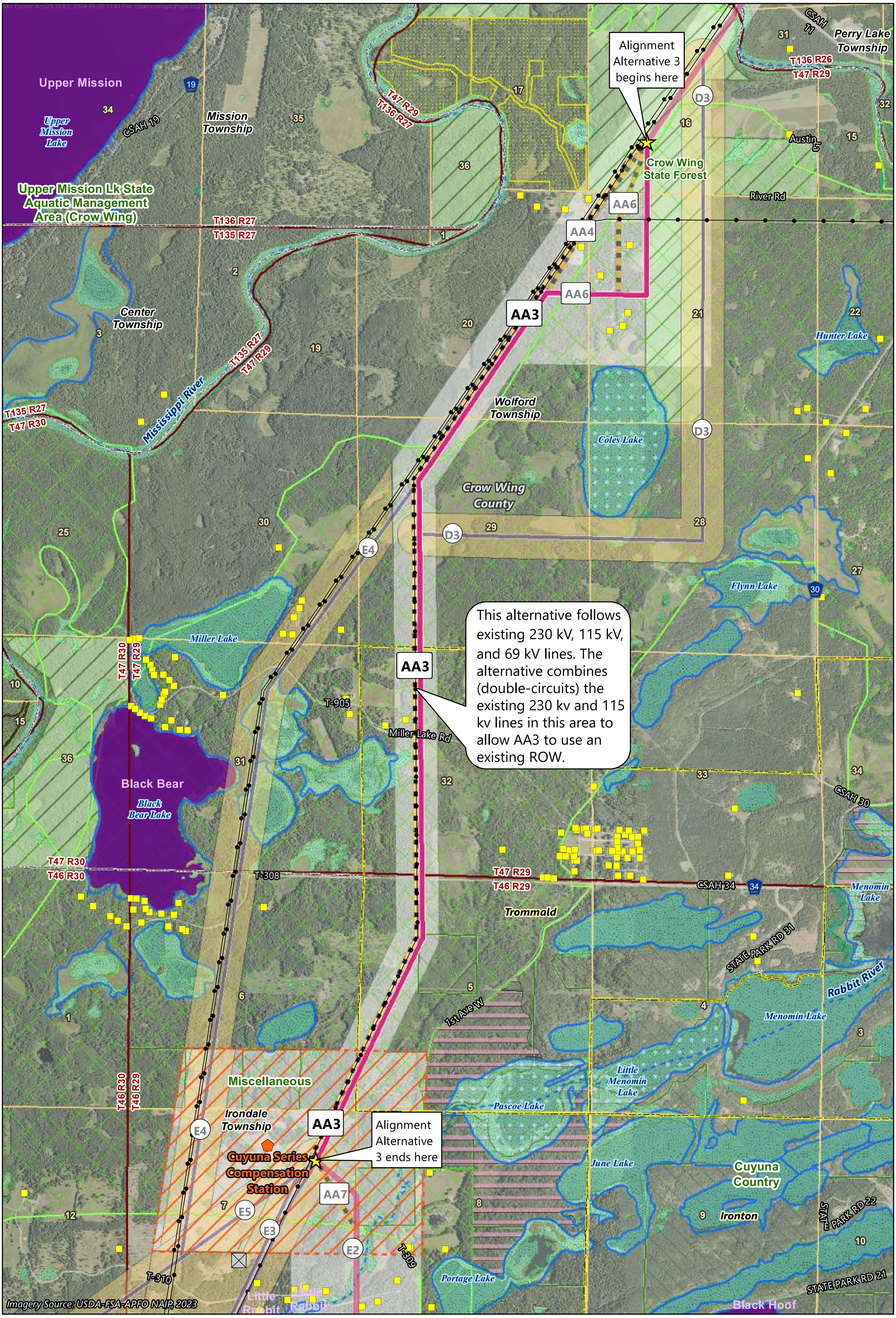
6.3.3 Alignment Alternative AA3 – Cole Lake-Riverton Region

Alignment alternative AA3 provides an alternative placement of the applicants' proposed alignment in the northern half of the Cole Lake-Riverton region (Map 6-13). Alignment alternative AA3 would entail double-circuiting two existing transmission lines, which would then allow placement of alignment alternative AA3 within existing transmission line ROW. Potential impacts of alignment alternative AA3 and the applicants' equivalent are summarized in Table 6-58 and shown on Map 6-13.

Table 6-58 Human and Environmental Impacts – Alignment Alternative AA3, Cole Lake-Riverton Region

Resource	Element	Alignment Alternative AA3	Applicants' Equivalent
Length (miles)		4.9	5.1
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	3	0
	Residences within 250-500 feet (count)	1	4
	Residences within 500–1,000 feet (count)	3	4
Land-Based Economies	Agricultural land in 150-ft ROW	22	3
Water Resources	Total wetlands in 150-foot ROW (acres)	7	13
	Forested wetlands in 150-ft ROW (acres)	<1	2
Vegetation	Forested landcover in 150-foot ROW (acres)	44[1]	79
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	58	75
	Federal-or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	4.9 (100)	4.0 (79)
	Roadway (miles, percent)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	2.0 (41)	2.6 (51)
	Total ROW sharing and paralleling (miles, percent)	4.9 (100)	4.7 (92)
Reliability	Crossing of existing transmission lines (count)	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$55.9-$66.9[2]	$28.5

1 The NLCD indicates forested vegetation is in the ROW; however, the ROW is an existing transmission line ROW that has been cleared and is routinely maintained.
2 Cost is driven by the need to reconfigure three existing transmission lines with this alignment alternative (base cost of $26.9 million)



Alignment Alternative 3
Applicants' AA3 Equivalent
Route Width
Route Alternative Width
Existing Transmission Line
Cuyuna Series Compensation Station
Substation Siting Area
Residence
Active Aggregate Mine
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Native Plant Community
State Conservation Easement
State Forest
Aquatic Management Area
Other DNR Land
Municipal Boundary

Lakes of Biological Significance

Outstanding Significance
Moderate Significance

Wetlands

Non-Forested Wetland
Forested Wetland

Forest Inventory Old Growth

Designated Future Old Growth

Site of Biodiversity Significance

Moderate Significance

Feet
0 1,000 2,000

Map 6-13

ALIGNMENT ALTERNATIVE AA3

Cole Lake/Riverton Region

Northland Reliability Project

6.3.3.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements, described in Chapter 5.3. For some of the human settlement evaluation elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed exclusively in Chapter 5.3, include cultural values, displacement, electronic interference, noise, property values, and zoning and land use.

6.3.3.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternative AA3 is shown in Table 6-59, while ROW paralleling and sharing are shown in Table 6-60.

Route alternative AA3 and the applicants' equivalent would have a similar number of residences nearby, but alignment alternative AA3 would entail double-circuiting two existing transmission lines, which would then allow placement of alignment alternative AA3 within existing transmission line ROW. As a result, alignment alternative AA3 minimizes aesthetic impacts to a greater extent than the applicants' equivalent.

Table 6-59 Cole Lake-Riverton Region Proximity of Residences to Alignment Alternative AA3

Residences, Distance from Anticipated Alignment	Alignment Alternative AA3	Applicants' Equivalent
Residences within 0-75 feet	0	0
Residences within 75-250 feet	3	0
Residences within 250-500 feet	1	4
Residences within 500-1,000 feet	3	4
Total Residences within 1,000 feet	7	8

Table 6-60 Cole Lake-Riverton Region ROW Sharing and Paralleling of Alignment Alternative AA3

Infrastructure	Alignment Alternative AA3 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)
Follows Existing Transmission Line	4.9 (100)	4.0 (79)
Total – Follows Transmission Line, Road, or Railroad	4.9 (100)	4.0 (79)
Follows Field, Parcel, or Section Lines	2.0 (41)	2.6 (51)
Total – ROW Paralleling and Sharing	4.9 (100)	4.7 (92)
Total Length of Route Alternative	4.9	5.1

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line, and therefore, the sum may be greater than 100 percent.

6.3.3.1.2 Socioeconomics and Environmental Justice

Socioeconomic factors provide an indication of how economic activity affects and is shaped by social processes. Socioeconomic measures indicate how societies progress, stagnate, or regress because of the actions and interactions within and between the local, regional, or global economic scale. Transmission line projects can contribute to growth and progress at the local level over time, but generally do not have a significant long-term socioeconomic impact.

The project would improve the socioeconomics of the region through the creation of jobs, generation of tax revenue, and providing more reliable electrical service to the surrounding communities. Alignment alternative AA3 intersects with the city limits of Trommald, which has been identified as an EJC. No adverse or permanent impacts to the identified EJC are anticipated. While alignment alternative AA3 does intersect an EJC, this community is not anticipated to experience disproportionately adverse impacts as a result of the project.

6.3.3.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no active mining operations within the ROW of alignment alternative AA3 or the ROW of the applicants' equivalent. Therefore, potential project impacts to mining would be minimal and independent of the route selected.

6.3.3.2.1 Agriculture

Agricultural land impacts differ between the 150-foot ROW of alternative alignment AA3 and the applicants' equivalent. Alternative alignment AA3 ROW follows an existing transmission line ROW; thus, there will be no new impacts to agricultural lands for AA3. Accordingly, AA3 best minimizes agricultural impacts.

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the ROW of alternative alignment AA3 or the applicants' equivalent.

6.3.3.2.2 Forestry

Impacts to forestry within the Cole Lake-Riverton region were assessed through an evaluation of the designated forestry resources within the 150-foot ROW (Chapter 5.8.2). Forested land comprises approximately 44 acres of the ROW of route alternative AA3 and 79 acres of the ROW of the applicants' equivalent (reference (108)). The forested land is comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C). However, it is important to note that while the NLCD indicates forested vegetation is in the alignment alternative AA3 ROW, this ROW consists of an existing transmission line ROW that has been cleared and is routinely maintained. Alignment alternative AA3 and the applicants' equivalent both cross Crow Wing State Forest.

As shown in Table 6-61, the designated forestry resources within the 150-foot ROW of the alignment alternative consist of DNR state forest land and Minnesota School Trust Land. There are no Forests for the Future lands within the ROW of alignment alternative AA3 or the applicants' equivalent.

Table 6-61 Designated Forestry Resources within the 150-foot ROW of Alignment Alternative AA3

Forestry Resources	Alignment Alternative AA3	Applicants' Equivalent
Acres of DNR State Forest within 150-foot ROW	1	69
Acres of Minnesota School Trust Land[1] within 150-foot ROW	5	11

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)
1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

As alignment alternative AA3 follows an existing transmission line ROW, it would have significantly fewer impacts to forestry resources.

6.3.3.2.3 Recreation and Tourism

Recreation and tourism activities within the Cole Lake-Riverton region include outdoor recreational activities and camping opportunities on state managed lands, trails, and scenic byways. Since transmission line construction and operation generally has minimal permanent and temporary impacts to trails, recreation, and tourism, project impacts in this region are expected to be minimal where it parallels existing ROWs.

Alignment alternative AA3 and applicants' equivalent route traverse Crow Wing State Forest and have minimal trail crossings (Map Book 5C). Trail crossings among the route alternatives occur in areas where the alternative parallels existing transmission lines; thus, permanent impacts to resources in this area would be minimal. Alignment alternative AA3 follows an existing transmission line ROW, reducing permanent impacts to recreational opportunities in Crow Wing State Forest. In comparison, the applicants' equivalent in this area includes a portion of the route which does not parallel an existing transmission line, which could result in permanent impacts to recreation and tourism by altering aesthetics and noise in the vicinity. Temporary impacts as a result of all of alignment alternative AA3 and applicants' equivalent could include trail closings during construction and temporary interruptions in recreational opportunities within the Crow Wing State Forest (Chapter 5.8.4.1). Although temporary impacts would occur, they are expected to have a minimal impact on recreation.

6.3.3.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the route width of alignment alternative AA3 and the applicants' equivalent. As a result, impacts to cultural resources are anticipated to be minimal and independent of the route selected.

6.3.3.4 Natural Environment

6.3.3.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This route alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-13 shows the water resources along alignment alternative AA3.

6.3.3.4.1.1 Watercourses and Waterbodies

There are no watercourses or waterbodies crossed by alignment alternative AA3 or the applicants' equivalent.

6.3.3.4.1.2 Wetlands

Table 6-58 identifies the acreage of wetlands crossed by alternative alignment AA3 and the applicants' equivalent. The applicants' equivalent would cross more forested and non-forested wetland than alignment alternative AA3. Alignment alternative AA3 and the applicants' equivalent would not have any wetland crossing over 1,000 feet; as such, wetlands are anticipated to be spanned.

6.3.3.4.2 Vegetation

Alignment alternative AA3 would impact significantly less forested vegetation than the applicants' equivalent. Alignment alternatives AA3 follows an existing transmission line ROW that has already been cleared of forested vegetation and is maintained in this condition. The applicants' equivalent parallels an existing transmission line ROW for approximately 79 percent of its length and would fragment a densely forested area where it does not parallel this ROW (Map Book 5C).

6.3.3.4.3 Wildlife

Alignment alternative AA3 would have less impact on wildlife habitat because it follows an existing transmission line ROW for its entire length. The applicants' equivalent would not only permanently remove more forested habitat, but it would also fragment habitat by establishing a new transmission line ROW for approximately 21 percent of its length.

6.3.3.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federally protected species have been documented within 1 mile of alignment alternative AA3 or the applicants' equivalent. Four state-protected species have been documented within 1 mile of alignment alternative AA3 and the applicants' equivalent, none of which have been documented within the ROW of either alternative (Appendix N). Several state special concern species have been documented within 1 mile of alignment alternative AA3 and the applicants' equivalent (Appendix N).

The ROW of alignment alternative AA3 and the applicants' equivalent would all intersect a DNR SBS ranked moderate, with the ROW of AA3 intersecting 58 acres and the applicants' equivalent intersecting 75 acres. As shown on Map 6-13, alignment alternative AA3 would follows an existing transmission line ROW through the SBS, while the applicants' equivalent would require the construction of a new transmission line ROW through a portion of the SBS, including the placement of several transmission line structures within it.

6.3.3.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.3.3.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-58). Alignment alternative AA03, would cost between approximately $55 million and $66 million due to the need to double-circuit existing transmission lines. By comparison, the applicants' equivalent would cost approximately $28 million, making it the less expensive option between these two route alternatives.

6.3.4 Route Alternatives E1 through E5 - Cole Lake-Riverton Region

Route alternatives E1 through E5 provide different options to the applicants' equivalent in the central part of the Cole Lake-Riverton region. Route alternative E1 is shifted from the applicants' equivalent to avoid impacts to the Cuyuna County State Recreation Area by double-circuiting two existing transmission lines, which would then allow placement of route alternative E1 within existing transmission line ROW. Route alternative E2 is shifted from the applicants' equivalent to avoid impacts to public water accesses by using land owned by the applicants. Route alternative E2 would share existing transmission line ROW for a portion of its length (approximately 2.6 miles). Route alternative E3 is shifted from the applicants' equivalent to avoid private property and is, for the most part, a shorter version of route alternative E1. Route alternatives E4 and E5 are shifted from the applicants' equivalent to avoid impacts to Hay Lake. Route alternative E4 would share existing transmission line ROW for approximately 8 of its 11 miles. Route alternative E5 was proposed as a shorter alternative to route alternative E4. It would share existing transmission line ROW for approximately 6 of its 8 miles. Potential impacts of the routing alternatives and the applicants' equivalent are summarized in Table 6-62 and shown on Map 6-14 and Map 6-15.

Table 6-62 Human and Environmental Impacts – Route Alternatives E1 through E5, Cole Lake-Riverton Region

Resource	Element	Route Alternative E1	Route Alternative E2	Route Alternative E3	Route Alternative E4	Route Alternative E5	Applicants' Equivalent
Length (miles)		10.2	10.7	11.1	11.2	11.4	11.0
Human Settlement	Residences within 0-75 feet (count)	0	0	2	3	3	1
	Residences within 75-250 feet (count)	8	7	8	8	8	2
	Residences within 250-500 feet (count)	21	11	16	13	10	10
	Residences within 500–1,000 feet (count)	23	26	31	20	17	25
Land-Based Economies	Agricultural land in 150-ft ROW	33	6	20	12	13	9
Water Resources	Total wetlands in 150-foot ROW (acres)	53	71	52	63	54	76
	Forested wetlands in 150-ft ROW (acres)	3	10	5	8	7	13
Vegetation	Forested landcover in 150-foot ROW (acres)	88[1]	131	127[1]	127	137	136
Wildlife	Wildlife Management Area in 150-foot ROW (acres)	4	4	1	4	4	0
	Shallow Wildlife Lake in 150-foot ROW (acres)	0	0	0.2	0	0	0

Resource	Element	Route Alternative E1	Route Alternative E2	Route Alternative E3	Route Alternative E4	Route Alternative E5	Applicants' Equivalent
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	61	63	83	62	63	84
	Native Plant Communities in 150-foot ROW (acres)	0	0	18	0	0	18
	Lake of Biological Significance in 150-foot ROW (acres)	3	0	3	0	0	0
	Federal- or state-protected species documented in 150-foot ROW (count)	1	1	1	1	1	1
ROW Sharing and Paralleling	Transmission line (miles, percent)	10.2 (100)	5.9 (55)	7.5 (68)	10.0 (89)	9.4 (83)	3.2 (29)
	Roadway (miles, percent)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	1.9 (19)	4.0 (37)	4.6 (41)	0 (0)	1.9 (17)	7.9 (71)
	Total ROW sharing and paralleling (miles, percent)	10.2 (100)	7.9 (74)	10.1 (92)	10.0 (89)	9.4 (83)	9.2 (83)
Reliability	Crossing of existing transmission lines (count)	0	0	0	6	6	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$118.7-$145.7[2]	$59.3	$118.5-$145.5[3]	$75.7[4]	$76.6[5]	$61.1[6]

1 The NLCD indicates forested vegetation is in the ROW; however, the ROW is an existing transmission line ROW that has been cleared and is routinely maintained.

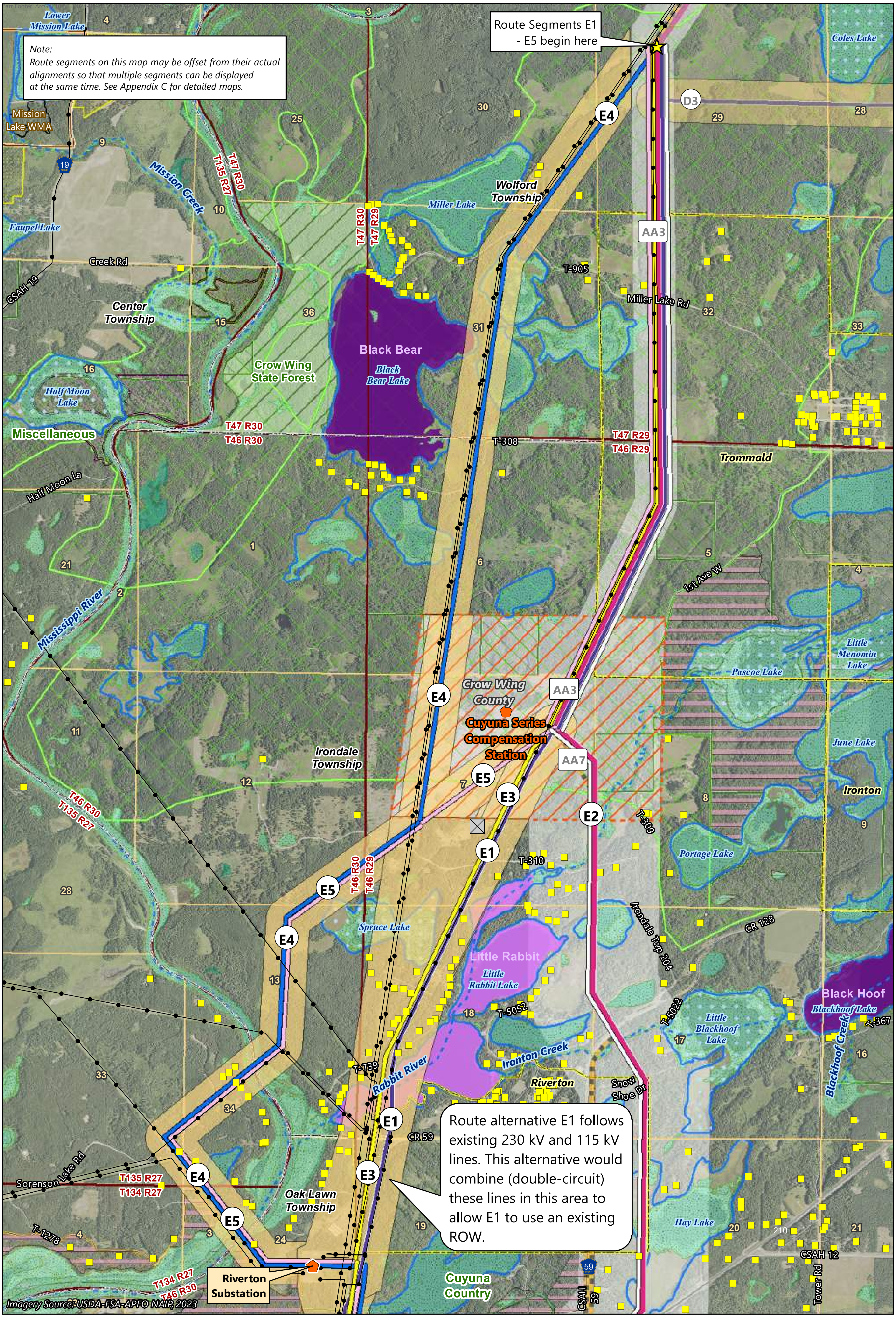
2 Cost is driven by the need to reconfigure and remove up to thirteen existing transmission lines, underground three distribution lines, and retire and relocate one substation with this route alternative (base cost of $56.7 million)

3 Cost is driven by the need to reconfigure and remove up to thirteen existing transmission lines, underground three distribution lines, and retire and relocate one substation with this route alternative (base cost of $61.5 million). In addition, this route alternative may require residential displacement. There is no way to estimate the displacement cost at this time.

4 This route would require crossing six existing lines. Two heavy-angle structures would also be needed for an additional cost of approximately $740,000 per structure ($62.2 million base cost). In addition, this route alternative may require residential displacement. There is no way to estimate the displacement cost at this time.

5 This route would require crossing six existing lines. Two heavy-angle structures would also be needed for an additional cost of approximately $740,000 per structure ($63.1 million base cost). In addition, this route alternative may require residential displacement. There is no way to estimate the displacement cost at this time.

6 This route alternative may require residential displacement. There is no way to estimate the displacement cost at this time.



Route Segment E1
Route Segment E2
Route Segment E3
Route Segment E4
Route Segment E5
Applicants' Route E Equivalent
Route Width
Route Alternative Width
Existing Transmission Line
Riverton Substation
Cuyuna Series Compensation Station
Substation Siting Area
Residence
Active Aggregate Mine
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Native Plant Community
State Conservation Easement
Wildlife Management Area
State Forest
Other DNR Land
Municipal Boundary

Lakes of Biological Significance

Outstanding Significance
Moderate Significance

Wetlands

Non-Forested Wetland
Forested Wetland

Forest Inventory Old Growth

Designated Old Growth
Designated Future Old Growth
Candidate Old Growth

Site of Biodiversity Significance

High Significance
Moderate Significance

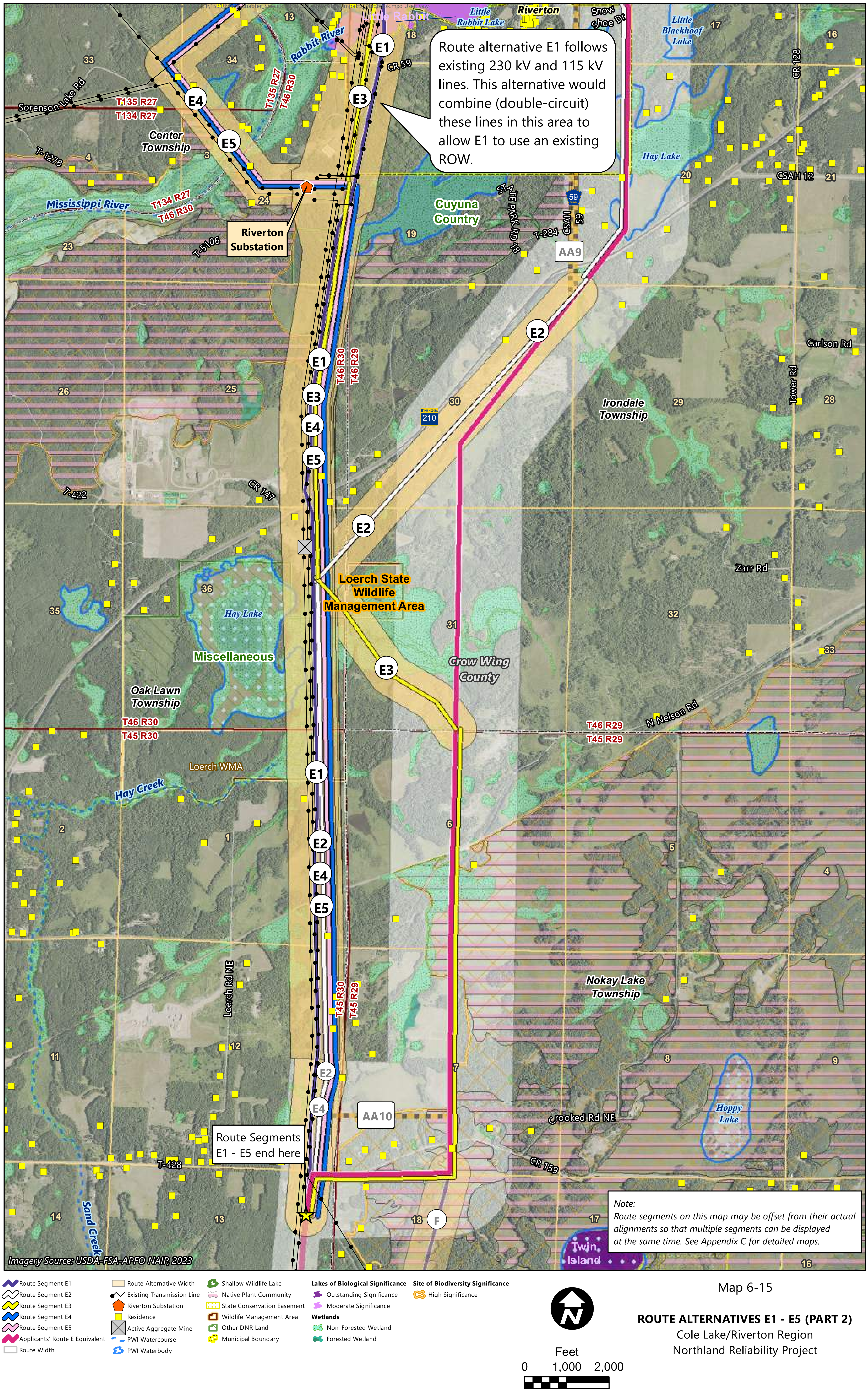
Feet
0 1,000 2,000

Map 6-14

ROUTE ALTERNATIVES E1 - E5 (PART 1)

Cole Lake/Riverton Region

Northland Reliability Project



Map 6-15

ROUTE ALTERNATIVES E1 - E5 (PART 2)

Cole Lake/Riverton Region

Northland Reliability Project

6.3.4.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements, described in Chapter 5.3. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed exclusively in Chapter 5.3, include cultural values, electronic interference, noise, property values, and zoning and land use.

6.3.4.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternatives E1 through E5 are shown in Table 6-63, while ROW paralleling and sharing are shown in Table 6-64.

There are 57 residences located within 1,000 feet of route alternative E3, 52 residences within 1,000 feet of route alternative E1, 44 residences each within 1,000 feet of route alternatives E2 and E4, and 38 residences each within 1,000 feet of route alternative E5 and the applicants' equivalent. Thus, for proximity to residences, route alternative E5 and the applicant's equivalent best minimize aesthetic impacts.

Route alternatives E1 and E3 involve double-circuiting two existing transmission lines, which would then allow placement of these route alternatives within existing transmission line ROW. Route alternative E1 follows the existing transmission line ROW for the entirety of its length. Thus, based on ROW sharing and paralleling, route alternative E1 best minimizes aesthetic impacts.

Table 6-63 Cole Lake-Riverton Region Proximity of Residences to Route Alternatives E1 through E5

Residences, Distance from Anticipated Alignment	Route Alternative E1	Route Alternative E2	Route Alternative E3	Route Alternative E4	Route Alternative E5	Applicants' Equivalent
Residences within 0-75 feet	0	0	2	3	3	1
Residences within 75-250 feet	8	7	8	8	8	2
Residences within 250-500 feet	21	11	16	13	10	10
Residences within 500-1,000 feet	23	26	31	20	17	25
Total Residences within 1,000 feet	52	44	57	44	38	38

Table 6-64 Cole Lake-Riverton Region ROW Sharing and Paralleling of Route Alternatives E1 through E5

Infrastructure	E1 miles (percent)	E2 miles (percent)	E3 miles (percent)	E4 miles (percent)	E5 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Follows Existing Transmission Line	10.2 (100)	5.9 (55)	7.5 (68)	10.0 (89)	9.4 (83)	3.2 (29)
Total – Follows Transmission Line, Road, or Railroad	10.2 (100)	5.9 (55)	7.5 (68)	10.0 (89)	9.4 (83)	3.2 (29)
Follows Field, Parcel, or Section Lines	1.9 (19)	4.0 (37)	4.6 (41)	0 (0)	1.9 (17)	7.9 (71)
Total – ROW Paralleling and Sharing	10.2 (100)	7.9 (74)	10.1 (92)	10.0 (89)	9.4 (83)	9.2 (83)
Total Length of Routing Alternative	10.2	10.7	11.1	11.2	11.4	11.0

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line, and therefore, the sum may be greater than 100 percent.

6.3.4.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW, due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no churches, childcare centers, or schools located within the 150-foot ROW for any of the route alternatives described in this Chapter. However, route alternatives E3, E4, E5, and the applicants' equivalent all have permanent residential buildings located within their 150-foot ROW. All route alternatives except E1 have non-residential buildings (storage shed, agricultural outbuildings, etc.) located within their rights-of-way (Table 6-65).

Table 6-65 Residential and Non-Residential Buildings within Route Alternative ROW

	Route Alternative E1	Route Alternative E2	Route Alternative E3	Route Alternative E4	Route Alternative E5	Applicants' Equivalent
Number of Residential Buildings	0	0	2	3	3	1
Number of Non-Residential Buildings	0	5	2	5	5	1

All residential buildings located with the ROW of route alternatives E3, E4, E5, and the applicants' equivalent could potentially be displaced. Similarly, the non-residential buildings in the ROW of these route alternatives may or may not be displaced as a result of the project. Though buildings are generally not allowed with the ROW of a transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For each of the buildings noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.3.4.1.3 Socioeconomics and Environmental Justice

Socioeconomic factors provide an indication of how economic activity affects and is shaped by social processes. Socioeconomic measures indicate how societies progress, stagnate, or regress because of the actions and interactions within and between the local, regional, or global economic scale. Transmission line projects can contribute to growth and progress at the local level over time, but generally do not have a significant long-term socioeconomic impact.

The project would improve the socioeconomics of the region through the creation of jobs, generation of tax revenue, and providing more reliable electrical service to the surrounding communities. Route alternatives E1, E2, E3, and E5 intersect with the city limits of Trommald; route alternatives E1, E2, and E3 intersect with the city limits of Riverton. Trommald and Riverton both have been identified as communities with EJCs. No adverse or permanent impacts to the identified communities with EJC are anticipated. While these routing alternatives do intersect EJCs, these communities are not anticipated to experience disproportionately adverse impacts as a result of the project.

6.3.4.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. Potential impacts to recreation and tourism are assessed by looking at various elements of these opportunities as outlined in Chapter 5.8.4.

6.3.4.2.1 Agriculture

Agricultural impacts differ between the 150-foot ROW route alternatives E1 through E5 and the applicants' equivalent. Route alternative E2 includes the least amount (6 acres) of agricultural land in the ROW. Route alternative E1 has the most amount (33 acres) of agricultural land in the ROW. However, route alternatives E1 and E3 follow existing transmission line ROW for all or part of their length. Thus, these alternatives introduce no new agricultural impacts in these areas. Accordingly, they best minimize agricultural impacts.

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the ROW of the route alternatives or the applicants' equivalent.

6.3.4.2.2 Forestry

Impacts to forestry within the Cole Lake-Riverton region were primarily assessed by evaluating the designated forestry resources within the 150-foot ROW (Chapter 5.8.2) of each route alternative. Forested land comprises approximately 88 acres of the ROW of route alternative E1, the least among routing alternatives in this area Route alternative E5 contains the greatest amount of forestry resources with 137 acres (reference (108)). The forested land is comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C). Route alternative E4 and the applicants' equivalent both cross Crow Wing State Forest. However, it is important to note that while the NLCD indicates forested vegetation is in the route alternative E1 and E3 ROW, this ROW consists of an existing transmission line ROW that has been cleared and is routinely maintained.

As shown in Table 6-66, the designated forestry resources within the ROW of the route alternatives consist of DNR state forest land and Minnesota School Trust Land. There is no Forests for the Future land within the ROW of the route alternatives or the applicants' equivalent.

Table 6-66 Designated Forestry Resources within the 150-foot ROW of Route Alternatives E1 Through E5

Forestry Resources	Route Alternative E1	Route Alternative E2	Route Alternative E3	Route Alternative E4	Route Alternative E5	Applicants' Equivalent
Acres of DNR state forest within 150-foot ROW	32	32	32	35	32	32
Acres of Minnesota School Trust Land[1] within 150-foot ROW	15	11	6	14	15	2

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)
1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

Because route alternatives E1 and E3 follow existing transmission line ROW for all or part of their length, they best minimize impacts to forestry resources. The existing ROW has already been cleared of forested vegetation and is maintained in this condition. Thus, route alternatives E1 and E3 minimize new forestry impacts.

6.3.4.2.3 Mining

Potential impacts on mining operations are likely to occur if the construction or operation of a transmission line prevents access to and recovery of resources. The construction of a transmission line could limit the ability to mine these resources, depending on the proximity of the resources to the route selected for the project.

Based on aerial imagery review, there are two active aggregate mines, unnamed mine 1 and unnamed mine 2, within the 150-foot ROW of route alternatives E1, E3, E4, and E5 in the Cole Lake-Riverton Region (Map Book 5D). The 150-foot ROW of route alternative E3 passes along the eastern edge of unnamed mine 1, while the 150-foot ROW for route alternative E5 borders the west side of this mine. The 150-foot ROW for route alternatives E1, E3, E4, and E5 all pass through unnamed mine 2. There is an existing transmission line ROW that passes through this area, which would reduce impacts from E1 due to ROW following. As discussed in Chapter 5.8.3, construction of a transmission line could impact future mining operations if structures interfere with access to mineable resources or the recovery of those resources. These impacts could be either temporary or permanent depending on the location of the resource. Based on aerial imagery, the ROW of the route alternatives and applicants' equivalent pass through the eastern edge of unnamed mine 1, which may result in fewer impacts. While impacts to unnamed mine 2 from route alternative E1 would be minimal due to co-location, route alternatives E3, E4, and E5 may be more impactful since a new ROW through the aggregate mine would be required.

6.3.4.2.4 Recreation and Tourism

Route alternatives E1 and E3 would cross through the northwest corner of a portion of the Cuyuna Country State Recreation Area; however, these alternatives would cross the state recreation area within existing transmission line ROW. An additional 80 feet of ROW from within the Cuyuna Country State Recreation Area would be needed to accommodate the double-circuiting and placement of the route through this area. As a result, only minor impacts to the Cuyuna Country State Recreation Area are anticipated. Route alternatives E2, E4, E5, and the applicants' equivalent would not cross the Cuyuna Country State Recreation Area.

6.3.4.3 Archaeological and Historic Resources

Six previously documented cultural resources are located within the 1,000-foot route width of route alternatives E1, E3, and E5. Five previously documented cultural resources are located in the route width of route alternatives E2, E4, and the applicants' equivalent (Table 6-67), as shown on Map Book 5F.

Table 6-67 Cultural Resources within the Route Width of Route Alternatives E1 through E5 and the Applicants' Equivalent

Resource Number	Resource Type	NRHP Eligibility	Location
21CW0176	Rowe Mine Concentration Plant and Railroad Grade	Eligible	route alternative E1, route alternative E3
21CW0184	Precontact lithic scatter	Not evaluated	route alternative E4 route alternative E5
21CWy	Rabbit River Mission (Precontact artifact scatter)	Not evaluated	route alternative E1, route alternative E2, route alternative E3, route alternative E5, applicants' equivalent
CW-XXX-00001	Cuyuna Iron Range Historic Mining Landscape District	Eligible	route alternative E1, route alternative E2, route alternative E3, route alternative E4 route alternative E5, applicants' equivalent
XX-ROD-00153	Trunk Highway 210	Not Eligible	route alternative E1, route alternative E2, route alternative E3, route alternative E4 route alternative E5, applicants' equivalent
XX-RRD-NPR007	RR ROW between LS&M/StP&D main line at Carlton, and ND State Line at Moorhead (Duplicate Recordation)	Eligible	route alternative E1, route alternative E2, route alternative E3, route alternative E4 route alternative E5, applicants' equivalent
XX-RRD-NPR021	RR ROW between LS&M/StP&D main line at Carlton, and ND State Line at Moorhead (Duplicate Recordation)	Eligible	route alternative E1, route alternative E2, route alternative E3, route alternative E4 route alternative E5, applicants' equivalent

As XX-ROD-00153 is not eligible for the NRHP and, therefore, cannot be adversely affected by the project, it is not discussed further. Several of the cultural resources located within the 1,000-foot route width of the E alternatives are eligible for the NRHP. Resource CW-XXX-00001 consists of the Cuyuna Iron Range Historic Mining landscape. The route width of all six route alternatives cross a portion of this resource where an existing transmission line is present. Due to paralleling an existing transmission line, the route alternatives do not have the potential to alter that resource's setting, feeling, appearance, and/or association. The same is true for historic architectural resource XX-RRD-NPR007/ XX-RRD-NPR021. Each of the six route alternatives cross this resource within an existing transmission line ROW; therefore, the route alternatives do not have the potential to alter that resource's setting, feeling, appearance, and/or association.

Archaeological sites 21CW0176, 21CW0184, and 21CWy may also be impacted by the project if any of these sites are present within the footprint of ground disturbance. Ground disturbing activities resulting from the project have the potential to impact these resources if they cannot be avoided by the project.

The primary means to minimize archaeological and historic architectural resource impacts is prudent routing or structure placement (i.e., avoiding known archaeological and historic resources). If they cannot be avoided, impacts to these resources could be mitigated by measures developed in consultation with the SHPO prior to construction. Based on the above discussion, route alternatives E1 and E3 have the most potential to impact a significant cultural resource – NRHP-eligible archaeological site 21CW0176.

6.3.4.4 Natural Environment

6.3.4.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This route alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-14 and Map 6-15 shows the water resources along the route alternatives E1 through E5 and the applicants' equivalent.

6.3.4.4.1.1 Watercourses and Waterbodies

Table 6-68 identifies watercourses and waterbodies crossed by route alternative E1 through E5 and the applicants' equivalent. Route alternative E1 would minimize impacts associated with new water crossings by utilizing the existing transmission line ROW. Route alternative E2 is the only route that would cross Hay Lake, which would require the placement of transmission structures within the lake. Route alternative E3 would cross less watercourses and waterbodies then the other route alternatives. Route alternative E4 and E5 would avoid impacts to Hay Lake; however, they would both cross the Mississippi River at two separate locations.

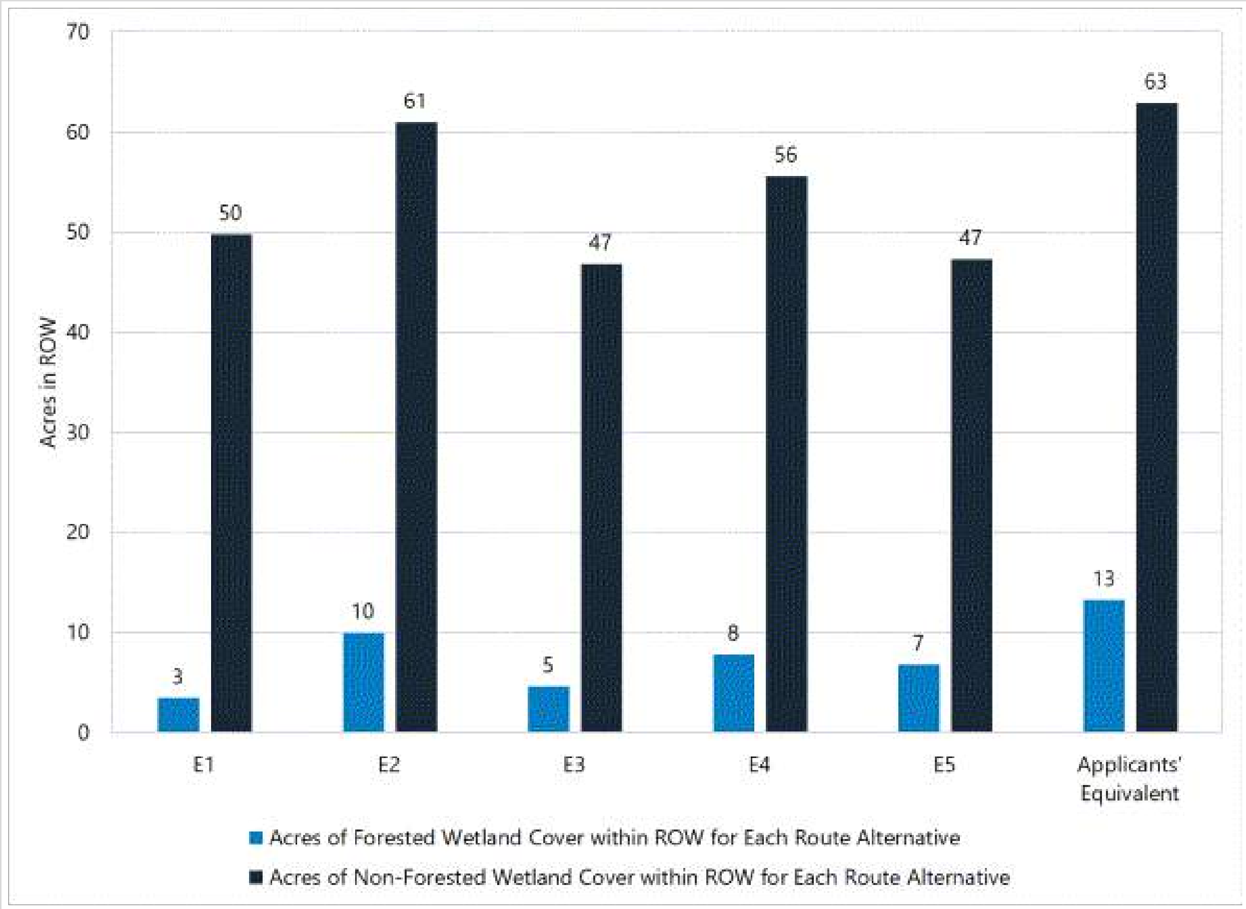
Table 6-68 Watercourses and Waterbodies Crossed by Route Alternatives E1 Through E5

Resources	Route Alternative E1	Route Alternative E2	Route Alternative E3	Route Alternative E4	Route Alternative E5	Applicants' Equivalent
Number of NHD stream crossings	5	7	4	6	5	6
Number of impaired stream crossings	0	0	0	2	2	0
Number PWI stream crossings	2	5	2	3	3	5
Number of NHD lake crossings	1	6	1	3	1	1
Number of impaired lake crossings	1	0	1	0	0	0
Number of PWI basin crossings	1	3	1	1	0	3

6.3.4.4.1.2 Wetlands

Figure 6-8 identifies the acreage of wetlands crossed by route alternatives E1 through E5 and the applicants' equivalent. The applicants' equivalent would cross more forested and non-forested wetland than route alternative E1 through E5. Route alternative E1 would cross the least amount of forested wetlands, and route alternatives E3 and E5 would cross the least amount of non-forested wetlands. The applicants' equivalent would have seven wetland crossings over 1,000 feet, and route alternatives E1, E3, and E5 would have five wetland crossings over 1,000 feet. Crossing over 1,000 feet in length would require placing one or more transmission structures in wetlands.

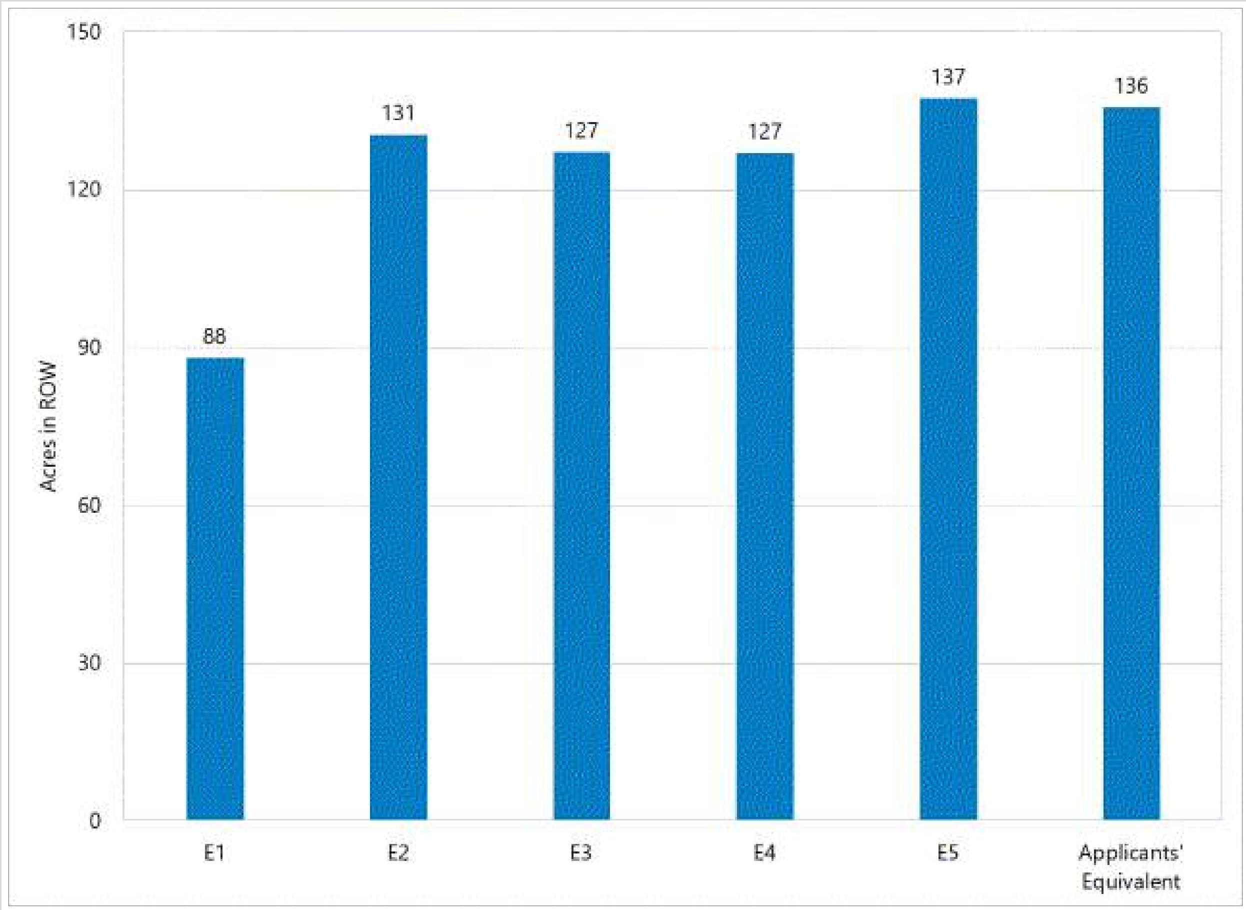
Figure 6-8 Acres of Wetlands Crossed by Route Alternatives E1 Through E5



6.3.4.4.2 Vegetation

Route alternative E1 would have less impact on forested vegetation in the ROW compared to route alternatives E2 through E5 and the applicants' equivalent, all of which would impact similar amounts of forested vegetation (Figure 6-9). Because route alternative E1 follows an existing transmission line ROW, no new impacts to forested vegetation would occur along this alternative. In addition, because route alternative E1 would be co-located with an existing transmission line for its entire length, it would minimize impacts associated with forest fragmentation. The applicants' equivalent would result in the most forest fragmentation because it only parallels an existing transmission line ROW for approximately 29 percent of its length, while route alternatives E2 through E5 would parallel existing transmission lines for over half of their lengths.

Figure 6-9 Forested Vegetation in the 150-foot ROW of Route Alternatives E1 though E5 and the Applicants' Equivalent



6.3.4.4.3 Wildlife

Impacts to wildlife habitat would occur for route alternatives E1 though E5 and the applicants' equivalent. However, route alternative E1 would minimize impacts associated with habitat fragmentation by following existing transmission line ROW for its entire length, while the applicants' equivalent would result in the most habitat fragmentation by paralleling the least amount of transmission line ROW. As such, the potential for impacts to avian species could be highest with the applicants' equivalent and lowest for route alternative E1. However, as discussed in Chapter 5.10.5.2, avian impacts can be minimized through use of bird flight diverters.

All route alternatives except the applicants' equivalent would traverse the Loerch WMA; however, they would do so while paralleling an existing transmission line ROW, thereby minimizing impacts (Map 6-14 and Map 6-15). The ROW of route alternative E3 would traverse the edge of Spruce Lake, a DNR-identified shallow wildlife lake (Map 6-14 and Map 6-15). However, potential impacts to wildlife associated with the shallow lake would be minimized because route alternative E3 would parallel existing transmission line ROW in this area.

6.3.4.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federally protected species have been documented within 1 mile of route alternatives E1 through E5 or the applicants' equivalent. Between four and six state protected species have been documented within 1 mile of all route alternatives and the applicants' equivalent. One of these species, the state threatened Blanding's turtle, has been documented within the ROW of all route alternatives and the applicants' equivalent (Appendix N). Several state special concern species have been documented within 1 mile of all route alternatives and the applicants' equivalent (Appendix N).

The ROW of route alternatives E1 through E5 and the applicants' equivalent would intersect DNR SBS, with the ROW of route alternative E3 and the applicants' equivalent having the greatest impact (Table 6-3). As shown on Map 6-14 and Map 6-15, the ROW for all route alternatives would traverse the SBS ranked moderate by paralleling an existing transmission line ROW, thereby minimizing impacts to this resource. However, the ROW of route alternative E3 and the applicants' equivalent would require the establishment of a new transmission line ROW through an SBS ranked high and the native plant communities mapped within them (Table 6-69; Map 6-14 and Map 6-15). The ROW of route alternatives E1 and E3 would traverse Little Rabbit Lake, a DNR Lake of Biodiversity Significance (Map 6-14 and Map 6-15). However, potential impacts to wildlife associated with this Lake of Biodiversity Significance would be minimized because both route alternatives would follow existing transmission line ROW in this area.

Table 6-69 Acres of Sensitive Ecological Resources in 150-foot ROW for Route Alternatives E1 through E5 and the Applicants' Equivalent

Sensitive Ecological Resource	Route Alternative E1	Route Alternative E2	Route Alternative E3	Route Alternative E4	Route Alternative E5	Applicants' Equivalent
Sites of Biodiversity Significance	61 acres ranked moderate	63 acres ranked moderate	83 total acres; 21 acres ranked high; 62 acres ranked moderate	62 acres ranked moderate	63 acres ranked moderate	84 total acres; 22 acres ranked high; 62 acres ranked moderate
Native Plant Communities	0 acres	0 acres	18 acres - conservation status S3-S5	0 acres	0 acres	18 acres - conservation status S3-S5
Lake of Biological Significance	3 acres - ranked moderate	0 acres	3 acres - ranked moderate	0 acres	0 acres	0 acres

6.3.4.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

Route alternatives E4 and E5 would each require six transmission line crossings, thereby introducing increased reliability concerns for these two route alternatives. Route alternatives E1, E2, E3, and the applicants' equivalent would require no transmission line crossings.

6.3.4.7 Cost

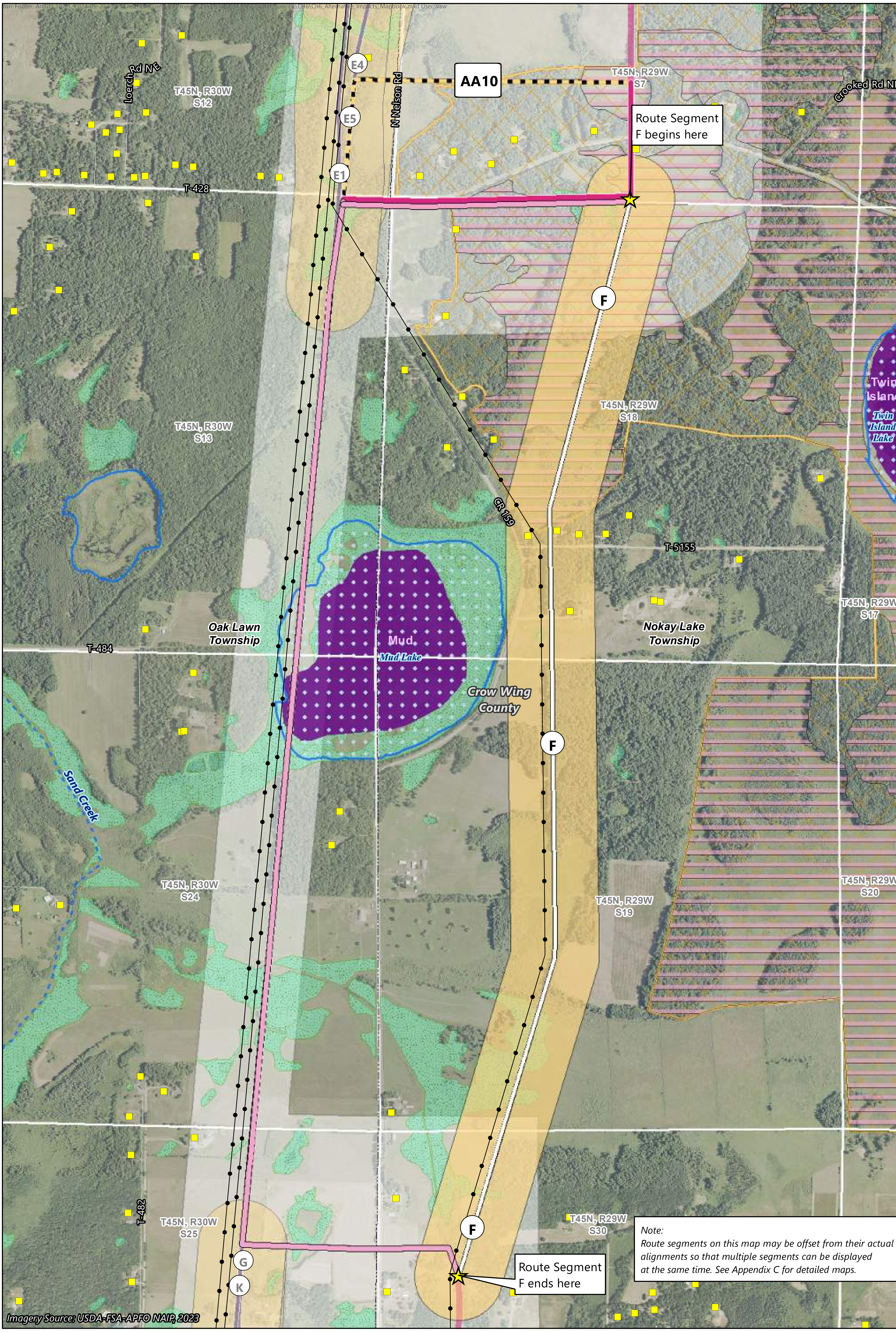
Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-62). Route alternatives E1 through E5 plus the applicants' equivalent vary in cost between approximately $59 million and $145 million. Route alternatives E1 and E3 are the most expensive (approximately $118-$145 million); this is driven by the need to reconfigure and remove up to thirteen existing transmission lines, underground three distribution lines, and retire and relocate one substation with these two route alternatives. Route alternatives E2, E4, E5, and the applicants' equivalent are similar in length and cost, with route alternative E2 being the least expensive of these six route alternatives.

6.3.5 Route Alternative F - Cole Lake-Riverton Region

Route alternative F provides a different option to the applicants' equivalent in the southern part of the Cole Lake-Riverton region. Route alternative F shifts east of the applicants' equivalent in an effort to reduce impacts to natural resources. Route alternative F would parallel existing transmission line ROW for approximately 1.5 of its 2.4 miles. Potential impacts of route alternative F and the applicants' equivalent are summarized in Table 6-70 and shown on Map 6-16.

Table 6-70 Human and Environmental Impacts – Route Alternative F, Cole Lake-Riverton Region

Resource	Element	Route Alternative F	Applicants' Equivalent
Length (miles)		2.4	3.4
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	3	0
	Residences within 250-500 feet (count)	1	4
	Residences within 500–1,000 feet (count)	9	14
Land-Based Economies	Agricultural land in 150-ft ROW	13	20
Water Resources	Total wetlands in 150-foot ROW (acres)	23	4
	Forested wetlands in 150-ft ROW (acres)	1	<1
Vegetation	Forested landcover in 150-foot ROW (acres)	14	19
Wildlife	Shallow Wildlife Lake in 150-foot ROW (acres)	0	6
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	13	7
	Native Plant Communities in 150-foot ROW (acres)	13	5
	Lake of Biological Significance in 150-foot ROW (acres)	0	2
	Federal- or state-protected species documented in 150-foot ROW (count)	0	1
ROW Sharing and Paralleling	Transmission line (miles, percent)	1.6 (67)	2.3 (69)
	Roadway (miles, percent)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	0.1 (4)	1.1 (31)
	Total ROW sharing and paralleling (miles, percent)	1.7 (71)	3.4 (100)
Reliability	Crossing of existing transmission lines (count)	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$13.1	$18.7



Route Segment F
Applicants' Route F Equivalent
Alignment Alternative 10
Applicants' AA10 Equivalent
Route Width
Route Alternative Width
Existing Transmission Line
Residence
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Native Plant Community

Lakes of Biological Significance
Outstanding Significance

Wetlands
Non-Forested Wetland

Site of Biodiversity Significance
High Significance

Feet
0 500 1,000

Map 6-16

ROUTE ALTERNATIVE F AND ALIGNMENT ALTERNATIVE AA10

Cole Lake/Riverton Region

Northland Reliability Project

6.3.5.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed exclusively in Chapter 5.3, include cultural values, displacement, electronic interference, noise, property values, socioeconomics and environmental justice concern, and zoning and land use.

6.3.5.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternative F is shown in Table 6-71, while ROW paralleling and sharing are shown in Table 6-72.

Route alternative F has more homes within 250 feet compared to the applicants' equivalent; however, the applicants' equivalent has more total residences within 1,000 feet than route alternative F. Route alternative F and the applicants' equivalent parallel almost the same amount of existing infrastructure ROW (67 percent and 69 percent, respectively). Thus, aesthetic impacts for these routing alternatives are anticipated to be similar.

Table 6-71 Cole Lake-Riverton Region Proximity of Residences to Route Alternative F

Residences, Distance from Anticipated Alignment	Route Alternative F	Applicants' Equivalent
Residences within 0-75 feet	0	0
Residences within 75-250 feet	3	0
Residences within 250-500 feet	1	4
Residences within 500-1,000 feet	9	14
Total Residences within 1,000 feet	13	18

Table 6-72 Cole Lake-Riverton Region ROW Sharing and Paralleling of Route Alternative F

Infrastructure	Route Alternative F miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)
Follows Existing Transmission Line	1.6 (67)	2.3 (69)
Total – Follows Transmission Line, Road, or Railroad	1.6 (67)	2.3 (69)
Follows Field, Parcel, or Section Lines	0.1 (4)	1.1 (31)
Total – ROW Paralleling and Sharing	1.7 (71)	3.4 (100)
Total Length of Route Alternative	2.4	3.4

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.3.5.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no active mining operations or designated forestry resources within the rights-of-ways for route alternative F or the applicants' equivalent. Additionally, there are few recreation and tourism opportunities, and these opportunities do not differ between route alternative F or the applicants' equivalent. As a result, potential impacts to forestry, mining, and recreation and tourism would be minimal and independent of the route selected.

6.3.5.2.1 Agriculture

Impacts to agricultural land in the 150-foot ROW of route alternative F and the applicants' equivalent differ. Route alternative F contains the least amount of agricultural land, with 13 acres in its ROW; the applicant's equivalent contains 20 acres of agricultural land in its ROW.

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the ROW of the route alternative F or the applicants' equivalent.

6.3.5.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the 1,000-foot route width of route alternative F or the applicants' equivalent. As a result, impacts to cultural resources are anticipated to be minimal and independent of the route selected.

6.3.5.4 Natural Environment

6.3.5.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-16 shows the water resources along route alternative F and the applicants' equivalent.

6.3.5.4.1.1 Watercourses and Waterbodies

Table 6-73 identifies the watercourses and waterbodies crossed by route alternative F and the applicants' equivalent. Route alternative F would reduce impacts to waterbodies by avoiding a PWI basin that would be crossed by the applicants' equivalent. This would prevent structures being placed within the PWI wetland as the crossing would be too long to span.

Table 6-73 Watercourses and Waterbodies Crossed by Route Alternative F

Resources	Route Alternative F	Applicants' Equivalent
Number of NHD stream crossings	1	2
Number of impaired stream crossings	0	2
Number PWI stream crossings	1	1
Number of NHD lake crossings	0	0
Number of impaired lake crossings	0	0
Number of PWI basin crossings	0	1

6.3.5.4.1.2 Wetlands

Table 6-62 identifies the acreage of wetlands crossed by route alternative F and the applicants' equivalent. The applicants' equivalent would cross more non-forested wetlands than route alternative F. However, route alternative F would cross more forested wetlands. Both route alternative F and applicants' equivalent would have one wetland crossing over 1,000 feet, which would require placement of one or more transmission structures in wetland.

6.3.5.4.2 Vegetation

The ROW of both route alternative F and the applicants' equivalent would impact forested vegetation, with route alternative F impacting approximately 14 acres and the applicants' equivalent impacting approximately 19 acres. Both route alternatives minimize impacts to forested fragmentation by paralleling existing rights-of-way for approximately 67 to 68 percent of their lengths. As such, the impacts to forested vegetation would be comparable for route alternative F and the applicants' equivalent.

6.3.5.4.3 Wildlife

Impacts to wildlife habitat would occur for route alternative F and the applicants' equivalent as a result of removal of a similar amount of forested habitat in the ROW and fragmenting habitat through the establishment of new transmission line rights-of-way for a similar portion of their lengths. The ROW of route alternative F would not traverse any areas that are preserved or managed for wildlife habitat. The applicants' equivalent would traverse the edge of Mud Lake, a DNR-identified shallow wildlife lake (Map 6-16). However, potential impacts to wildlife associated with the shallow lake would be minimized because the applicants' equivalent would parallel an existing transmission line ROW in this area. The potential impacts to wildlife habitat would be similar for route alternative F and the applicants' equivalent.

6.3.5.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federally protected species have been documented within 1 mile of route alternative F or the applicants' equivalent. One state threatened species, the Blanding's turtle, has been documented within the ROW of the applicants' equivalent and within 1 mile of route alternative F Appendix N. No state special concern species have been documented within 1 mile of route alternative F or the applicants' equivalent. In general, habitat is comparable between route alternative F and the applicants' equivalent; as such, it is anticipated that potential impacts to protected species would be comparable.

The ROW of route alternative F and the applicants' equivalent would traverse several sensitive ecological resources. The ROW of both route alternatives would intersect SBS ranked high and native plant communities, with the ROW of route alternative F intersecting slightly more acres of both (Table 6-74, Map 6-16). As shown on Map 6-16, the ROW of the applicants' equivalent would traverse the edge of Mud Lake, a DNR Lake of Biodiversity Significance. This lake is also a DNR-identified shallow wildlife lake and as noted above, impacts to any protected species associated with this lake would be minimized by paralleling an existing transmission line ROW in this area.

Table 6-74 Sensitive Ecological Resources in the ROW of Route Alternative F and the Applicants' Equivalent

Sensitive Ecological Resource	Area within ROW of Route Alternative F	Area within ROW of Applicants' Equivalent
Sites of Biodiversity Significance	13 acres ranked high	7 acres ranked high
Native Plant Communities	13 acres - conservation status S3-S5	5 acres - conservation status S3-S5
Lake of Biological Significance	0 acres	2 acres - ranked outstanding

6.3.5.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.3.5.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-70). There is a difference of approximately $5 million between the route alternative F (approximately $13 million) and the applicants' equivalent (approximately $18 million). Route alternative F is the least expensive of these two route alternatives.

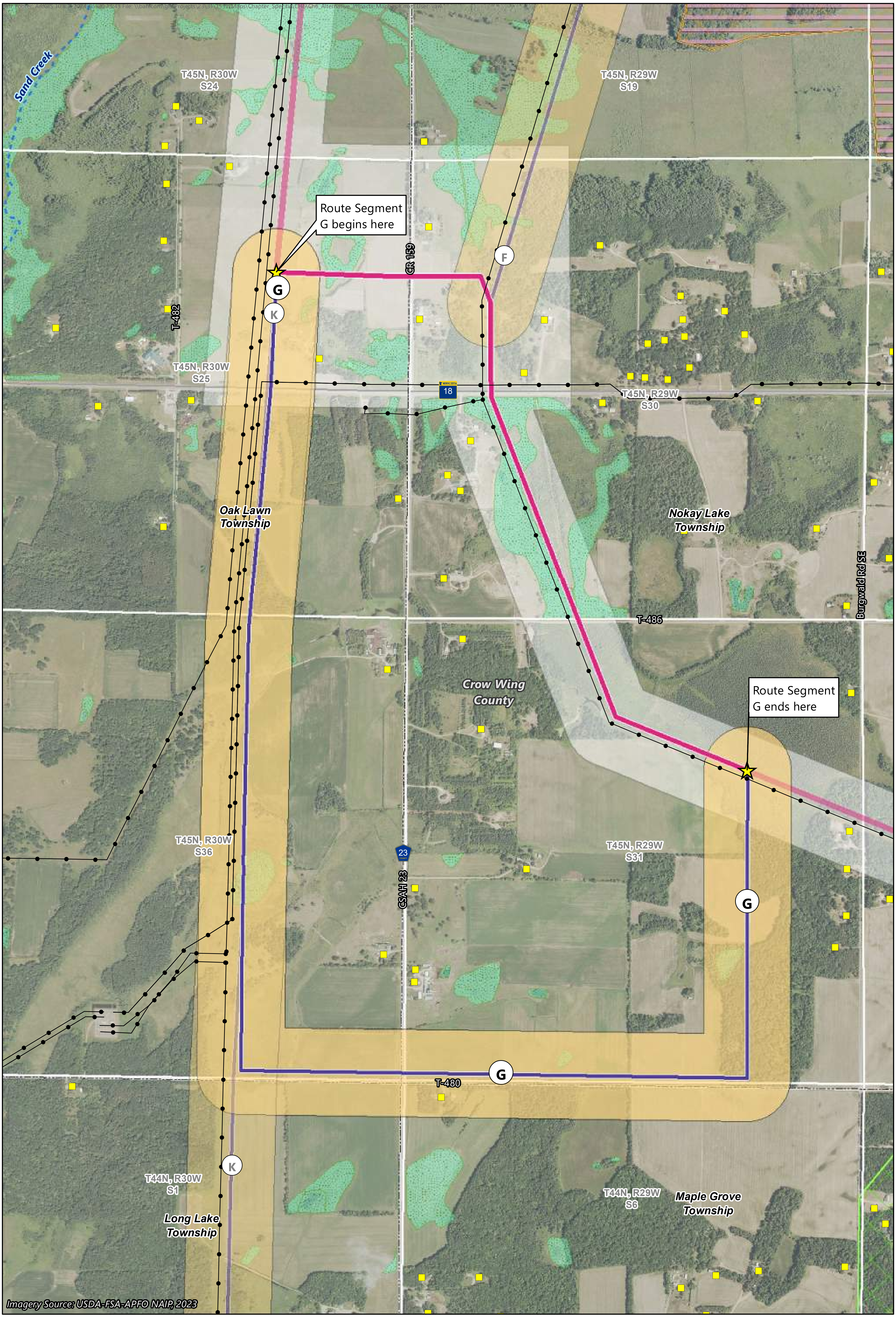
6.3.6 Route Alternative G - Cole Lake-Riverton Region

Route alternative G provides a different option to the applicants' equivalent in the southern part of the Cole Lake-Riverton region and northern part of the Long Lake region. Route alternative G shifts southwest of the applicants' equivalent in an effort to reduce impacts to residential areas. Route alternative G would parallel existing transmission line ROW for approximately half of its length. Potential impacts of route alternative G and the applicants' equivalent are summarized in Table 6-75 and shown on Map 6-17.

Table 6-75 Human and Environmental Impacts –Route Alternative G, Cole Lake-Riverton Region

Resource	Element	Route Alternative G	Applicants' Equivalent
Length (miles)		3.5	1.8
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	0	0
	Residences within 250-500 feet (count)	1	3
	Residences within 500–1,000 feet (count)	2	5
Land-Based Economies	Agricultural land in 150-ft ROW	38	7
Water Resources	Total wetlands in 150-foot ROW (acres)	14	25
	Forested wetlands in 150-ft ROW (acres)	1	<1
Vegetation	Forested landcover in 150-foot ROW (acres)	13	3
Rare and Unique Natural Resources	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	1.7 (50)	1.3 (75)
	Roadway (miles, percent)	1.0 (28)	0 (0)
	Field, parcel, or section lines (miles, percent)	1.8 (50)	0.4 (25)
	Total ROW sharing and paralleling (miles, percent)	3.5 (100)	1.8 (100)
Reliability	Crossing of existing transmission lines (count)	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$20.2[1]	$9.8

1 One heavy-angle structure would be needed for an additional cost of approximately $740,000 ($19.4 million base cost).



Route Segment G
Applicants' Route G Equivalent
Route Width
Route Alternative Width
Existing Transmission Line

Residence
PWI Watercourse
Native Plant Community

Wetlands

Non-Forested Wetland

Site of Biodiversity Significance

High Significance
Moderate Significance

N

Feet

0 500 1,000

Map 6-17

ROUTE ALTERNATIVE G

Cole Lake/Riverton Region

Northland Reliability Project

6.3.6.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and, therefore, are not discussed in this Chapter. These resources, which are discussed exclusively in Chapter 5.3, include cultural values, electronic interference, noise, property values, socioeconomics and environmental justice concerns, and zoning and land use.

6.3.6.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternative G is shown in Table 6-76, while ROW paralleling and sharing are shown in Table 6-77.

The applicants' equivalent has more homes within 500 feet and within 1,000 feet compared to route alternative G and, therefore, may be more impactful to aesthetics of nearby residences. Route alternative G may also minimize aesthetic impacts more than the applicants' equivalent by paralleling slightly more existing infrastructure ROW than the applicants' equivalent.

Table 6-76 Cole Lake-Riverton Region Proximity of Residences to Route Alternative G

Residences, Distance from Anticipated Alignment	Route Alternative G	Applicants' Equivalent
Residences within 0-75 feet	0	0
Residences within 75-250 feet	0	0
Residences within 250-500 feet	1	3
Residences within 500-1,000 feet	2	5
Total Residences within 1,000 feet	3	8

Table 6-77 Cole Lake-Riverton Region ROW Sharing and Paralleling of Route Alternative G

Infrastructure	Route Alternative G miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	1.0 (28)	0 (0)
Follows Existing Transmission Line	1.7 (50)	1.3 (75)
Total – Follows Transmission Line, Road, or Railroad	2.7 (78)	1.3 (75)
Follows Field, Parcel, or Section Lines	1.8 (50)	0.4 (25)
Total – ROW Paralleling and Sharing	3.5 (100)	1.8 (100)
Total Length of Route Alternative	3.5	1.8

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.3.6.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW, due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no permanent residences, churches, childcare centers, or schools located within the route alternative G ROW. However, one non-residential building (storage shed, agricultural outbuildings, etc.) is located within the 150-foot ROW of route alternative G.

This non-residential building may or may not be displaced as a result of route alternative G. Though buildings are generally not allowed with the transmission line ROW, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For the building noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.3.6.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no active mining operations or designated forestry resources within the ROW of route alternative G or the ROW of the applicants' equivalent. Additionally, there are few recreation and tourism opportunities, and these opportunities do not differ between route alternative G or the applicants' equivalent. As a result, potential impacts to forestry, mining, and recreation and tourism would be minimal and independent of the route selected.

6.3.6.2.1 Agriculture

Agricultural land impacts differ between the 150-foot ROW route alternative G and the applicants' equivalent. Route alternative G contains the most amount of agricultural land (38 acres) in its ROW, while the applicants' equivalent contains the least amount of agricultural land (7 acres) in its ROW.

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of route alternative G or the applicants' equivalent.

6.3.6.3 Archaeological and Historic Resources

One previously documented historic architectural resource is located within the 1,000-foot route width of route alternatives G and the applicants' equivalent (Table 6-78), as shown on Map Book 5F. Resource XX-ROD-00017, Trunk Highway 18, has been previously determined not eligible for the NRHP. Because this resource has been determined "not eligible", it cannot be adversely affected by the project and no additional work regarding this resource would be necessary for the project, regardless of which routing alternative is selected. As a result, impacts to cultural resources are anticipated to be minimal and independent of the route selected.

Table 6-78 Cultural Resources within the Route Width of Route Alternative G and the Applicants' Equivalent

Resource Number	Resource Type	NRHP Eligibility	Location
XX-ROD-00017	Trunk Highway 18	Not Eligible	route alternative G; applicants' equivalent

6.3.6.4 Natural Environment

6.3.6.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This route alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-17 shows the water resources along route alternative G and the applicants' equivalent.

6.3.6.4.1.1 Watercourses and Waterbodies

Table 6-79 identifies the watercourses and waterbodies crossed by route alternative G and the applicants' equivalent. Route alterative G would avoid crossing an unnamed creek, which is also listed as impaired.

Table 6-79 Watercourses and Waterbodies Crossed by Route Alternative G

Resources	Route Alternative G	Applicants’ Equivalent
Number of NHD Streams	0	3
Number of impaired stream crossings	0	3
Number PWI stream crossings	0	0
Number of NHD lake crossings	1	0
Number of impaired lake crossings	0	0
Number of PWI basin crossings	0	0
Number of PWI wetland crossings	0	0

6.3.6.4.1.2 Wetlands

Table 6-75 identifies the acreage of wetlands crossed by route alternative G and the applicants’ equivalent. The applicants’ equivalent would cross more non-forested wetland than route alternative G. However, route alternative G would cross more forested wetlands then the applicants’ equivalent. The applicants’ equivalent would have three wetland crossings over 1,000 feet and route alternatives G would have two wetland crossings over 1,000 feet. Crossings greater than 1,000 feet cannot be spanned and would require placement of one or more transmission structures in wetland.

6.3.6.4.2 Vegetation

The ROW of route alternative G and the applicants’ equivalent would both impact forested vegetation, with route alternative G impacting approximately 13 acres and the applicants’ equivalent impacting only 3 acres. Both alternatives would parallel existing transmission line and/or road rights-of-way, for approximately three-fourths of their length, thereby minimizing impacts associated with forested fragmentation.

6.3.6.4.3 Wildlife

Impacts to wildlife habitat would occur for route alternative G and the applicants’ equivalent as a result of removal of forested habitat in the ROW and fragmenting habitat through the establishment of new transmission line rights-of-way for approximately one-quarter of their lengths. Neither route alternative would traverse any areas that are preserved or managed for wildlife habitat. While the applicants’ equivalent parallels an existing transmission line ROW for 75 percent of its length, route alternative G only parallels an existing transmission line ROW for 50 percent of its length. As a result, route alternative G could pose a higher potential for impacts to avian species as a result of establishing more new transmission line ROW. As discussed in Chapter 5.10.5.2, these impacts can be minimized through use of bird flight diverters.

6.3.6.5 Rare and Unique Natural Resources

Using the NHIS database, no federal- or state-protected species, or state species of special concern, have been documented within 1 mile of route alternative G or the applicants’ equivalent. Route alternative G and the applicants' equivalent would not traverse any designated sensitive ecological resources. As such, potential impacts to protected species and sensitive ecological resources would be comparable for each alternative.

6.3.6.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.3.6.7 Cost

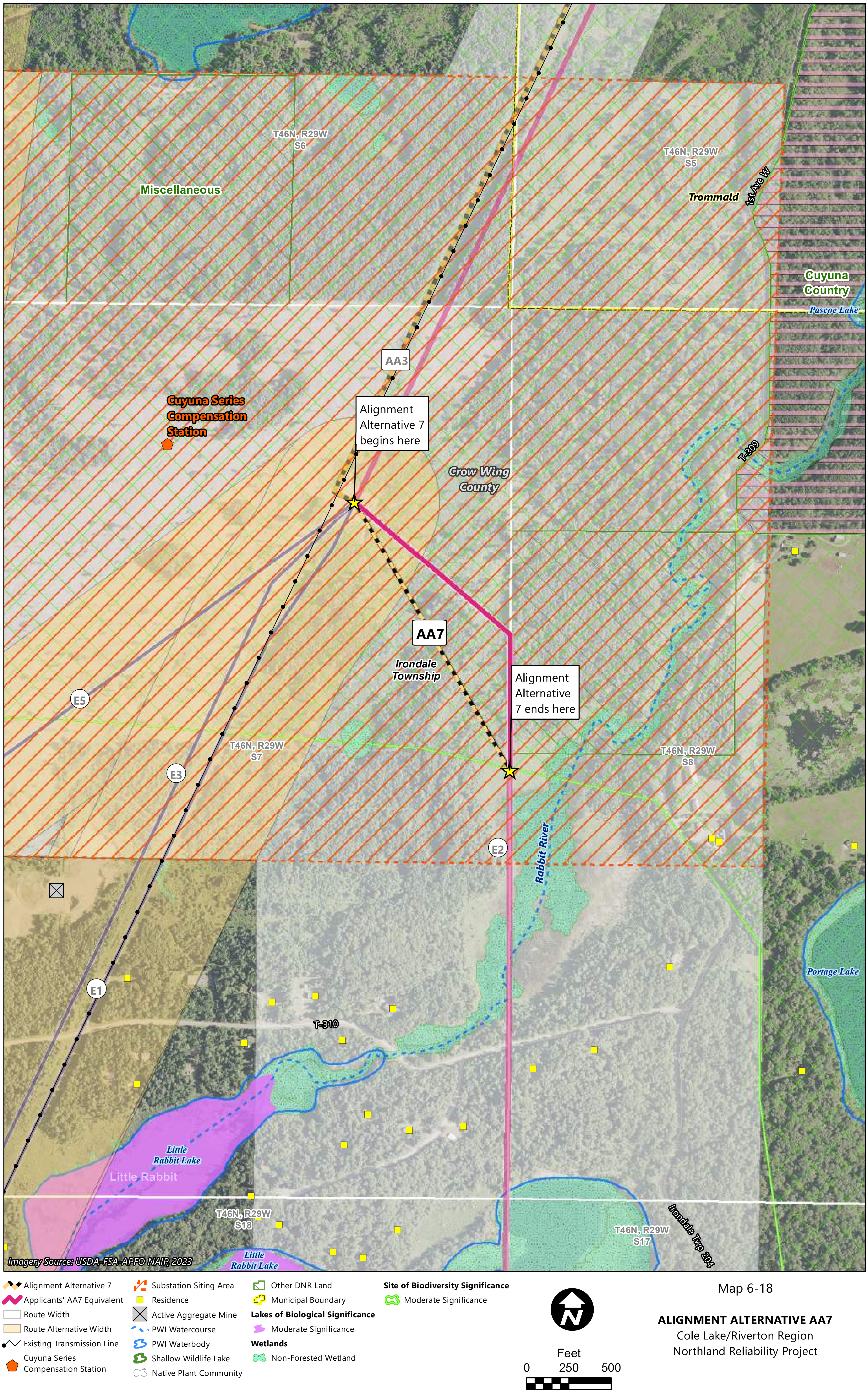
Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-75). Route alternative G, in addition to being approximately 1.8 miles longer than the applicants' equivalent, would require one additional heavy angle structure, which costs approximately 3 times that of a tangent structure. As a result, the applicants' equivalent (approximately $9.7 million) would cost approximately $10 million less than route alternative G (approximately $19.4 million).

6.3.7 Alignment Alternative AA7 - Cole Lake-Riverton Region

Alignment alternative AA7 provides an alternative placement of the applicants' proposed alignment in the central part of the Cole Lake-Riverton region. Alignment alternative AA7 is shifted southwest of the applicants' alignment to avoid state land and minimize impacts to natural resources. Alignment alternative AA7 does not include any transmission line ROW sharing, paralleling, or double circuiting. Potential impacts of alignment alternative AA7 and the applicants' equivalent are summarized in Table 6-80 and shown on Map 6-18.

Table 6-80 Human and Environmental Impacts – Alignment Alternative AA7, Cole Lake-Riverton Region

Resource	Element	Alignment Alternative AA7	Applicants' Equivalent
Length (miles)		0.35	0.38
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	0	0
	Residences within 250-500 feet (count)	0	0
	Residences within 500–1,000 feet (count)	0	0
Land-Based Economies	Agricultural land in 150-ft ROW	0	0
Water Resources	Total wetlands in 150-foot ROW (acres)	2	2
	Forested wetlands in 150-ft ROW (acres)	<1	2
Vegetation	Forested landcover in 150-foot ROW (acres)	2	2
Rare and Unique Natural Resources	Site of Biodiversity Significance in 150-foot ROW (acres)	6	7
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	0 (0)	0 (0)
	Roadway (miles, percent)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	0 (0)	0.15 (40)
	Total ROW sharing and paralleling (miles, percent)	0 (0)	0.15 (40)
Reliability	Crossing of existing transmission lines (count)	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$1.9	$2.1



Map 6-18

ALIGNMENT ALTERNATIVE AA7

Cole Lake/Riverton Region

Northland Reliability Project

6.3.7.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed exclusively in Chapter 5.3, include cultural values, displacement, electronic interference, noise, property values, socioeconomics and environmental justice concern, and zoning and land use.

6.3.7.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Neither alignment alternative AA7 nor the applicants' equivalent have residents within 1,000 feet of the alignment (Table 6-81). ROW paralleling and sharing are shown in Table 6-81. Neither alignment alternative AA7 nor the applicants' equivalent parallel existing infrastructure ROW in this area; the applicants' equivalent may minimize aesthetic impacts by sharing a small amount of ROW with field, parcel, or section lines.

Table 6-81 Cole Lake-Riverton Region ROW Sharing and Paralleling of Alignment Alternative AA7

Infrastructure	Alignment Alternative AA7 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)
Follows Existing Transmission Line	0 (0)	0 (0)
Total – Follows Transmission Line, Road, or Railroad	0 (0)	0 (0)
Follows Field, Parcel, or Section Lines	0 (0)	0.15 (40)
Total – ROW Paralleling and Sharing	0 (0)	0.15 (40)
Total Length of Alignment Alternative	0.35	0.38

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.3.7.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no agricultural lands or active mining operations within the rights-of-way of alignment alternative AA7 or the applicants' equivalent. Additionally, there are few recreation and tourism opportunities, and these opportunities do not differ between alignment alternative AA7 or the applicants' equivalent. As a result, potential impacts to agriculture, mining, and recreation and tourism would be minimal and independent of the route selected.

6.3.7.2.1 *Forestry*

Impacts to forestry within the Cole Lake-Riverton region were primarily assessed by evaluating the designated forestry resources within the 150-foot ROW (Chapter 5.8.2). Forested land comprises approximately 2 acres of the ROW of route alternative AA7 and 2 acres of the ROW of the applicants' equivalent (reference (108)). The forested land is comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C). The ROW of alignment alternative AA7 does not contain any designated forestry resources. The ROW of the applicants' equivalent route contains 1 acre of Minnesota School Trust Land.

Only the applicants' equivalent route would have potential impacts to designated forestry resources within its 150-foot ROW. Impacts to forestry resources would include permanently removing trees from the ROW before construction (Chapter 5.8.2.1).

6.3.7.3 Archaeological and Historic Resources

One previously documented archaeological resource is located within the 1,000-foot route width of alignment alternative AA7 and the applicants' equivalent (Table 6-82), as shown on Map Book 5F. Site 21CWy consists of the former location of Rabbit River Mission. Archaeological site 21Cwy may be impacted if it is present within the footprint of ground disturbance and if it cannot be avoided by the project.

The primary means to minimize impacts to archaeological resources is prudent routing or structure placement (i.e., avoiding known archaeological and historic resources). If they cannot be avoided, impacts to these resources could be mitigated by measures developed in consultation with the SHPO prior to construction. Based on the above discussion, alignment alternative AA7 and the applicants' equivalent each have the potential to impact archaeological resource 21CWy, if it is present within the footprint of ground disturbance.

Table 6-82 Cultural Resources within the Route Width of Alignment Alternative AA7 and the Applicants' Equivalent

Resource Number	Resource Type	NRHP Eligibility	Location
21CWy	Rabbit River Mission (Precontact artifact scatter)	Not evaluated	alignment alternative AA7; applicants' equivalent

6.3.7.4 Natural Environment

6.3.7.4.1 *Water Resources*

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This route alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-18 shows the water resources along alignment alternative AA7 and the applicants' equivalent.

6.3.7.4.1.1 *Watercourses and Waterbodies*

Alignment alternative AA7 and the applicants' equivalent would not cross any watercourses or waterbodies.

6.3.7.4.1.2 Wetlands

Table 6-80 identifies the acreage of wetlands crossed by alignment alternative AA7 and the applicants' equivalent. The applicants' equivalent would cross more forested wetlands than alignment alternative AA7. The applicants' equivalent and alignment alternative AA7 would not have any wetland crossings over 1,000 feet; as such, both route alternatives would span wetlands.

6.3.7.4.2 Vegetation

Alignment alternative AA7 and the applicants' equivalent would impact approximately 2 acres of forested vegetation. Neither alternative would parallel an existing transmission line or road ROW; however, the area appears to have been disturbed by previous logging activity so the impacts of forest fragmentation would be minimized.

6.3.7.4.3 Wildlife

Alignment alternative AA7 and the applicants' equivalent would have similar impacts on wildlife habitat because both alternatives would remove the same amount of forested habitat and neither alternative parallel an existing transmission line or road ROW. Neither alternative would traverse any areas that are preserved or managed for wildlife habitat.

6.3.7.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federal- or state-protected species, or state species of special concern, have been documented within 1 mile of alignment alternative AA7 or the applicants' equivalent. The ROW of alignment alternative AA7 and the applicants' equivalent would intersect 6 to 7 acres of a DNR SBS ranked moderate. As shown on Map 6-18, neither alternative would parallel an existing transmission line or road ROW through the SBS. Potential impacts to protected species or sensitive ecological resources would be similar for alignment alternative AA7 and the applicants' equivalent.

6.3.7.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.3.7.7 Cost

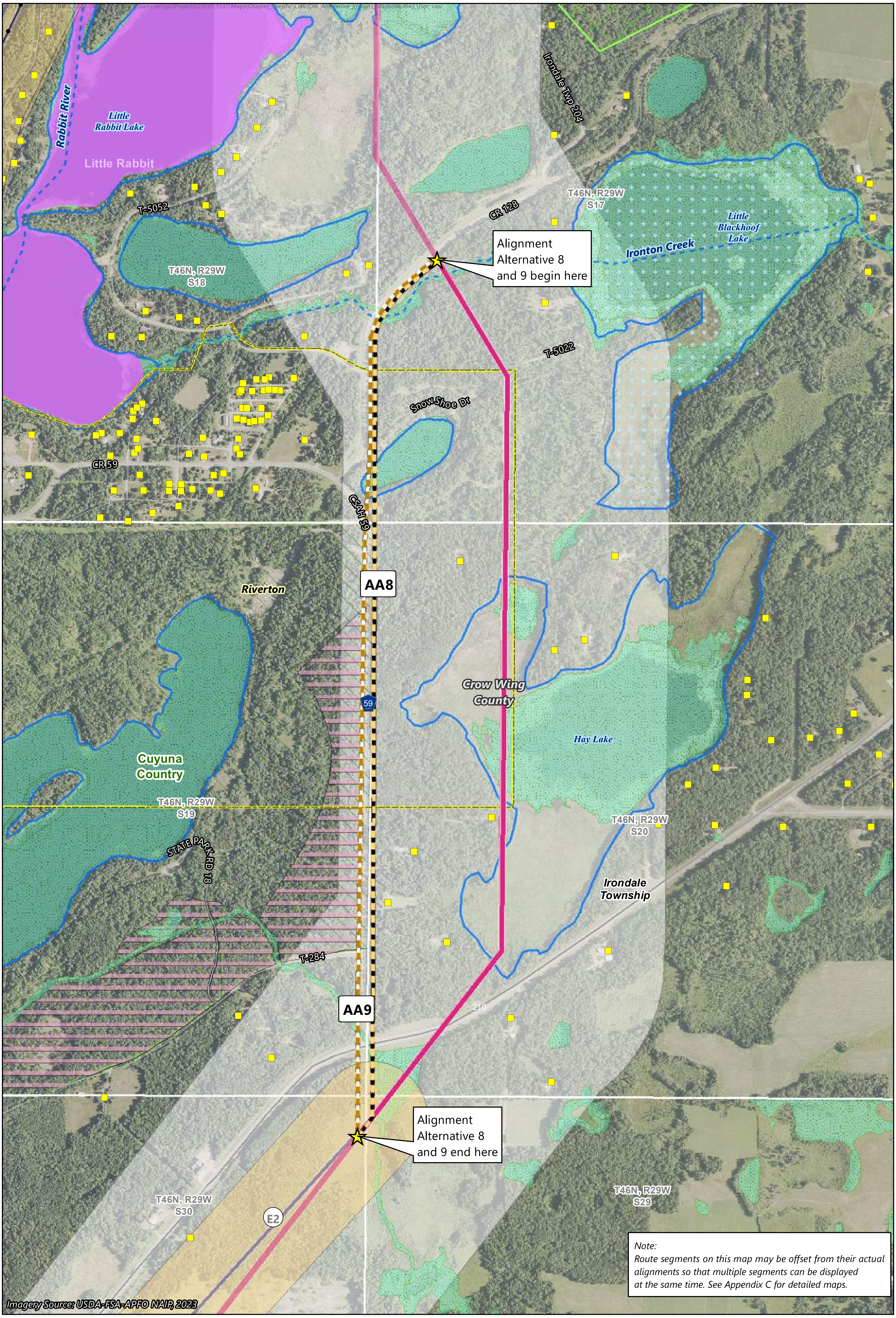
Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-80). Alignment alternative AA7 is anticipated to cost approximately $1.9 million, while the applicants' equivalent is anticipated to cost approximately $2.1 million, making alignment alternative AA7 the least expensive option.

6.3.8 Alignment Alternatives AA8 and AA9 - Cole Lake-Riverton Region

Alignment alternative AA8 and AA9 provide an alternative placement of the applicants' proposed alignment in the central part of the Cole Lake-Riverton region. Both alignment alternatives are shifted west to avoid impacts to the Cuyuna Recreation Area. Neither AA8 nor AA9 include any transmission line ROW sharing, paralleling, or double-circuiting. Potential impacts of alignment alternative AA8, AA9, and the applicants' equivalent are summarized in Table 6-83 and shown on Map 6-19.

Table 6-83 Human and Environmental Impacts – Alignment Alternatives AA8 and AA9, Cole Lake-Riverton Region

Resource	Element	Alignment Alternative AA8	Alignment Alternative AA9	Applicants' Equivalent
Length (miles)		1.6	1.6	1.6
Human Settlement	Residences within 0-75 feet (count)	0	0	0
	Residences within 75-250 feet (count)	1	0	1
	Residences within 250-500 feet (count)	3	4	4
	Residences within 500–1,000 feet (count)	12	14	7
Land-Based Economies	Agricultural land in 150-ft ROW	2	<1	0
Water Resources	Total wetlands in 150-foot ROW (acres)	5	4	14
	Forested wetlands in 150-ft ROW (acres)	<1	1	<1
Vegetation	Forested landcover in 150-foot ROW (acres)	15	11	18
Rare and Unique Natural Resources	Native Plant Communities in 150-foot ROW (acres)	0	6	0
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	0 (0)	0 (0)	0 (0)
	Roadway (miles, percent)	1.4 (90)	1.4 (91)	0 (0)
	Field, parcel, or section lines (miles, percent)	1.5 (97)	1.6 (100)	1.0 (61)
	Total ROW sharing and paralleling (miles, percent)	1.5 (97)	1.6 (100)	1.0 (61)
Reliability	Crossing of existing transmission lines (count)	0	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$8.7	$8.6	$9.1



Alignment Alternative 8
Alignment Alternative 9
Applicants' AA8-9 Equivalent
Route Width
Route Alternative Width
Existing Transmission Line
Residence
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Native Plant Community
Other DNR Land
Municipal Boundary

Lakes of Biological Significance

Moderate Significance

Wetlands

Non-Forested Wetland

Site of Biodiversity Significance

Moderate Significance

Feet
0 400 800

Map 6-19

ALIGNMENT ALTERNATIVES AA8 AND AA9

Cole Lake/Riverton Region

Northland Reliability Project

6.3.8.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed exclusively in Chapter 5.3, include cultural values, displacement, electronic interference, noise, property values, and zoning and land use.

6.3.8.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure ROW. Proximity of residences to alignment alternatives AA8, AA9, and the applicants' equivalent are shown in Table 6-84, while ROW paralleling and sharing are shown in Table 6-85.

The applicants' equivalent has the least number of residences within 1,000 feet of the anticipated alignment, whereas alignment alternative AA9 has the most. However, each of these route alternatives are surrounded by trees and therefore, the route is not anticipated to be visible from those residences located within 1,000 feet. Alignment alternatives AA8 and AA9 would likely minimize aesthetic impacts more than the applicants' equivalent as both parallel an existing road, while the applicants' equivalent would be routed through a greenfield in this area.

Table 6-84 Cole Lake-Riverton Region Proximity of Residences to Alignment Alternatives AA8 and AA9

Residences, Distance from Anticipated Alignment	Alignment Alternative AA8	Alignment Alternative AA9	Applicants' Equivalent
Residences within 0-75 feet	0	0	0
Residences within 75-250 feet	1	0	1
Residences within 250-500 feet	3	4	4
Residences within 500-1,000 feet	12	14	7
Total Residences within 1,000 feet	16	18	12

Table 6-85 Cole Lake-Riverton Region ROW Sharing and Paralleling of Alignment Alternatives AA8 and AA9

Infrastructure	Alignment Alternative AA8 miles (percent)	Alignment Alternative AA9 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)	0 (0)
Follows Existing Roads	1.4 (90)	1.4 (91)	0 (0)
Follows Existing Transmission Line	0 (0)	0 (0)	0 (0)
Total – Follows Transmission Line, Road, or Railroad	1.4 (90)	1.4 (91)	0 (0)
Follows Field, Parcel, or Section Lines	1.5 (97)	1.6 (100)	1.0 (61)
Total – ROW Paralleling and Sharing	1.5 (97)	1.6 (100)	1.0 (61)
Total Length of Alignment Alternative	1.6	1.6	1.6

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line, and therefore, the sum may be greater than 100 percent.

6.3.8.1.2 Socioeconomics and Environmental Justice

Socioeconomic factors provide an indication of how economic activity affects and is shaped by social processes. Socioeconomic measures indicate how societies progress, stagnate, or regress because of the actions and interactions within or between the local, regional, or global economic scale. Transmission line projects can contribute to growth and progress at the local level over time, but generally do not have a significant socioeconomic impact.

The project would improve the socioeconomics of the region through the creation of jobs, generation of tax revenue, and providing more reliable electrical service to the surrounding communities. Alignment alternatives AA8 and AA9 intersect the city of Riverton, which is identified as an EJC. No adverse or permanent impacts to the identified communities with EJC are anticipated. While alignment alternatives AA8 and AA9 intersect an EJC, this community is not anticipated to experience disproportionately adverse impacts as a result of the project.

6.3.8.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no agricultural lands, forestry resources, or active mining operations within the rights-of-way of alignment alternatives AA8 and AA9 or the applicants' equivalent. As a result, potential impacts to agriculture, forestry, and mining would be minimal and independent of the route selected.

6.3.8.2.1 Recreation and Tourism

Recreation and tourism opportunities within the Cole Lake-Riverton region include outdoor recreational activities and camping opportunities on state managed lands, various trails, and scenic byways. Since transmission line construction and operation generally has minimal permanent and temporary impacts to trails, recreation, and tourism, project impacts in this region are expected to be minimal where it parallels existing ROWs.

Alignment alternatives AA8 and AA9 border the Cuyuna Country State Recreation Area, though both alignment alternatives parallel a roadway for the majority of their lengths, which has already created disturbance in the vicinity of recreational resources. In comparison, the applicants' equivalent in this area does not contain any recreation or tourism resources (Map Book 5C). Permanent impacts as a result of all of the alignment alternatives could include increased noise due to transmission line operation and a reduction in aesthetic value (Chapter 5.8.4.1). Temporary interruptions in recreational opportunities within the Cuyuna Country State Recreation Area are expected to have a minimal impact on recreation.

6.3.8.3 Archaeological and Historic Resources

Two previously documented historic architectural resources are located within the 1,000-foot route width of alignment alternatives AA8, AA9, and the applicants' equivalent (Table 6-86), as shown on Map Book 5F.

Table 6-86 Cultural Resources within the Route Width of Alignment Alternatives AA8, AA9, and the Applicants' Equivalent

Resource Number	Resource Type	NRHP Eligibility	Location
CW-XXX-00001	Cuyuna Iron Range Historic Mining Landscape District	Eligible	alignment alternative AA8; alignment alternative AA9; applicants' equivalent
XX-ROD-00153	Trunk Highway 210	Not Eligible	alignment alternative AA8; alignment alternative AA9; applicants' equivalent

As XX-ROD-00153 is not eligible for the NRHP and, therefore, cannot be adversely affected by the project, it is not discussed further. Resource CW-XXX-00001 consists of the Cuyuna Iron Range Historic Mining landscape. The route width of all three routing alternatives crosses a portion of this resource and at a location where an existing transmission line or other infrastructure is not present. As a result, the routing alternatives have the potential to alter that resource's setting, feeling, appearance, and/or association.

The primary means to minimize impacts to cultural resources is prudent routing or structure placement (i.e., avoiding known archaeological and historic resources). If they cannot be avoided, impacts to these resources could be mitigated by measures developed in consultation with the SHPO prior to construction. Based on the above discussion, alignment alternatives AA8, AA9, and the applicants' equivalent each have the potential to impact the same NRHP-eligible cultural resource in the same way.

6.3.8.4 Natural Environment

6.3.8.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-19 shows the water resources along alignment alternatives AA8 and AA9, as well as the applicants' equivalent.

6.3.8.4.1.1 Watercourses and Waterbodies

Table 6-87 identifies the watercourses and waterbodies crossed by alignment alternatives AA8 and AA9 and the applicants' equivalent. Alignment alternatives AA8 and AA9 would have similar watercourse and waterbodies impacts.

Table 6-87 Watercourses and Waterbodies Crossed by Alignment Alternative AA8 and AA9

Resources	Alignment Alternative AA8	Alignment Alternative AA9	Applicants' Equivalent
Number of NHD stream crossings	2	2	2
Number of impaired streams crossings	0	0	0
Number PWI stream crossings	1	1	1
Number of NHD lake crossings	2	2	2
Number of impaired lake crossings	0	0	0
Number of PWI basin crossings	1	1	0

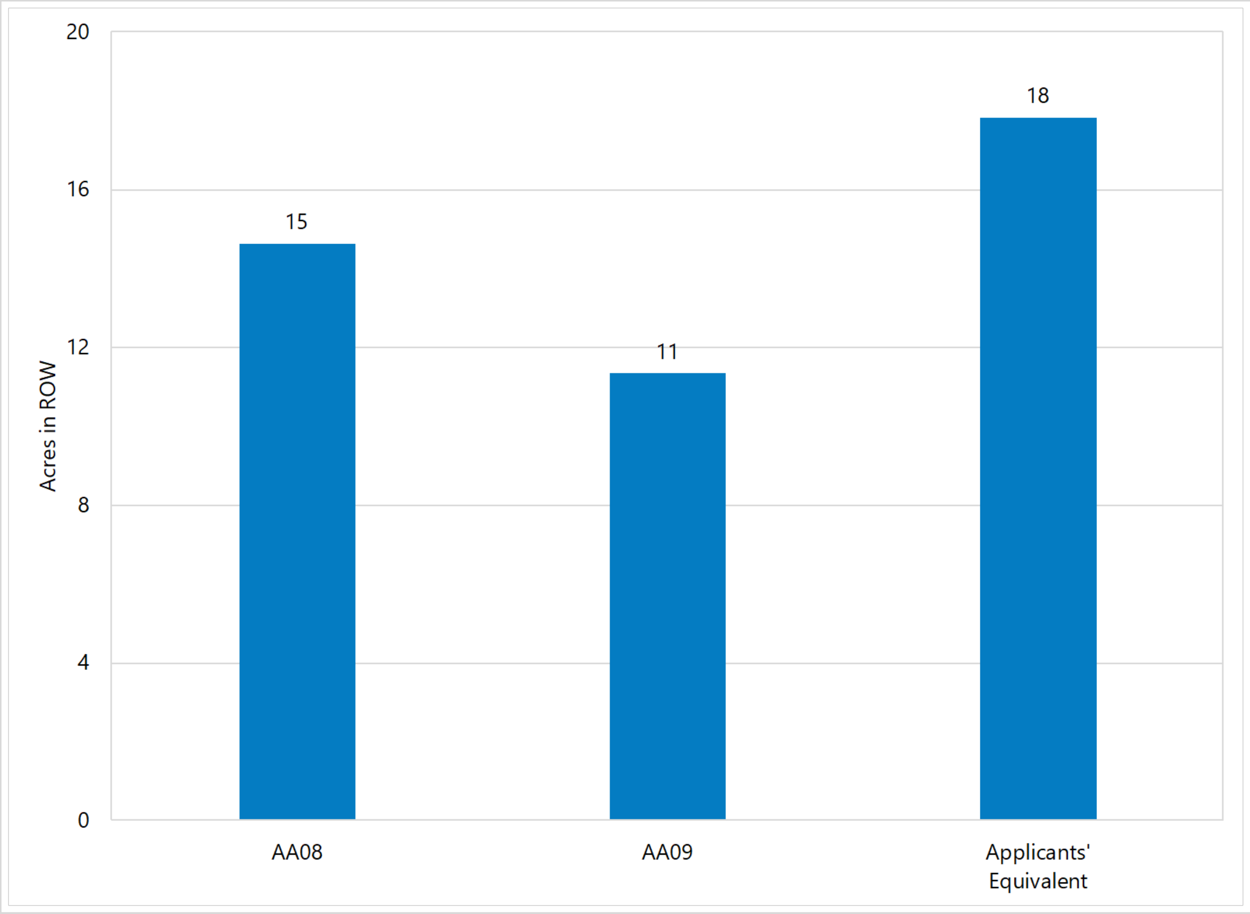
6.3.8.4.1.2 Wetlands

Table 6-83 identifies the acreage of wetlands crossed by alignment alternatives AA8 and AA9 and the applicants' equivalent. The applicants' equivalent would cross more forested wetlands (14 acres) than alignment alternatives AA8 and AA9 (5 acres or less). The applicants' equivalent would have one wetland crossing over 1,000 feet, which would require placing one or more transmission structures in wetland. Alignment alternatives AA8 and AA9 would not have any wetland crossing over 1,000 feet and would be able to be spanned. The applicants' equivalent would cross one PWI wetland.

6.3.8.4.2 Vegetation

The ROW of the applicants' equivalent would impact more forested vegetation than alignment alternatives AA8 and AA9 (Figure 6-10). In addition, the applicants' equivalent would not parallel any existing transmission line or road rights-of-way, resulting in forest fragmentation. Alignment alternatives AA8 and AA9 would parallel an existing road corridor for at least 90 percent of their lengths, thereby minimizing impacts associated with forest fragmentation. Alignment alternatives AA8 and AA9 would result in the least amount of impact to forested vegetation.

Figure 6-10 Forested Vegetation in the ROW of Alignment Alternative AA8, AA9, and the Applicants' Equivalent



6.3.8.4.3 *Wildlife*

Impacts to wildlife habitat would occur for alignment alternatives AA8, AA9, and the applicants' equivalent as a result of removal of forested habitat in the ROW, with the applicants' equivalent impacting the most forested habitat and resulting in the most habitat fragmentation because it does not parallel any existing transmission line or road rights-of-way. Neither alignment alternative or the applicants' equivalent would traverse areas that are managed or preserved for wildlife. Alignment alternatives AA8 and AA9 would have the least amount of impact to wildlife and associated habitat.

6.3.8.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federally protected species have been documented within 1 mile of alignment alternatives AA8, AA9, or the applicants' equivalent. Two state protected species have been documented within 1 mile of alignment alternatives AA8, AA9, and the applicants' equivalent, neither species has documented within the ROW or route width of these alternatives (Appendix N). Several state special concern species have been documented within 1 mile of all alignment alternatives AA8, AA9, and the applicants' equivalent (Appendix N).

The ROW of alignment alternative AA9 would intersect approximately 6 acres of the edge of a native plant community while paralleling a road corridor (Map 6-19). The ROW of alignment alternative AA8 and the applicants' equivalent would not intersect sensitive ecological resources.

6.3.8.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.3.8.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-80). Alignment alternatives AA8, AA9, and the applicants' equivalent are very similar in cost, with no additional structure costs anticipated for any of these route alternatives. Alignment alternative AA8 is anticipated to cost approximately $8.7 million, alignment alternative AA9 is anticipated to cost approximately $8.6 million, and the applicants' equivalent is anticipated to cost approximately $9.1 million, making alignment alternative AA9 the least expensive option.

6.3.9 Alignment Alternative AA10 - Cole Lake-Riverton Region

Alignment alternative AA10 provides an alternative placement of the applicants' proposed alignment in the southern part of the Cole Lake-Riverton region. Alignment alternative AA10 is shifted north and west of the applicants' alignment to avoid impacts to private land. Alignment alternative AA10 would share an existing transmission line ROW for a small portion of its length (approximately 0.25 mile). Potential impacts of alignment alternative AA10 and the applicants' equivalent are summarized in Table 6-88 and shown on Map 6-16.

Table 6-88 Human and Environmental Impacts – Alignment Alternative AA10, Cole Lake-Riverton Region

Resource	Element	Alignment Alternative AA10	Applicants' Equivalent
Length (miles)		0.9	0.9
Human Settlement	Residences within 0-75 feet (count)	0	1
	Residences within 75-250 feet (count)	1	0
	Residences within 250-500 feet (count)	0	4
	Residences within 500–1,000 feet (count)	10	5
Land-Based Economies	Agricultural land in 150-ft ROW	2	1
Water Resources	Total wetlands in 150-foot ROW (acres)	5	5
	Forested wetlands in 150-ft ROW (acres)	0	0
Vegetation	Forested landcover in 150-foot ROW (acres)	8	7
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	6	12
	Native Plant Communities in 150-foot ROW (acres)	2	8
	Federal- or state-protected species documented in 150-foot ROW (count)	1	1
ROW Sharing and Paralleling	Transmission line (miles, percent)	0.3 (31)	0 (0)
	Roadway (miles, percent)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	0.6 (69)	0.9 (100)
	Total ROW sharing and paralleling (miles, percent)	0.9 (100)	0.9 (100)
Reliability	Crossing of existing transmission lines (count)	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$4.7	$4.8

6.3.9.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources, which are discussed exclusively in Chapter 5.3, include cultural values, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.3.9.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to alignment alternative AA10 are shown in Table 6-89, while ROW paralleling and sharing are shown in Table 6-90.

While the applicant's equivalent has one less residence within 1,000 feet compared to alignment alternative AA10, it has more residences within 500 feet. Alignment alternative AA10 minimizes new aesthetic impacts by paralleling existing transmission line ROW for a portion of its length, while the applicants' equivalent does not. Both alternatives are routed along field, parcel, or section lines for the remainder of their lengths. Based on the number of residences within 500 feet and the paralleling of existing transmission line ROW, alignment alternative AA10 minimizes aesthetic impacts to a greater extent than the applicants' equivalent.

Table 6-89 Cole Lake-Riverton Region Proximity of Residences to Alignment Alternative AA10

Residences, Distance from Anticipated Alignment	Alignment Alternative AA10	Applicants' Equivalent
Residences within 0-75 feet	0	1
Residences within 75-250 feet	1	0
Residences within 250-500 feet	0	4
Residences within 500-1,000 feet	10	5
Total Residences within 1,000 feet	11	10

Table 6-90 Cole Lake-Riverton Region ROW Sharing and Paralleling of Alignment Alternative AA10

Infrastructure	Alignment Alternative AA10 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)
Follows Existing Transmission Line	0.3 (31)	0 (0)
Total – Follows Transmission Line, Road, or Railroad	0.3 (31)	0 (0)
Follows Field, Parcel, or Section Lines	0.6 (69)	0.9 (100)
Total – ROW Paralleling and Sharing	0.9 (100)	0.9 (100)
Total Length of Alignment Alternative	0.9	0.9

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.3.9.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW, due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no churches, childcare centers, or schools located within the 150-foot ROW for the applicants' equivalent. However, there is one permanent residential building and one non-residential building (storage shed, agricultural outbuildings, etc.) located within the 150-foot ROW of the applicants' equivalent.

The residential building located within the 150-foot ROW of the applicants' equivalent could potentially be displaced as a result of the project. Similarly, the non-residential building may or may not be displaced as a result of the applicants' equivalent. Though buildings are generally not allowed with the ROW of a transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For each of the buildings noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.3.9.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements, summarized in Chapter 6.1.1. There are no agricultural lands, forestry resources, or active mining operations within the rights-of-way of alignment alternative AA10 or the applicants' equivalent. Additionally, there are few recreation and tourism opportunities, and these opportunities do not differ between alignment alternative AA10 or the applicants' equivalent. As a result, potential impacts to land-based economies would be minimal and independent of the route selected.

6.3.9.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the 1,000-foot route width of alignment alternative AA10 or the applicants' equivalent. As a result, impacts to cultural resources are anticipated to be minimal and independent of the route selected.

6.3.9.4 Natural Environment

6.3.9.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-16 shows the water resources along alignment alternative AA10 and the applicants' equivalent.

6.3.9.4.1.1 Watercourses and Waterbodies

Alignment alternative AA10 and the applicants' equivalent would not cross any watercourses or waterbodies.

6.3.9.4.1.2 Wetlands

Table 6-88 identifies the acreage of wetlands crossed by alignment alternative AA10 and the applicants' equivalent. Alignment alternative AA10 and the applicants' equivalent have the same amount of wetland in their rights-of-way (5 acres) and do not cross forested wetland. In addition, the alignment alternative AA10 and the applicants' equivalent would not have a wetland crossing longer than 1,000 feet, meaning all wetland areas would be spanned.

6.3.9.4.2 Vegetation

The ROW of the alignment alternative AA10 and the applicants' equivalent would impact 7 to 8 acres of forested vegetation. However, the applicants' equivalent would fragment more forest, as it traverses the middle of a forested area, while alignment alternative AA10 would traverse the edge of forested areas. In addition, alignment alternative AA10 would also parallel an existing transmission line for 30 percent of its length, while the applicants' equivalent would not parallel any transmission line ROW.

6.3.9.4.3 Wildlife

Impacts to wildlife habitat would occur for alignment alternative AA10 and the applicants' equivalent as a result of removal of forested habitat in the ROW, with the applicants' equivalent resulting in the most habitat fragmentation because it does not parallel any existing transmission line or road ROW. As a result, the applicants' equivalent could pose an increased potential for impacts to avian species; however, as discussed in Chapter 5.10.5.2, these impacts can be minimized through use of bird flight diverters. Neither alignment alternative AA10 or the applicants' equivalent would traverse areas that are managed or preserved for wildlife.

6.3.9.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federally protected species have been documented within 1 mile of alignment alternative AA10 or the applicants' equivalent. One state protected species, the Blanding's turtle has been documented within the ROW of alignment alternative AA10 and the applicants' equivalent (Appendix N).

The ROW of alignment alternative AA10 and the applicants' equivalent would intersect an SBS ranked high and native plant communities, with the applicants' equivalent intersecting significantly more acreage of both resources (Table 6-91; Map 6-16).

Table 6-91 Sensitive Ecological Resources in the ROW of Alignment Alternative AA10 and the Applicants' Equivalent

Sensitive Ecological Resource	Area within ROW of AA10	Area within ROW of Applicants' Equivalent
Sites of Biodiversity Significance	6 acres - ranked high	12 acres - ranked high
Native Plant Communities	2 acres - conservation status S3-S5	8 acres - conservation status S3-S5

6.3.9.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.3.9.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-88). Alignment alternative AA10 and the applicants' equivalent are each very similar in cost, with no additional structure costs anticipated for these route alternatives. Alignment alternative AA10 is anticipated to cost approximately $4.7 million and the applicants' equivalent is anticipated to cost approximately $4.8 million, making alignment alternative AA10 slightly less expensive.

6.4 Long Lake Region

The Long Lake region is located in the central part of the project, in Crow Wing County (Figure 6-11). In addition to the applicants' proposed route, the region has eight route alternatives (H1, H2, H3, H4, H5, H6, H7, and K) and four alignment alternatives (AA12, AA13, AA14, and AA17) (Map Book 3A). Chapter 6.4.1 summarizes the potential impacts resulting from construction and operation of the applicants' proposed route in the Long Lake region. Chapter 6.4.2 provides a comparison of the potential impacts resulting from construction and operation of route alternatives H1, H2, H3, H4, H5, H6, H7, and the applicants' equivalent. Chapter 6.4.3 provides a comparison of the potential impacts resulting from construction and operation of route alternative K and the applicants' equivalent. Chapter 6.4.4 provides a comparison of the potential impacts resulting from construction and operation of alignment alternative AA12 and the applicants' equivalent. Chapter 6.4.5 provides a comparison of the potential impacts resulting from construction and operation of alignment alternative AA13 and the applicants' equivalent. Chapter 6.4.6 provides a comparison of the potential impacts resulting from

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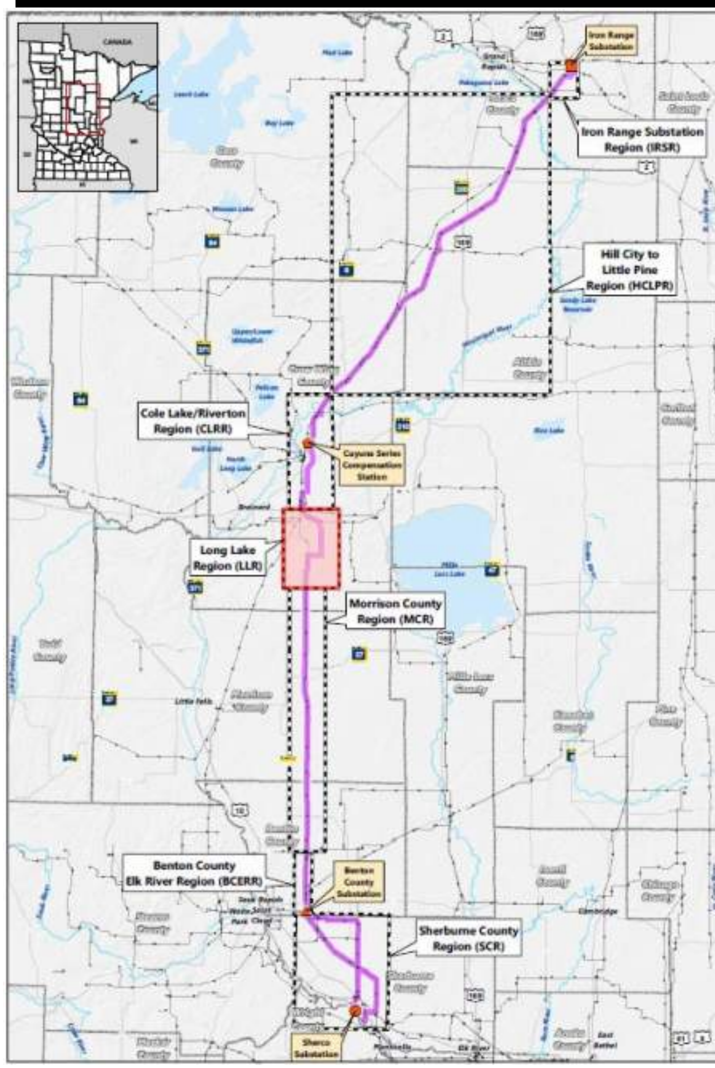


construction and operation of alignment alternative AA14 and the applicants' equivalent. Chapter 6.4.7 provides a comparison of the potential impacts resulting from construction and operation of alignment alternative AA17 and the applicants' equivalent.

6.4.1 Applicants' Proposed Route – Long Lake Region

Potential impacts of the applicants' proposed route in the Long Lake region are summarized in Table 6-92Table 6-1 and discussed in Chapters 6.4.1.1 through 6.4.1.5.

Table 6-92 Human and Environmental Impacts – Applicants' Proposed Route, Long Lake Region

Resource	Element	Applicants' Proposed Route
Length (miles)		14.3
Human Settlement	Residences within 0-75 feet (count)	0
	Residences within 75-250 feet (count)	3
	Residences within 250-500 feet (count)	4
	Residences within 500–1,000 feet (count)	22
Land-Based Economies	Agricultural land in 150-foot ROW	52
Water Resources	Total wetlands in 150-foot ROW (acres)	104
	Forested wetlands in 150-foot ROW (acres)	7
Vegetation	Forested landcover in 150-foot ROW (acres)	126
Wildlife	Grassland Bird Conservation Area in 150-foot ROW (acres)	84
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	114
	Federal- or state-protected species documented in 150-foot ROW (count)	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	7.4 (52)
	Roadway (miles, percent)	0 (0)
	Field, parcel, or section lines (miles, percent)	8.9 (62)
	Total ROW sharing and paralleling (miles, percent)	13.7 (96)
Estimated Cost	Total estimated cost (2022 dollars in millions)	$70.6

6.4.1.1 Human Settlements

As discussed in Chapter 5.3, potential human settlement impacts were assessed by looking at several human settlement evaluation elements: aesthetics, displacement, noise, property values, zoning and land-use compatibility, electronic interference, and cultural values. Proximity to homes, schools, and other human settlement features and the extent of ROW sharing with existing infrastructure are the primary indicators of potential human settlement impacts. Human settlement impacts are minimized by routes that are located aware from homes and that share ROW with existing infrastructure.

For some of the human settlement elements in the Long Lake region, project impacts are anticipated to be minimal. For the Long Lake region, aesthetics is the only human settlement element for which impacts are anticipated to be non-minimal.

6.4.1.1.1 Aesthetics

Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed route alternative would change these aesthetic attributes (Chapter 5.3.1). Determining the relative scenic value or visual importance in any given area depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure ROW. The proximity of the applicants' proposed route to residences is shown in Table 6-93. The sharing and paralleling of existing infrastructure ROW is shown in Table 6-94. Approximately half of the applicants' proposed route in the Long Lake Region would follow existing infrastructure ROW

Table 6-93 Long Lake Region Proximity of Residences to Applicants' Proposed Route

Residences, Distance from Anticipated Alignment	Applicants' Proposed Route
Residences within 0-75 feet	0
Residences within 75-250 feet	3
Residences within 250-500 feet	4
Residences within 500-1,000 feet	22
Total Residences within 1,000 feet	29

Table 6-94 Long Lake Region ROW Sharing and Paralleling of Applicants' Proposed Route

Infrastructure	Applicants' Proposed Route miles (percent)
Follows Existing Railroad	0 (0)
Follows Existing Roads	0 (0)
Follows Existing Transmission Line	7.4 (52)
Total – Follows Transmission Line, Road, or Railroad	7.4 (52)
Follows Field, Parcel, or Section Lines	8.9 (62)
Total – ROW Paralleling and Sharing	13.7 (96)
Total Length of Alternative	14.3

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.4.1.2 Land-Based Economies

As discussed in Chapter 5.8, impacts on land-based economies are assessed by considering four elements: agriculture, forestry, mining, and recreation and tourism. For some of the elements of land-based economies in the Long Lake region, impacts from the project are anticipated to be minimal.

For the Long Lake region, agriculture, forestry, and recreation and tourism are the only elements of land-based economies for which impacts are anticipated to be non-minimal. There are no active mining operations within ROW of the applicants' proposed route. As a result, potential project impacts to mining would be minimal.

6.4.1.2.1 Agriculture

Project impacts to agriculture within the Long Lake region were evaluated through land use and soil types within the 150-foot ROW of the applicants proposed route. Map Book 5C provides an overview of land cover types crossed by the applicants' proposed route. Approximately 52 acres of the applicants' proposed route ROW (20 percent of the ROW in this region) consists of agricultural land comprised of cultivated crops and hay/pasture lands.

According to the MDA Organic Farm Directory, no registered organic producers are within the 150-foot ROW (reference (105)). According to the Minnesota Apiary Registry, no apiaries are located within the ROW (reference (106)). In addition, no agricultural lands are enrolled in the USDA FSA CREP program within the 150-foot ROW (reference (107)).

Potential construction and operation-related impacts to agricultural land are summarized in Chapter 5.8.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to agricultural land, as described in Chapter 5.8.1.1.

6.4.1.2.2 Forestry

Impacts to forestry within the Long Lake region were primarily assessed by evaluating the designated forestry resources within the 150-foot ROW (Chapter 5.8.2). Approximately 126 acres of the applicants' proposed route ROW consists of forested land (reference (108)) comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands (Map Book 5C).

The only designated forestry resources within the ROW of the applicants' proposed route are 16 acres of Minnesota School Trust land. Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4)).

On whole, there are minimal potential impacts to designated forestry resources within the ROW of the applicants' proposed route. Vegetation clearing would include permanently removing trees from the ROW before construction. These physical impacts to forestry resources may result in negative financial impacts to state-owned forest lands and privately-owned commercial forest lands. As noted in Chapter 5.8.2.1, impacts to forestry resources could be mitigated by prudent routing and siting of staging areas. Where these areas cannot be avoided, commercial foresters and private landowners would be compensated for loss of timber from ROW clearing.

6.4.1.2.3 Recreation and Tourism

Recreation and tourism opportunities within the Long Lake region consist primarily of trail usage, including off-road vehicle trails and snowmobile trails. Since transmission line construction and operation generally has minimal permanent and temporary impacts to trails, recreation, and tourism, project impacts in this region are expected to be minimal.

The applicants' proposed route contains one off-road vehicle trail crossing and six snowmobile trail crossings (Map Book 5E). The applicants' proposed route parallels an existing transmission line ROW for approximately half of the route, reducing potential permanent impacts associated with operational noise and reduced aesthetic values (Chapter 5.8.4.1). Temporary impacts including trail closings during construction would occur but are expected to have a minimal impact on recreation.

6.4.1.3 Archaeological and Historic Resources

Archaeological and historic resource impacts are assessed by determining the presence of these resources within the project route width (Chapter 5.1.1). Map Book 5F provides an overview of archaeological and historic architectural resources in the Long Lake Region.

One previously documented historic architectural resource is located within the 1,000-ft route width of the applicants' proposed route (Table 6-95). Resource XX-ROD-00017, Trunk Highway 18, has been previously determined not eligible for the NRHP. Because this resource has been determined "not eligible", it cannot be adversely affected by the project and no additional work regarding this resource would be necessary.

Table 6-95 Cultural Resources within the Route Width of the Applicants' Proposed Route, Long Lake Region

Resource Number	Resource Type	NRHP Eligibility
XX-ROD-00017	Trunk Highway 18	Not Eligible

6.4.1.4 Natural Environment

6.4.1.4.1 Water Resources

Potential project impacts on water resources are examined by evaluating locations and conditions of watercourses and waterbodies, floodplains, wetlands, and groundwater. Project proximity to water bodies, watercourses, floodplains, wetlands, and groundwater wells and the necessity of crossing these features are the primary indicators of potential water resource impacts. Impacts to two elements of water resources, floodplains and groundwater, are anticipated to be minimal.

There are two water resource features where project impacts could be non-minimal: watercourses and waterbodies, and wetlands. This discussion focuses on those water resource features within the ROW or crossed by the routing alternatives. The number of surface water and wetland crossings is an important consideration when evaluating routes, even though there may be no direct impacts associated with these crossings. The crossings are important because of the potential indirect impacts associated with them (i.e., clearing of vegetation, soil movement). The amount of forested wetland within the ROW is also an important consideration when evaluating routes. Since large-growing woody vegetation would be cleared from the ROW, forested wetlands would be converted to other wetland types, resulting in permanent impacts. Map Book 5G shows the water resources along the applicants proposed route.

6.4.1.4.1.1 Watercourses and Waterbodies

According to the NHD, the applicants' proposed route would cross seven watercourses in the Long Lake region, including one public water watercourses (Nokasippi River) and two impaired streams: the Nokasippi River and an unnamed creek. The applicants' proposed route would also cross two NHD waterbodies, one of which is classified as impaired. The applicants' proposed route would not cross any public water basins in the Long Lake region.

It is anticipated that the watercourse and waterbodies would be spanned. Since no structures are anticipated to be placed within watercourses or waterbodies, no direct impacts to these resources are anticipated. Indirect impacts to these resources, such as increases in turbidity, could be minimized by using BMPs and by choosing a route alternative that has relatively fewer crossings of waterbodies and watercourses.

6.4.1.4.1.2 Wetlands

The applicants' proposed route cross approximately 104 acres of NWI wetlands in the Long Lake region. The NWI wetlands consist mainly of emergent wetlands (60 acres), shrub wetlands (35 acres), and forested wetlands (7 acres). The remaining area consists of 1 acre of ponded and riverine wetlands. There no PWI wetlands along the applicants' proposed route in the Long Lake region.

Although wetlands would be spanned to the extent possible, the applicants proposed route would cross several wetland areas wider than 1,000 feet, which may require one or more structures to be placed in a wetland. Placement of structures in a wetland would result in permanent impacts to that wetland. Permanent impacts to wetlands could also occur if wetlands in the ROW are forested. Forested wetlands would be converted to non-forested wetland types, as trees are not allowed within transmission line rights-of-way. Impacts associated with converting forested wetlands to non-forested wetland types could be minimized by selecting a route alternative with fewer forested wetlands in the ROW.

6.4.1.4.2 Vegetation

Vegetation impacts were evaluated by examining vegetative landcover within the 150-foot ROW (Chapter 5.10.4.1). Map Book 5C provides an overview of vegetative cover in the Long Lake region, and Table 6-96 summarizes the landcover types within the ROW of the applicants' proposed route within this region. The dominant vegetative landcover in the ROW of the applicants' proposed route in this region consists of forest, which represents approximately 48 percent of the ROW. Forest types include forested wetlands and upland deciduous, coniferous, and mixed forest communities.

Table 6-96 Landcover Types in the 150-foot ROW of the Applicants' Proposed Route in the Long Lake Region

Landcover Type	Acres in ROW	Percent of ROW[1]
Forested (upland and wetland)	126	48
Herbaceous (upland and wetland)	75	29
Agricultural (cultivated crops and hay/pasture)	52	20
Developed (low-high intensity; open space)	4	1
Shrub/Scrub	3	1
Open Water	<1	<1

Source: reference (110).
1 Totals may not sum to 100 percent due to rounding.

As discussed in Chapter 5.10.4.1, the applicants would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation to minimize potential interference with the transmission line. Approximately 52 percent of the applicants' proposed route in the Long Lake region would parallel an existing transmission line ROW where the forested areas have already been fragmented, thereby minimizing new impacts to forest vegetation in these areas.

6.4.1.4.3 Wildlife

Impacts to wildlife are primarily assessed by evaluating the presence of wildlife habitat, including areas that are preserved or managed for wildlife habitat, within the ROW. The applicants' proposed route in the Long Lake region would parallel an existing transmission line ROW for approximately 52 percent of its length. In these areas, the ROW of the applicants' proposed route would be placed adjacent to an area where wildlife habitat has been previously disturbed, thereby minimizing potential impacts associated with habitat fragmentation. In areas where the applicants' proposed route does not parallel an existing transmission line ROW, impacts to wildlife habitat could occur from conversion, fragmentation, or placement of structures. In addition, there would be increased potential for impacts to avian species in areas where the applicants' proposed route does not parallel an existing transmission line ROW.

The applicants' proposed route would traverse approximately 84 acres of USFWS GBCA (Map Book 5H). While the majority of these GBCA would be traversed by paralleling an existing transmission line ROW, the ROW of the applicants' proposed route would require the establishment of new transmission line ROW through approximately 19 acres of GBCA. This would result in fragmentation of wildlife habitat within these areas, as well as create an increased potential for impacts to avian species in this area. However, as discussed in Chapter 5.10.5.2, avian impacts can be minimized through use of bird flight diverters.

Potential construction and operation-related impacts to wildlife are summarized in Chapter 5.10.5. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife, as described in Chapter 5.10.5.

6.4.1.5 Rare and Unique Natural Resources

Impacts to rare and unique natural resources are primarily assessed by evaluating the presence of federal- and state-protected species within a 1-mile radius of the anticipated alignments and the presence of sensitive ecological resources within the 150-foot ROW (Chapter 5.10). Map Book 5I provides an overview of sensitive ecological resources within the Long Lake region; in order to protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

6.4.1.5.1 Protected Species

Using the NHIS database, it was determined that no federal- or state-protected species or state special concern species have been documented within 1 mile of the applicants' proposed route in the Long Lake region. Formal surveys for protected species have not been conducted for the project; as such, it is possible that protected species could be present where suitable habitat is available within the ROW. Potential impacts to protected species could occur should they be present within or near the ROW. While more mobile species would leave the area for nearby comparable habitats, non-mobile organisms, such as vascular plants or nesting birds, could be directly impacted.

Potential construction and operation-related impacts to protected species are summarized in Chapter 5.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species, as described in Chapter 5.11.1.3. In addition, the applicants may be required to conduct field surveys for protected species in coordination with the USFWS and/or DNR prior to construction.

6.4.1.5.2 Sensitive Ecological Resources

The ROW of the applicants' proposed route in the Long Lake region would traverse approximately 114 acres of SBS ranked high, approximately 20 acres of which would traverse the SBS while paralleling an existing transmission line ROW (Map Book 5I). As such, new impacts to approximately 94 acres SBS would occur as a result of establishing a new transmission line ROW through the SBS. In addition, because the SBS is too large to span, transmission line structures would need to be placed within it.

Potential construction and operation-related impacts to sensitive ecological resources are summarized in Chapter 5.11.2.1 and 5.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to sensitive ecological resources, as described in Chapter 5.11.2.1. In addition, the applicants may be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species within sensitive ecological resources that cannot be avoided.

6.4.2 Route Alternatives H1 through H7 – Long Lake Region

Route alternatives H1 through H7 provide different options to the applicants' proposed route in the northern half of the Long Lake region. Route alternatives H1 and H2 are shifted from the applicants' proposed route to avoid impacts to an AMA; however, as noted in Chapter 5.10.5, recent data from the DNR website and the latest spatial data downloaded in March 2024 from Minnesota Geospatial Commons do not list any AMA's within the ROW of the applicants' proposed route.

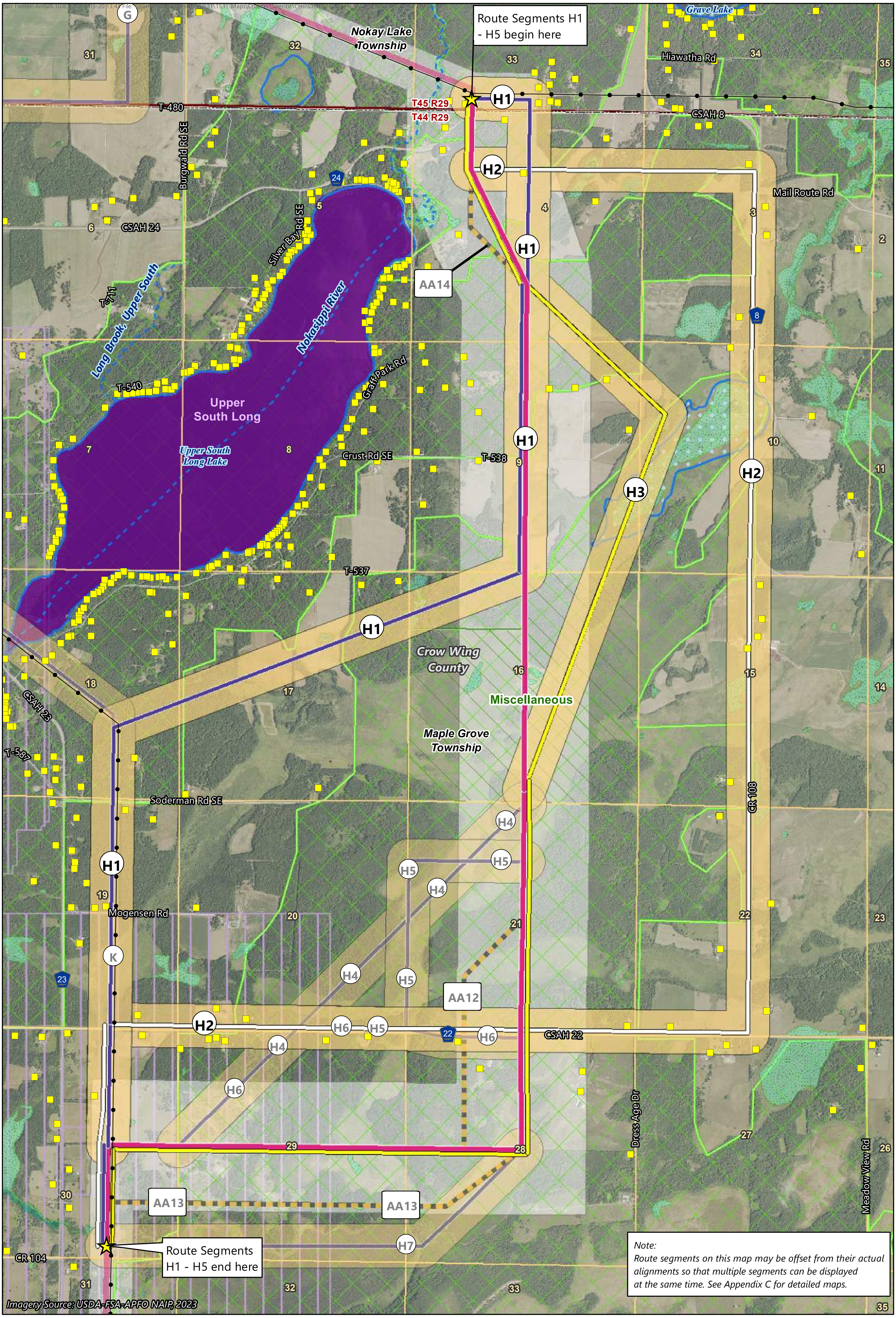
Route alternative H1 would parallel an existing transmission line ROW for approximately one-third of its length, while route alternative H2 would parallel existing transmission line ROW for approximately one-sixteenth of its length. Route alternative H3 is shifted from the applicants' proposed route to avoid impacts to private property enrolled in a state program. It does not include any transmission line ROW sharing, paralleling, or double-circuiting. Route alternative H4 is shifted from the applicants' proposed route to go through tax-forfeited land instead of private property and also does not include any transmission line ROW sharing, paralleling, or double-circuiting. Route alternatives H5, H6, and H7 are shifted from the applicants' proposed route to avoid impacts to private property and natural resources, and do not include any transmission line ROW sharing, paralleling, or double-circuiting. Potential impacts of the route alternatives and the applicants' equivalent are summarized in Table 6-97 and shown on Map 6-20 and Map 6-21.

Table 6-97 Human and Environmental Impacts – Route Alternatives H1 through H7, Long Lake Region

Resource	Element	Route Alternative H1	Route Alternative H2	Route Alternative H3	Route Alternative H4	Route Alternative H5	Route Alternative H6	Route Alternative H7	Applicants' Equivalent
Length (miles)		6.5	9.0	7.2	6.0	6.5	6.6	6.6	6.8
Human Settlement	Residences within 0-75 feet (count)	0	1	0	0	0	0	0	0
	Residences within 75-250 feet (count)	4	10	1	1	2	3	1	1
	Residences within 250-500 feet (count)	7	19	1	0	1	1	0	0
	Residences within 500–1,000 feet (count)	25	17	11	12	11	12	8	10
Land-Based Economies	Agricultural land in 150-foot ROW	26	59	16	14	14	15	4	14
Water Resources	Total wetlands in 150-foot ROW (acres)	25	31	54	42	48	38	65	47
	Forested wetlands in 150-foot ROW (acres)	<1	1	11	3	3	3	13	5
Vegetation	Forested landcover in 150-foot ROW (acres)	65	70	80	67	66	74	75	77
Wildlife	Grassland Bird Conservation Area in 150-foot ROW (acres)	26	35	26	31	30	30	18	26
	Shallow Wildlife Lake in 150-foot ROW (acres)	0	4	6	0	0	0	0	0

Resource	Element	Route Alternative H1	Route Alternative H2	Route Alternative H3	Route Alternative H4	Route Alternative H5	Route Alternative H6	Route Alternative H7	Applicants' Equivalent
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	55	65	107	79	90	90	100	95
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0	0	0	0	0	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	2.5 (39)	1.0 (11)	0.4 (6)	0.4 (7)	0.4 (7)	0.4 (7)	0 (0)	0.4 (6)
	Roadway (miles, percent)	0 (0)	2.8 (31)	0 (0)	0 (0)	0.5 (7)	1.0 (15)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	2.2 (34)	8.2 (91)	3.7 (51)	2.9 (48)	4.8 (74)	4.8 (74)	4.1 (62)	5.8 (85)
	Total ROW sharing and paralleling (miles, percent)	4.5 (70)	9.0 (100)	4.1 (57)	3.3 (55)	5.2 (80)	5.3 (80)	4.1 (62)	6.3 (92)
Reliability	Crossing of existing transmission lines (count)	0	0	0	0	0	0	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$31.9	$45.2[1]	$36.4[2]	$30.3[3]	$35.3[4]	$34.7[5]	$33.3[6]	$33.9

1 One heavy-angle structure would be needed for an additional cost of approximately $740,000 ($44.4 million base cost).
2 One heavy-angle structure would be needed for an additional cost of approximately $740,000 ($35.6 million base cost).
3 One heavy-angle structure would be needed for an additional cost of approximately $740,000 ($32.3 million base cost).
4 Four heavy-angle structures would be needed for an additional cost of approximately $740,000 per structure ($32.3 million base cost).
5 Three heavy-angle structures would be needed for an additional cost of approximately $740,000 per structure ($32.5 million base cost).
6 One heavy-angle structure would be needed for an additional cost of approximately $740,000 ($32.5 million base cost).



Route Segment H1
Route Segment H2
Route Segment H3
Applicants' Route H Equivalent
Route Width
Route Alternative Width
Existing Transmission Line
Residence
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Grassland Bird Conservation Areas
Other DNR Land

Lakes of Biological Significance

Outstanding Significance

Wetlands

Non-Forested Wetland

Forested Wetland

Site of Biodiversity Significance

Moderate Significance

N

Feet

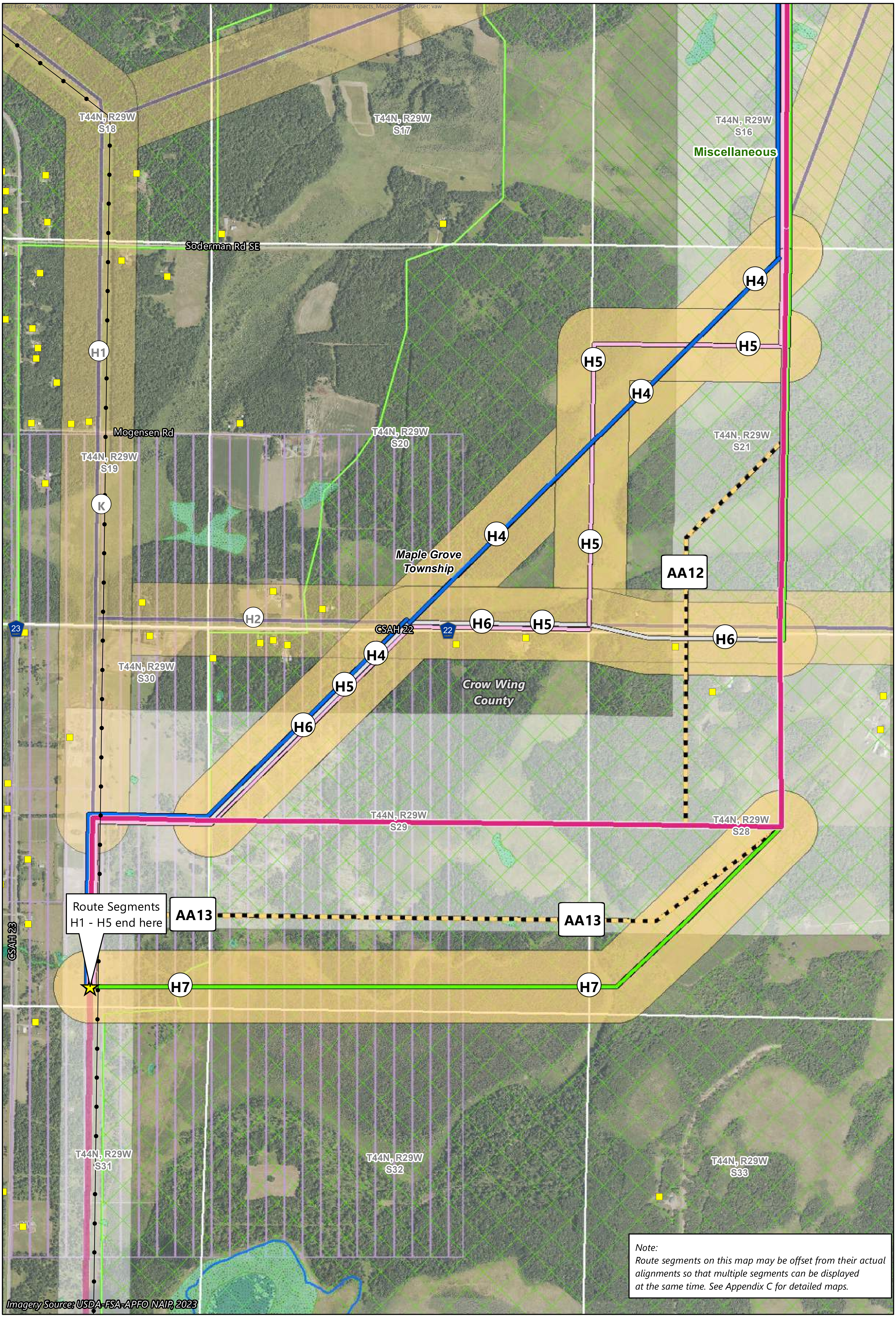
0 1,000 2,000

Map 6-20

ROUTE ALTERNATIVES H1 - H3

Long Lake Region

Northland Reliability Project



Route Segment H4
Route Segment H5
Route Segment H6
Route Segment H7
Applicants' Route H Equivalent
Alignment Alternative 12
Alignment Alternative 13
Route Width
Route Alternative Width
Existing Transmission Line
Residence
PWI Waterbody
Grassland Bird Conservation Areas
Other DNR Land

Wetlands

Non-Forested Wetland
Forested Wetland

Site of Biodiversity Significance

Moderate Significance

Feet
0 600 1,200

Map 6-21

ROUTE ALTERNATIVES H4 - H7 AND ALIGNMENT ALTERNATIVES AA12 AND AA13

Long Lake Region
Northland Reliability Project

6.4.2.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of these human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These elements include cultural values, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.4.2.1.1 Aesthetics

Aesthetic impacts vary by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternatives H1 through H7 and the applicants' equivalent are shown in Table 6-98, while ROW paralleling and sharing are shown in Table 6-99.

Route alternatives H1 and H2 have more than double the number of residences in proximity to them compared to the other route alternatives, with route alternative H1 also having one residence in its ROW. Route alternative H7 is near the fewest number of residences. While route alternatives H1 and H2 have the most residences in proximity, they also have the greatest opportunity to follow existing infrastructure ROW (approximately 40 percent of the lengths of each). Route alternatives H3, H4, and the applicants' equivalent would follow very little existing infrastructure; route alternative H7 would not follow any infrastructure ROW. No route alternative best minimizes aesthetic impacts; the alternatives that share the most ROW with existing infrastructure also have the most homes in proximity.

Table 6-98 Long Lake Region Proximity of Residences to Route Alternatives H1 through H7

Residences, Distance from Anticipated Alignment	Route Alternative H1	Route Alternative H2	Route Alternative H3	Route Alternative H4	Route Alternative H5	Route Alternative H6	Route Alternative H7	Applicants' Equivalent
Residences within 0-75 feet	0	1	0	0	0	0	0	0
Residences within 75-250 feet	4	10	1	1	2	3	1	1
Residences within 250-500 feet	7	19	1	0	1	1	0	0
Residences within 500-1,000 feet	25	17	11	12	11	12	8	10
Total Residences within 1,000 feet	36	47	13	13	14	16	9	11

Table 6-99 Long Lake Region ROW Sharing and Paralleling of Route Alternatives H1 through H7

Infrastructure	Route Alternative H1 miles (percent)	Route Alternative H2 miles (percent)	Route Alternative H3 miles (percent)	Route Alternative H4 miles (percent)	Route Alternative H5 miles (percent)	Route Alternative H6 miles (percent)	Route Alternative H7 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Follows Existing Roads	0 (0)	2.8 (31)	0 (0)	0 (0)	0.5 (7)	1.0 (15)	0 (0)	0 (0)
Follows Existing Transmission Line	2.5 (39)	1.0 (11)	0.4 (6)	0.4 (7)	0.4 (7)	0.4 (7)	0 (0)	0.4 (6)
Total – Follows Transmission Line, Road, or Railroad	2.5 (39)	3.7 (41)	0.5 (6)	0.4 (7)	0.9 (14)	1.4 (21)	0 (0)	0.5 (7)
Follows Field, Parcel, or Section Lines	2.2 (34)	8.2 (91)	3.7 (51)	2.9 (48)	4.8 (74)	4.8 (74)	4.1 (62)	5.8 (85)
Total – ROW Paralleling and Sharing	4.5 (70)	9.0 (100)	4.1 (57)	3.3 (55)	5.2 (80)	5.3 (80)	4.1 (62)	6.3 (92)
Total Length of Route Alternative	6.5	9.0	7.2	6.0	6.5	6.6	6.6	6.8

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line, and therefore, the sum may be greater than 100 percent.

6.4.2.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW, due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no permanent residences, churches, childcare centers, schools, or non-residential buildings located within the 150-foot ROW for route alternatives H1, H3, H4, H5, H6, H7, or the applicants' equivalent. However, route alternative H2 has one residential building and four non-residential buildings (storage shed, agricultural outbuildings, etc.) located within the proposed 150-foot ROW.

The permanent residence may potentially be displaced if route alternative H2 is selected. Similarly, the non-residential buildings may or may not be displaced as a result of route alternative H2. Though buildings are generally not allowed with the 150-foot transmission line ROW, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For each of the buildings noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.4.2.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements.. There are no active mining operations within the ROW of the route alternatives H1 through H7 or the ROW of the applicants' equivalent. Therefore, potential project impacts to mining would be minimal and independent of the route selected.

6.4.2.2.1 Agriculture

Agricultural land impacts differ between route alternatives H1 through H7 and the applicants' equivalent. The ROW of route alternative H7 contains the least amount of agricultural land (4 acres), while the ROW of route alternative H4 contains the most acres of agricultural land (59 acres).

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of the route alternatives or the applicants' equivalent.

6.4.2.2.2 Forestry

Impacts to forestry within the Long Lake region were primarily assessed by evaluating the designated forestry resources within the 150-foot ROW (Chapter 5.8.2). Forestry impacts are fairly similar across the routing alternatives; impacts range from 65 to 80 acres of forested land within the ROW.
(reference (108)).

The forested land is comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C). The only designated forestry resource within the ROW of the routing alternatives is Minnesota School Trust land; however, the ROWs of route alternatives H1 and H2 do not contain this resource (Table 6-100).

Table 6-100 Designated Forestry Resources within the 150-foot ROW of Route Alternatives H1 Through H7

Forestry Resources	Route Alternative H1	Route Alternative H2	Route Alternative H3	Route Alternative H4	Route Alternative H5	Route Alternative H6	Route Alternative H7	Applicants' Equivalent
Acres of Minnesota School Trust Land[1] within 150-foot ROW	0	0	19	16	16	16	15	16

Data Sources: reference (4)

1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

Route alternatives H3, H4, H5, H6, H7 and the applicants' equivalent would have similar minimal potential impacts to designated forestry resources within the 150-foot ROW. Route alternative H1 and H2 would both have the fewest impacts because their rights-of-way do not contain designated forestry resources.

6.4.2.2.3 Recreation and Tourism

Recreation and tourism opportunities within the Long Lake region consist primarily of trail usage, including off-road vehicle trails and snowmobile trails. Since transmission line construction and operation generally has minimal permanent and temporary impacts to trails, recreation, and tourism, project impacts in this region are expected to be minimal.

Each of the route alternatives and the applicants' equivalent have trail crossings, which include off-road vehicle trail crossings and snowmobile trail crossings (Map Book 5E). Each route alternative would have a similar number of trail crossings with one off-road vehicle use crossing and at least two snowmobile trail crossings; route alternatives H2 and H5 would have four snowmobile trail crossings. Permanent impacts such as increased noise and reduced aesthetic values would be minimal. Additionally, temporary impacts including trail closings during construction would occur but are expected to have a minimal impact on recreation.

6.4.2.3 Archaeological and Historic Resources

Two previously documented cultural resources are located within the 1,000-foot route width of route alternative H2 (Table 6-101), as shown on Map Book 5F. No other cultural resources have been documented within the route widths of any of the "H series" route alternatives.

Table 6-101 Cultural Resources within the Route Width of Route Alternatives H1 through H7 and the Applicants' Equivalent

Resource Number	Resource Type	NRHP Eligibility	Location
21CWak	Precontact artifact scatter	Not evaluated	route alternative H2
CW-MGT-00001	Maple Grove Township Hall	Not evaluated	route alternative H2

Resource CW-MGT-0000, Maple Grove Township Hall, has not been evaluated for the NRHP. The route width of route alternative H2 has the potential to alter this resource's setting, feeling, appearance, and/or association.

Archaeological site 21CWak may also be impacted by the project if this site falls within the footprint of ground disturbance. Ground disturbing activities resulting from the project has the potential to impact this resource if it cannot be avoided by the project.

The primary means to minimize archaeological and historic architectural resource impacts is prudent routing or structure placement – i.e., avoiding known archaeological and historic resources. If they cannot be avoided, impacts to these resources could be mitigated by measures developed in consultation with the SHPO prior to construction. Based on the above discussion, route alternative H2 has the most potential to impact archaeological and historic architectural resources.

6.4.2.4 Natural Environment

6.4.2.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies, and wetlands. Map 6-20 and Map 6-21 show the water resources along route alternatives H1 through H7.

6.4.2.4.1.1 Watercourses and Waterbodies

Table 6-102 identifies the watercourses and waterbodies crossed by route alternatives H1 through H7 and the applicants' equivalent. None of the route alternatives or the applicants' equivalent would cross any impaired streams, PWI watercourses, or impaired lakes. Route alternative H1 has the most NHD stream crossings (5); however, all are small streams that could be spanned by the transmission line. Route alternative H1 also has the most waterbody crossings (2), both of which could be spanned.

Route alternative H2 and H3 would cross an unnamed PWI basin, which is large enough that it could not be spanned and would require placement of one or more structures in the PWI basin. Route alternatives H4, H5, H6, H7 and the applicants' equivalent would require new transmission line ROW, would have the same number of watercourse crossings, and would not cross any public water basins or lakes.

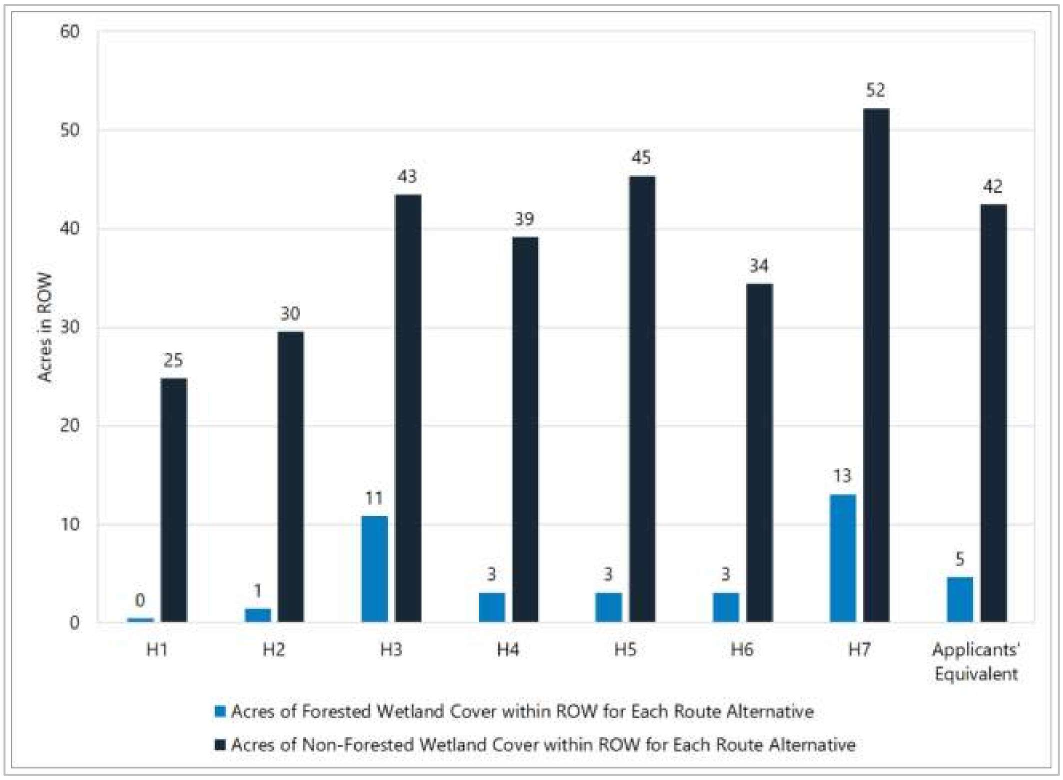
Table 6-102 Watercourses and Waterbodies Crossed by Route Alternative H1 through H7 and the Applicants' Equivalent

Resources	Route Alternative H1	Route Alternative H2	Route Alternative H3	Route Alternative H4	Route Alternative H5	Route Alternative H6	Route Alternative H7	Applicants' Equivalent
Number of NHD stream crossings	5	2	2	2	2	2	2	2
Number of impaired stream crossings	0	0	0	0	0	0	0	0
Number PWI stream crossings	0	0	0	0	0	0	0	0
Number of NHD lake crossings	2	1	0	0	0	0	0	0
Number of impaired lake crossings	0	0	0	0	0	0	0	0
Number of PWI basin crossings	0	1	1	0	0	0	0	0

6.4.2.4.1.2 Wetlands

Figure 6-12 identifies the acreage of wetlands crossed by route alternatives H1 through H7 and the applicants' equivalent. Route alternative H7 would cross more forested and non-forested wetland than the other route alternatives. Route alternative H1 would have the least amount of non-forested and forested wetland in its ROW. Route Alternative H1 would have one wetland crossing over 1,000 feet that could not be spanned; however, this crossing is adjacent to an existing transmission line that already crosses the same wetland. Route alternative H1 would be co-located with the existing transmission line for 2.6 miles, which would reduce the disturbance to forested wetlands. The applicants' equivalent would have the most wetland crossings (9) over 1,000 feet, which would require placement of one or more structures in wetlands.

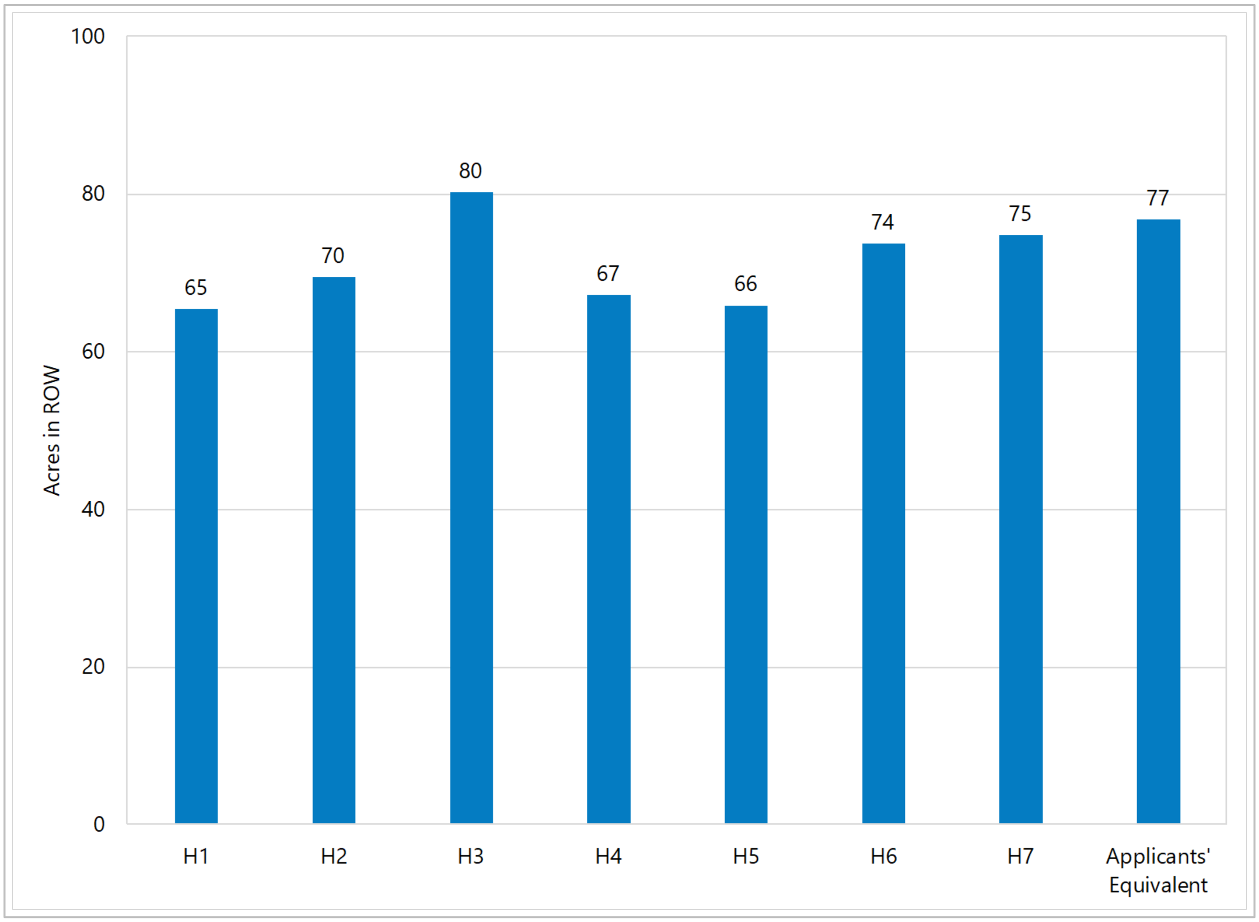
Figure 6-12 Acres of Wetlands Crossed by Route Alternatives H1 through H7 and the Applicants' Equivalent



6.4.2.4.2 Vegetation

Route alternatives H1 through H7 and the applicants' equivalent would all impact forested vegetation, with route alternative H3 having slightly more impact and route alternatives H1, H4, and H5 having slightly less impact on forested vegetation in the ROW (Figure 6-13). All route alternatives and the applicants' equivalent would fragment areas of dense forest despite paralleling existing ROW for some alternatives. Impacts to forested vegetation and forest fragmentation would be relatively comparable across route alternatives, with route alternative H3 having slightly more impact.

Figure 6-13 Forested Vegetation in the 150-foot ROW of Route Alternatives H1 through H7 and the Applicants' Equivalent



6.4.2.4.3 Wildlife

Impacts to wildlife habitat would occur for route alternatives H1 though H7 and the applicants' equivalent. However, route alternatives H1 and H2 would minimize impacts associated with habitat fragmentation by paralleling existing ROW (39 percent transmission line for H1 and 41 percent road/transmission line for H2), while H7 would parallel existing rights-of-way for less than 1 percent of its length.

All route alternatives and the applicants' equivalent would traverse a Grassland Bird Conservation Area (Table 6-103; Map 6-20 and Map 6-21). Route alternative H1 would minimize impacts to the Grassland Bird Conservation Area by paralleling an existing transmission line ROW while traversing it, while route alternatives H2 through H7 and the applicants' equivalent would all require new transmission line ROW through it. The ROW of route alternatives H2 and H3 would traverse Swamp Lake, a DNR-identified shallow wildlife lake; both route alternatives would require establishing a new transmission line ROW through it (Table 6-103; Map 6-20 and Map 6-21). Construction of new transmission line ROW through the Grassland Bird Conservation Area and Swamp Lake could increase the potential for impacts to avian species traveling through these areas. However, as discussed in Chapter 5.10.5.2, avian impacts can be minimized through use of bird flight diverters.

Table 6-103 Acres of Grassland Bird Conservation Area in 150-foot ROW for Route Alternatives H1 through H7 and the Applicants' Equivalent

Resource	Route Alternative H1	Route Alternative H2	Route Alternative H3	Route Alternative H4	Route Alternative H5	Route Alternative H6	Route Alternative H7	Applicants' Equivalent
Grassland Bird Conservation Area	26 acres	35 acres	26 acres	31 acres	30 acres	30 acres	18 acres	26 acres
DNR Shallow Wildlife Lake	0 acres	4 acres	6 acres	0 acres	0 acres	0 acres	0 acres	0 acres

Route alternative H1 would minimize impacts to wildlife by avoiding Swamp Lake and paralleling the most existing transmission line ROW, including through the Grassland Bird Conservation Area.

6.4.2.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federal- or state-protected species, or state species of special concern have been documented within 1 mile of route alternatives H1 through H7 and the applicants' equivalent.

The ROW of route alternatives H1 through H7 and the applicants' equivalent would intersect a DNR SBS ranked moderate, with the ROW of route alternative H1 intersecting the least (55 acres) and H3 intersecting the most (107 acres; Table 6-97; Map 6-20 and Map 6-21).

6.4.2.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.4.2.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-97). Route alternatives H2, H3, and H4 would each require one heavy angle structure. Route alternative H5 would require four additional heavy-angle structures while route alternative H6 would require three additional heavy-angle structures. Route alternative H7 would require one additional heavy angle structure. Route alternative H1 and the applicants' equivalent require only tangent structures.

Of these eight route alternatives, route alternative H1 is the least expensive at approximately $30 million and route alternative H2 is the most expensive at approximately $45 million. The remaining route alternatives range between $31 million to $36 million.

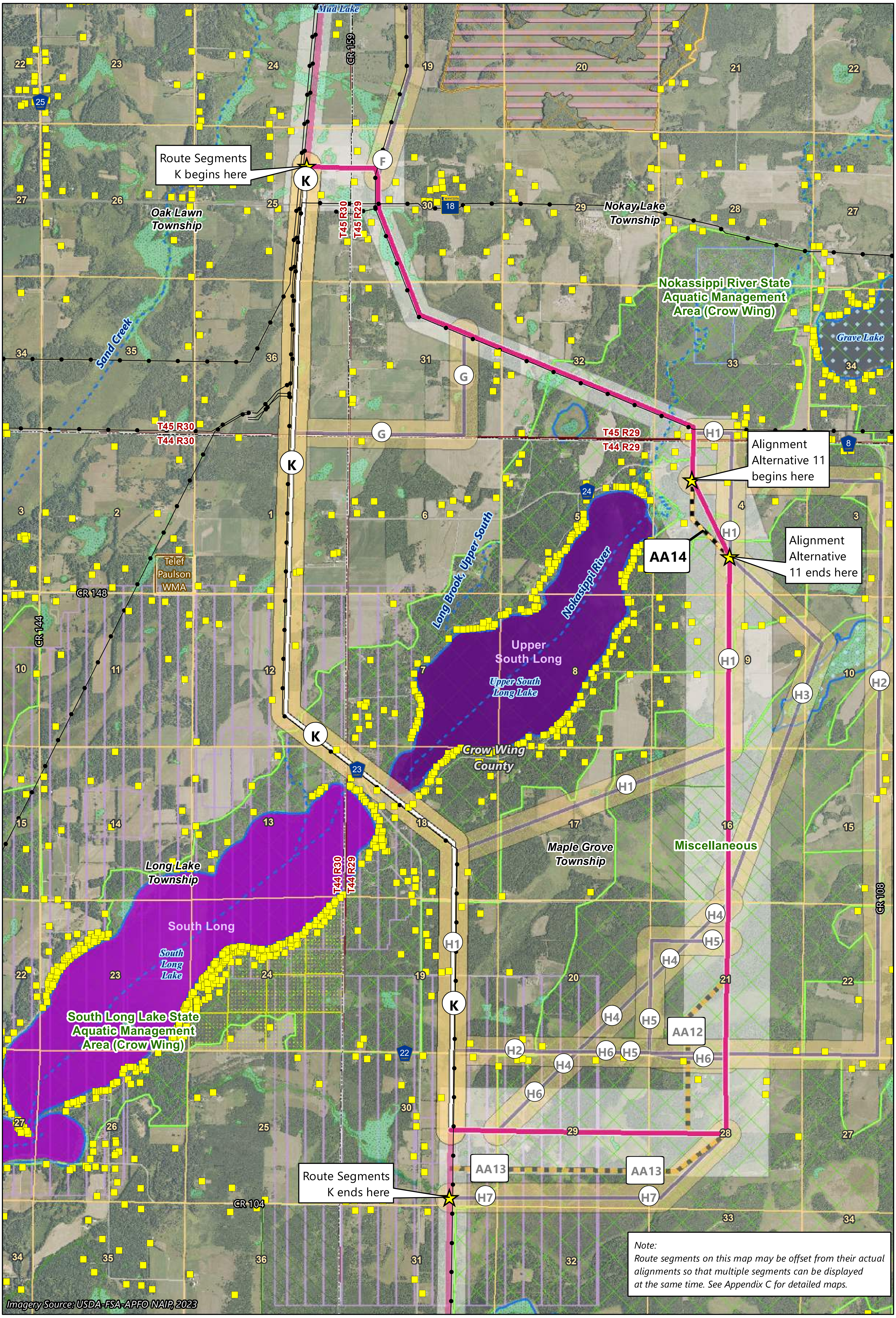
6.4.3 Route Alternative K – Long Lake Region

Route alternative K provides an option to the applicants' equivalent in the northern part of the Long Lake region. Route alternative K shifts west from the applicants' equivalent in an effort to reduce cost and limit impacts to natural resources. 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. Potential impacts of route alternative K and the applicants' equivalent are summarized in Table 6-104 and shown on Map 6-22.

Table 6-104 Human and Environmental Impacts – Route Alternative K, Long Lake Region

Resource	Element	Route Alternative K	Applicants' Equivalent
Length (miles)		6.8	9.8
Human Settlement	Residences within 0-75 feet (count)	2	0
	Residences within 75-250 feet (count)	3	2
	Residences within 250-500 feet (count)	10	4
	Residences within 500–1,000 feet (count)	38	13
Land-Based Economies	Agricultural land in 150-foot ROW	60	20
Water Resources	Total wetlands in 150-foot ROW (acres)	28	78
	Forested wetlands in 150-foot ROW (acres)	1	5
Vegetation	Forested landcover in 150-foot ROW (acres)	33	98
Wildlife	Grassland Bird Conservation Area in 150-foot ROW (acres)	52	18
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	30	114
	Lake of Biological Significance in 150-foot ROW (acres)	1	0
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	6.8 (100)	3.0 (30)
	Roadway (miles, percent)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	0.1 (2)	6.3 (64)
	Total ROW sharing and paralleling (miles, percent)	6.8 (100)	9.3 (94)
Reliability	Crossing of existing transmission lines (count)	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$33.7[1]	$48.6

1 This route alternative may require displacing residences and non-residential buildings. There is no way to estimate displacement cost at this time.



Route Segment K
Applicants' Route K Equivalent
Alignment Alternative 14
Route Width
Route Alternative Width
Existing Transmission Line
Residence
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Native Plant Community
Grassland Bird Conservation Areas
Wildlife Management Area
Aquatic Management Area
Other DNR Land

Lakes of Biological Significance

Outstanding Significance
High Significance

Wetlands

Non-Forested Wetland
Forested Wetland

Site of Biodiversity Significance

High Significance
Moderate Significance

Feet
0 1,500 3,000

Map 6-22

ROUTE ALTERNATIVE K AND ALIGNMENT ALTERNATIVE AA14

Long Lake Region
Northland Reliability Project

6.4.3.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources include cultural values, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.4.3.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternative K are shown in Table 6-105, while ROW paralleling and sharing are shown in Table 6-106.

Route alternative K would be located near more than double the number of residences compared to the applicants' equivalent. Additionally, route alternative K has five residences within 250 feet of the anticipated alignment, with two residences within the anticipated ROW. With respect to ROW sharing and paralleling, route alternative K follows an existing infrastructure ROW for 100 percent of its length; the applicants' equivalent follows existing infrastructure ROW for only 30 percent Thus, the indicators for aesthetic impacts point in opposite directions – the applicants' equivalent is near the least number of residences; route alternative K minimizes aesthetic impacts by following significantly more infrastructure ROW than the applicants' equivalent.

Table 6-105 Long Lake Region Proximity of Residences to Route Alternative K

Residences, Distance from Anticipated Alignment	Route Alternative K	Applicants' Equivalent
Residences within 0-75 feet	2	0
Residences within 75-250 feet	3	2
Residences within 250-500 feet	10	4
Residences within 500-1,000 feet	38	13
Total Residences within 1,000 feet	53	19

Table 6-106 Long Lake Region ROW Sharing and Paralleling of Route Alternative K

Infrastructure	Route Alternative K miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)
Follows Existing Transmission Line	6.8 (100)	3.0 (30)
Total – Follows Transmission Line, Road, or Railroad	6.8 (100)	3.0 (30)
Follows Field, Parcel, or Section Lines	0.1 (2)	6.3 (64)
Total – ROW Paralleling and Sharing	6.8 (100)	9.3 (94)
Total Length of Route Alternative	6.8	9.8

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.4.3.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW, due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no churches, childcare centers, or schools located within the 150-foot ROW the applicants equivalent or route alternative K. However, there are two permanent residences and three non-residential buildings (storage shed, agricultural outbuildings, etc.) located within the proposed 150-foot ROW for route alternative K.

These residential buildings located with the ROW for route alternative K may potentially be displaced as a result of the project. Similarly, the non-residential buildings may or may not be displaced as a result of the project. Though buildings are generally not allowed with the ROW of a transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For each of the buildings noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.4.3.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements. There are no active mining operations within the rights-of-way of route alternative K or the applicants' equivalent. Additionally, there very few recreation and tourism opportunities in the vicinity, and they do not differ between the route alternatives. Therefore, potential impacts to mining and recreation and tourism would be minimal and independent of the route selected.

6.4.3.2.1 Agriculture

Agricultural land impacts differ between the 150-foot ROW route alternatives K and the applicants' equivalent. The ROW of route alternative K contains the greatest amount of agricultural land (60 acres), and the ROW of the applicants' equivalent contains the least amount of agricultural land (20 acres).

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of route alternative K or the applicants' equivalent.

6.4.3.2.2 Forestry

Impacts to forestry within the Long Lake region were primarily assessed by evaluating the designated forestry resources within the 150-foot ROW (Chapter 5.8.2). Approximately 33 acres of the ROW of route alternative K consist of forested land while 98 acres of the ROW of the applicants' equivalent consist of forested land (Table 6-107). Forestry resources are comprised of deciduous forest, evergreen forest, mixed forest, and forested wetlands within this region (Map Book 5C). The ROW of route alternative K does not contain any designated forestry resources. The ROW of the applicants' equivalent route contains 16 acres of Minnesota School Trust Land (Table 6-107).

Table 6-107 Designated Forestry Resources within the 150-foot ROW of Route Alternative K

Forestry Resources	Route Alternative K	Applicants' Equivalent
Acres of forested land within 150-foot ROW	33	98
Acres of Minnesota School Trust Land[1] within 150-foot ROW	0	16

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated and the analysis results may over-represent potential impacts.
Data Sources: references (108); (4)
1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

Only the applicants' equivalent would have potential impacts to designated forestry resources within the 150-foot ROW, while route alternative K would not impact designated forestry resources due to it paralleling an existing transmission line. Impacts to forestry resources would include permanently removing trees from the ROW before construction.

6.4.3.3 Archaeological and Historic Resources

Three previously documented cultural resources are located within the 1,000-foot route width of route alternative K, and one previously documented cultural resource is located within the 1,000-foot route width of the applicants' equivalent (Table 6-108), as shown on Map Book 5F.

Table 6-108 Cultural Resources within the Route Width of Route Alternative K and the Applicants' Equivalent

Resource Number	Resource Type	NRHP Eligibility	Location
21CW0198	Precontact lithic scatter	Not eligible	route alternative K
21CWad	Precontact earthwork	Not evaluated	route alternative K
XX-ROD-00017	Trunk Highway 18	Not eligible	route alternative K, applicants' equivalent

Resource XX-ROD-00017, Trunk Highway 18, has been previously determined not eligible for the NRHP. Because this resource has been determined “not eligible”, it cannot be adversely affected by the project and no additional work regarding this resource would be necessary.

Archaeological sites 21CW0198 and 21CWad may be impacted by the project if they are located within the footprint of ground disturbance. Ground disturbing activities resulting from the project have the potential to impact these resources if they cannot be avoided by the project.

The primary means to minimize impacts to archaeological and historic architectural resources is prudent routing or structure placement (i.e., avoiding known archaeological and historic resources). If they cannot be avoided, impacts to these resources could be mitigated by measures developed in consultation with the SHPO prior to construction. Based on the above discussion, route alternative K has the most potential to impact archaeological and historic architectural resources.

6.4.3.4 Natural Environment

6.4.3.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-22 shows the water resources along route alternative K and the applicants’ equivalent.

6.4.3.4.1.1 Watercourses and Waterbodies

Table 6-109Table 6-109 identifies the watercourses and waterbodies crossed by route alternative K and the applicants’ equivalent. Route alternative K would follow an existing transmission line alignment, which crosses the Nokasippi River and Upper South Long Lake (Photo 6-2). The applicants’ equivalent would cross Nokasippi River north of South Long Lake parallel to an existing transmission line ROW.

Photo 6-2 Route Alternative K: View of Existing Transmission Line Alignment Crossing South Long Lake

Table 6-109 Watercourses and Waterbodies Crossed by Route Alternative K and the Applicants' Equivalent

Resources	Route Alternative K	Applicants' Equivalent
Number of NHD stream crossings	3	6
Number of impaired stream crossings	1	4
Number PWI stream crossings	1	1
Number of NHD lake crossings	2	1
Number of impaired lake crossings	1	0
Number of PWI basin crossings	1	0
Number of PWI wetland crossings	0	0

6.4.3.4.1.2 Wetlands

Table 6-104 identifies the acreage of wetlands crossed by route alternative K and the applicants' equivalent. Route alternative K would cross less forested and non-forested wetlands than the applicants' equivalent. Route alternative K would have two wetland crossings over 1,000 feet; however, these crossings would occur along an existing transmission line and, though the distance is not spannable, it would not require additional permanent disturbance to the wetlands. The applicants' equivalent would have nine wetland crossings over 1,000 feet, requiring new structures to be placed within the wetlands and additional tree removal within forested wetlands.

6.4.3.4.2 Vegetation

The ROW of both route alternative K and the applicants' equivalent would impact forested vegetation, with the applicants' equivalent impacting almost three times as much (98 acres) as route alternative K (33 acres). In addition, route alternative K would minimize forest fragmentation by following an existing transmission line ROW for its entire length, while the applicants' equivalent only parallels existing transmission line ROW for 30 percent of its length.

6.4.3.4.3 Wildlife

Impacts to wildlife habitat would occur for route alternative K and the applicants' equivalent. However, route alternative K would impact less forested habitat and would minimize habitat fragmentation by following an existing transmission line ROW for its entire length. The applicants' equivalent would only parallel existing transmission line ROW for 30 percent of its length, thereby fragmenting habitat and potentially increasing impacts to avian species. As discussed in Chapter 5.10.5.2, avian impacts can be minimized through use of bird flight diverters.

The ROW of route alternative K and the applicants' equivalent would traverse a Grassland Bird Conservation Area, with route alternative K traversing significantly more acreage (52 acres) than the applicants' equivalent (18 acres; Map 6-22). However, route alternative K would minimize impacts to the Grassland Bird Conservation Area by paralleling an existing transmission line ROW while traversing it, while the applicants' equivalent would require new transmission line ROW through it.

6.4.3.5 Rare and Unique Natural Resources

During the NHIS database, it was determined that no federal- or state-protected species, or state species of special concern have been documented within 1 mile of route alternative K or the applicants' equivalent. The ROW of route alternative K and the applicants' equivalent would intersect a DNR SBS ranked moderate, with the ROW of the applicants' equivalent intersecting significantly more of this resource (Table 6-103; Map 6-22).

Route alternative K would minimize impacts to the SBS by traversing it while paralleling an existing transmission line ROW, while the applicants' equivalent would require new ROW through the SBS (Map 6-22). The ROW of route alternative K would traverse the edge of Upper South Long Lake, a DNR Lake of Biodiversity Significance ranked outstanding (Table 6-110; Map 6-22). However, impacts to any protected species associated with this lake would be minimized by paralleling an existing transmission line ROW in this area.

Table 6-110 Sensitive Ecological Resources in the ROW of Route Alternative K and the Applicants' Equivalent

Sensitive Ecological Resource	Area within ROW of Route Alternative K	Area within ROW of Applicants' Equivalent
Sites of Biodiversity Significance	30 acres ranked moderate	114 acres ranked moderate
Lake of Biological Significance	1 acre ranked outstanding	0 acres

6.4.3.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.4.3.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-104). When comparing base costs, route alternative K ($33 million) is approximately $14 million less than the applicants' equivalent ($48 million). However, route alternative K may require displacing multiple residences and non-residences between the Long Lakes. At this time, there is no way to estimate these displacement costs.

6.4.4 Alignment Alternative AA12 – Long Lake Region

Alignment alternative AA12 provides an alternative placement of the applicants' proposed alignment in the central part of the Long Lake region. Alignment alternative AA12 is shifted west to avoid impacts to private property. Alignment alternative AA12 does not include any transmission line ROW sharing, paralleling, or double-circuiting. Potential impacts of alignment alternative AA12 and the applicants' equivalent are summarized in Table 6-111 and shown on Map 6-21.

Table 6-111 Human and Environmental Impacts – Alignment Alternative AA12, Long Lake Region

Resource	Element	Alignment Alternative AA12	Applicants' Equivalent
Length (miles)		1.1	1.3
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	1	0
	Residences within 250-500 feet (count)	1	0
	Residences within 500–1,000 feet (count)	0	1
Land-Based Economies	Agricultural land in 150-foot ROW	<1	1
Water Resources	Total wetlands in 150-foot ROW (acres)	3	11
	Forested wetlands in 150-foot ROW (acres)	0	2
Vegetation	Forested landcover in 150-foot ROW (acres)	17	14
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	21	23
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	0 (0)	0 (0)
	Roadway (miles, percent)	<0.1 (2)	<0.1 (2)
	Field, parcel, or section lines (miles, percent)	0.7 (68)	1.3 (100)
	Total ROW sharing and paralleling (miles, percent)	0.7 (68)	1.3 (100)
Reliability	Crossing of existing transmission lines (count)	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$6.9[1]	$6.2

1 Two heavy-angle structures would be needed for an additional cost of approximately $740,000 per structure ($5.5 million base cost).

6.4.4.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources include cultural values, displacement, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.4.4.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to alignment alternative AA12 are shown in Table 6-112, while ROW paralleling and sharing are shown in Table 6-113.

Alignment alternative AA12 has two residences within 1,000 feet of its anticipated alignment, compared to one residence within 1,000 feet of the applicants' equivalent. While neither route alternative follows existing infrastructure for any meaningful extent, the applicants' equivalent has the potential to follow field, parcel, or section lines for its entire length while alignment alternative AA12 can only do so for a portion of its length. Due to greater opportunities for aligning with field, parcel, or section lines and having one less residence in proximity, the applicants' equivalent is anticipated to have fewer aesthetics impacts than alignment alternative AA12.

Table 6-112 Long Lake Region Proximity of Residences to Alignment Alternative AA12

Residences, Distance from Anticipated Alignment	Alignment Alternative AA12	Applicants' Equivalent
Residences within 0-75 feet	0	0
Residences within 75-250 feet	1	0
Residences within 250-500 feet	1	0
Residences within 500-1,000 feet	0	1
Total Residences within 1,000 feet	2	1

Table 6-113 Long Lake Region ROW Sharing and Paralleling of Alignment Alternative AA12

Infrastructure	Alignment Alternative AA12 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	<0.1 (2)	<0.1 (2)
Follows Existing Transmission Line	0 (0)	0 (0)
Total – Follows Transmission Line, Road, or Railroad	<0.1 (2)	<0.1 (2)
Follows Field, Parcel, or Section Lines	0.7 (68)	1.3 (100)
Total – ROW Paralleling and Sharing	0.7 (68)	1.3 (100)
Total Length	1.1	1.3

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.4.4.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements. There are no forestry resources or active mining operations within the rights-of-way of alignment alternative AA12 or the applicants' equivalent. Agricultural resources within the ROW of alignment alternative AA12 and the applicants' equivalent are both less than one acre. Additionally, there are few recreation and tourism opportunities, and those present do not differ between alignment alternative AA12 or the applicants' equivalent. As a result, potential impacts to land-based economies would be minimal and independent of the route selected.

6.4.4.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the 1,000-foot route width of alignment alternative AA12 or the applicants' equivalent. As a result, impacts to cultural resources are anticipated to be minimal and independent of the route selected.

6.4.4.4 Natural Environment

6.4.4.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-21 shows the water resources along alignment alternative AA13 and the applicants' equivalent.

6.4.4.4.1.1 Watercourses and Waterbodies

Alignment alternative AA12 and the applicants' equivalent would not cross any watercourses or waterbodies.

6.4.4.4.1.2 Wetlands

Table 6-111 identifies the acreage of wetlands crossed by alignment alternative AA12 and the applicants' equivalent. Alignment alternative AA12 would not cross any forested wetlands and would cross less non-forested wetlands than the applicants' equivalent. In addition, alignment alternative AA12 would not have any wetland crossings over 1,000 feet (i.e. wetland areas would be spanned) whereas the applicants' equivalent would have two wetland crossings over 1,000 feet, which may require placement of one or more structures in wetland.

6.4.4.4.2 Vegetation

Alignment alternative AA12 would impact slightly more forested land (17 acres) than the applicants' equivalent (14 acres). Both alternatives would fragment areas of dense forest, as they follow an existing ROW for only two percent of their lengths.

6.4.4.4.3 Wildlife

Alignment alternative AA12 and the applicants' equivalent would have similar impacts on wildlife habitat because both alternatives would remove relatively similar amounts of forested habitat and neither alternative parallels an existing transmission line or road corridor for more than two percent of its length. Neither alternative would traverse any areas that are preserved or managed for wildlife habitat.

6.4.4.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federal- or state-protected species, or state species of special concern, have been documented within 1 mile of alignment alternative AA12 or the applicants' equivalent. The ROW of alignment alternative AA12 and the applicants' equivalent would intersect similar amounts of an SBS ranked moderate, with the applicants' equivalent intersecting slightly more (23 acres) than alignment alternative AA12 (21 acres) (Map 6-21). Both alignment alternatives would require establishing a new ROW through the SBS.

6.4.4.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.4.4.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-111). Alignment alternative AA12 would require two heavy-angle structures, which cost more than three times that of a tangent structure. As a result, the applicants' equivalent (approximately $6.1 million) is less expensive than alignment alternative AA12 (approximately $6.9 million).

6.4.5 Alignment Alternative AA13 – Long Lake Region

Alignment alternative AA13 provides an alternative placement of the applicants' proposed alignment in the central part of the Long Lake region. Alignment alternative AA13 is shifted south to avoid impacts to private property and natural resources. Alignment alternative AA13 does not include any transmission line ROW sharing, paralleling, or double-circuiting. Potential impacts of alignment alternative AA13 and the applicants' equivalent are summarized in Table 6-114 and shown on Map 6-21.

Table 6-114 Human and Environmental Impacts – Alignment Alternative AA13, Long Lake Region

Resource	Element	Alignment Alternative AA13	Applicants' Equivalent
Length (miles)		1.9	2.0
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	0	0
	Residences within 250-500 feet (count)	0	0
	Residences within 500–1,000 feet (count)	1	2
Land-Based Economies	Agricultural land in 150-foot ROW	1	10
Water Resources	Total wetlands in 150-foot ROW (acres)	15	7
	Forested wetlands in 150-foot ROW (acres)	1	0
Vegetation	Forested landcover in 150-foot ROW (acres)	20	21
Wildlife	Grassland Bird Conservation Area in 150-foot ROW (acres)	18	22
Rare and Unique Natural Resources	Sites of Biodiversity Significance	29	27
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	0 (0)	0.2 (12)
	Roadway (miles, percent)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	1.3 (70)	1.8 (88)
	Total ROW sharing and paralleling (miles, percent)	1.3 (70)	2.0 (100)
Reliability	Crossing of existing transmission lines (count)	1	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$10[1]	$10

1 One heavy-angle structure would be needed for an additional cost of approximately $740,000 ($9.3 million base cost).

6.4.5.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and, therefore, are not discussed in this Chapter. These resources include cultural values, displacement, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.4.5.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to alignment alternative AA13 are shown in Table 6-115, while ROW paralleling and sharing are shown in Table 6-116.

Alignment alternative AA13 would be near one less residence compared to the applicants' equivalent. While neither route alternative follows existing infrastructure, the applicants' equivalent has the potential to follow field, parcel, or section lines for its entire length while alignment alternative AA13 can only do so for a portion of its length. Although the applicants' equivalent is located closer to one more home than alignment alternative AA13, it likely best minimizes aesthetic impacts by having greater opportunities to share ROW with existing infrastructure and field, parcel, or section lines.

Table 6-115 Long Lake Region Proximity of Residences to Alignment Alternative AA13

Residences, Distance from Anticipated Alignment	Alignment Alternative AA13	Applicants' Equivalent
Residences within 0-75 feet	0	0
Residences within 75-250 feet	0	0
Residences within 250-500 feet	0	0
Residences within 500-1,000 feet	1	2
Total Residences within 1,000 feet	1	2

Table 6-116 Long Lake Region ROW Sharing and Paralleling of Alignment Alternative AA13

Infrastructure	Alignment Alternative AA13 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)
Follows Existing Transmission Line	0 (0)	0.2 (12)
Total – Follows Transmission Line, Road, or Railroad	0 (0)	0.2 (12)
Follows Field, Parcel, or Section Lines	1.3 (70)	1.8 (88)
Total – ROW Paralleling and Sharing	1.3 (70)	2.0 (100)
Total Length	1.9	2.0

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.4.5.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements. There are no forestry resources or active mining operations within the ROW of alignment alternative AA13 or the ROW of the applicants' equivalent. Additionally, there are few recreation and tourism opportunities, and those that are present do not differ between alignment alternative AA13 or the applicants' equivalent. As a result, potential impacts to forestry, mining, and recreation and tourism would be minimal and independent of the route selected.

6.4.5.2.1 Agriculture

Agricultural land impacts differ between the 150-foot ROW alternative alignment AA13 and the applicants' equivalent. The ROW of the applicants' equivalent contains the most agricultural land (10 acres) while the ROW of alignment alternative AA13 contains the least (1 acre).

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of alternative alignment AA13 or the applicants' equivalent.

6.4.5.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the 1,000-foot route width of alignment alternative AA13 or the applicants' equivalent. As a result, impacts to cultural resources are anticipated to be minimal and independent of the route selected.

6.4.5.4 Natural Environment

6.4.5.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies, and wetlands. Map 6-21 shows the water resources along alignment alternative AA13 and the applicants' equivalent.

6.4.5.4.1.1 Watercourses and Waterbodies

Alignment alternative AA13 and the applicants' equivalent would not cross any watercourses or waterbodies.

6.4.5.4.1.2 Wetlands

Table 6-114 identifies the acreage of wetlands crossed by alignment alternative AA13 and the applicants' equivalent. Alignment alternative AA13 would cross more forested and non-forested wetlands than the applicants' equivalent. In addition, alignment alternative AA13 would have one wetland crossing over 1,000 feet, which would require placement of one or more structures in wetland. The applicants' equivalent would be able to span wetlands.

6.4.5.4.2 Vegetation

Impacts to forested vegetation would be similar for alignment alternative AA13 (20 acres) and the applicants' equivalent (21 acres). Both alternatives would fragment densely forested areas.

6.4.5.4.3 Wildlife

Alignment alternative AA13 and the applicants' equivalent would have similar impacts on wildlife habitat because both alternatives would remove relatively similar same amount of forested habitat. However, the applicants' equivalent would result in less habitat fragmentation by paralleling an existing transmission line ROW for 12 percent of its length. Alignment alternative AA13 and the applicants' equivalent would both traverse a Grassland Bird Conservation Area (Map 6-21). Although the applicants' equivalent traverses slightly more (22 acres) than AA13 (18 acres), the additional acreage traversed by the applicants' equivalent would do so by paralleling an existing transmission line ROW.

6.4.5.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federal- or state-protected species, or state species of special concern, have been documented within 1 mile of alignment alternative AA13 or the applicants' equivalent. The ROW of alignment alternative AA13 and the applicants' equivalent would intersect similar amounts of an SBS ranked moderate, with AA13 intersecting slightly more (29 acres) than the applicants' equivalent (27 acres) (Map 6-21). Both routing alternatives would require establishing a new ROW through the SBS.

6.4.5.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

Alignment alternative AA13 would require one transmission line crossing, thereby introducing an increased reliability concern. The applicants' equivalent would require no transmission line crossings.

6.4.5.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-114). Alignment alternative AA13 would require one heavy angle structure, which costs more than three times that of a tangent structure. Nevertheless, both alignment alternative AA13 and the applicants' equivalent would cost roughly the same amount (approximately $10 million).

6.4.6 Alignment Alternative AA14 – Long Lake Region

Alignment alternative AA14 provides an alternative placement of the applicants' proposed alignment in the northern part of the Long Lake region. Alignment alternative AA14 is shifted west to reduce costs and limit impacts to natural resources. It does not include any transmission line ROW sharing, paralleling, or double-circuiting. Potential impacts of alignment alternative AA14 and the applicants' equivalent are summarized in Table 6-117 and shown on Map 6-22.

Table 6-117 Human and Environmental Impacts – Alignment Alternative AA14, Long Lake Region

Resource	Element	Alignment Alternative AA14	Applicants' Equivalent
Length (miles)		0.6	0.6
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	0	0
	Residences within 250-500 feet (count)	1	0
	Residences within 500–1,000 feet (count)	1	2
Land-Based Economies	Agricultural land in 150-foot ROW	0	0
Water Resources	Total wetlands in 150-foot ROW (acres)	3	4
	Forested wetlands in 150-foot ROW (acres)	1	3
Vegetation	Forested landcover in 150-foot ROW (acres)	11	11
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	4	5
	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	0 (0)	0 (0)
	Roadway (miles, percent)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	0.2 (42)	0 (0)
	Total ROW sharing and paralleling (miles, percent)	0.2 (42)	0 (0)
Reliability	Crossing of existing transmission lines (count)	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$2.9	$2.7

6.4.6.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources include cultural values, displacement, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.4.6.1.1 Aesthetics

Aesthetic impacts differ by route alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to alignment alternative AA14 are shown in Table 6-118, while ROW paralleling and sharing are shown in Table 6-119.

Alignment alternative AA14 would be near the same number of residences as the applicants' equivalent. Neither route alternative would follow existing infrastructure; however, alignment alternative AA14 has more opportunity for paralleling field, parcel, or section lines, which may minimize aesthetic impacts. However, both route alternatives would result in the introduction of new transmission line infrastructure, which would cause a change in local aesthetics.

Table 6-118 Long Lake Region Proximity of Residences to Alignment Alternative AA14

Residences, Distance from Anticipated Alignment	Alignment Alternative AA14	Applicants' Equivalent
Residences within 0-75 feet	0	0
Residences within 75-250 feet	0	0
Residences within 250-500 feet	1	0
Residences within 500-1,000 feet	1	2
Total Residences within 1,000 feet	2	2

Table 6-119 Long Lake Region ROW Sharing and Paralleling of Alignment Alternative AA14

Infrastructure	Alignment Alternative AA14 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)
Follows Existing Transmission Line	0 (0)	0 (0)
Total – Follows Transmission Line, Road, or Railroad	0 (0)	0 (0)
Follows Field, Parcel, or Section Lines	0.25 (42)	0 (0)
Total – ROW Paralleling and Sharing	0.25 (42)	0 (0)
Total Length	0.60	0.56

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.4.6.2 Land-Based Economies

Potential impacts to land-based economies are assessed through an evaluation of several elements. There are no agricultural lands, forestry resources, or active mining operations within the ROW of alignment alternative AA14 or the ROW of the applicants' equivalent. Additionally, there are few recreation and tourism opportunities, and these opportunities do not differ between alignment alternative AA14 and the applicants' equivalent. As a result, potential impacts to land-based economies would be minimal and independent of the route selected.

6.4.6.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the 1,000-foot route width of alignment alternative AA14 or the applicants' equivalent. As a result, impacts to cultural resources are anticipated to be minimal and independent of the route selected.

6.4.6.4 Natural Environment

6.4.6.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies and wetlands. Map 6-22 shows the water resources along alignment alternative AA14 and the applicants' equivalent.

6.4.6.4.1.1 Watercourses and Waterbodies

Alignment Alternative AA14 and the applicants' equivalent would both cross the Nokasippi River, a PWI stream. The stream crossing would be less than 1,000 long and could be spanned.

6.4.6.4.1.2 Wetlands

Table 6-116 identifies the acreage of wetlands crossed by alignment alternative AA14 (3 acres) and the applicants' equivalent (4 acres). Alignment alternative AA14 would cross less forested and non-forested wetlands than the applicants' equivalent. In addition, alignment alternative AA14 would be able to span wetlands, but the applicants' equivalent would have one wetland crossings over 1,000 feet, which would require replacement of one or more structures in wetland.

6.4.6.4.2 Vegetation

Alignment alternative AA14 and the applicants' equivalent would each impact approximately 11 acres of forested vegetation. Both alternatives would fragment forested areas, and neither alignment would parallel an existing transmission line or road corridor.

6.4.6.4.3 Wildlife

Alignment alternative AA14 and the applicants' equivalent would have similar impacts on wildlife habitat and fragmentation, as they would remove the same amount of forested habitat and neither alignment would parallel existing transmission line or road rights-of-way. Neither alternative would traverse any areas that are preserved or managed for wildlife habitat.

6.4.6.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federal- or state-protected species, or state species of special concern, have been documented within 1 mile of alignment alternative AA14 or the applicants' equivalent. The ROW of alignment alternative AA14 and the applicants' equivalent would intersect similar amounts of an SBS ranked moderate, with AA14 intersecting slightly less (4 acres) than the applicants' equivalent (5 acres) (Map 6-22). Both alignment alternatives would require establishing a new ROW through the SBS.

6.4.6.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.4.6.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-117). There are no additional structure costs anticipated for alignment alternative AA14; therefore, alignment alternative AA14 (approximately $2.9 million) and the applicants' equivalent (approximately $2.7 million) are expected to cost roughly the same amount, though the applicants' equivalent is slightly less expensive.

6.4.7 Alignment Alternative AA17 – Long Lake Region

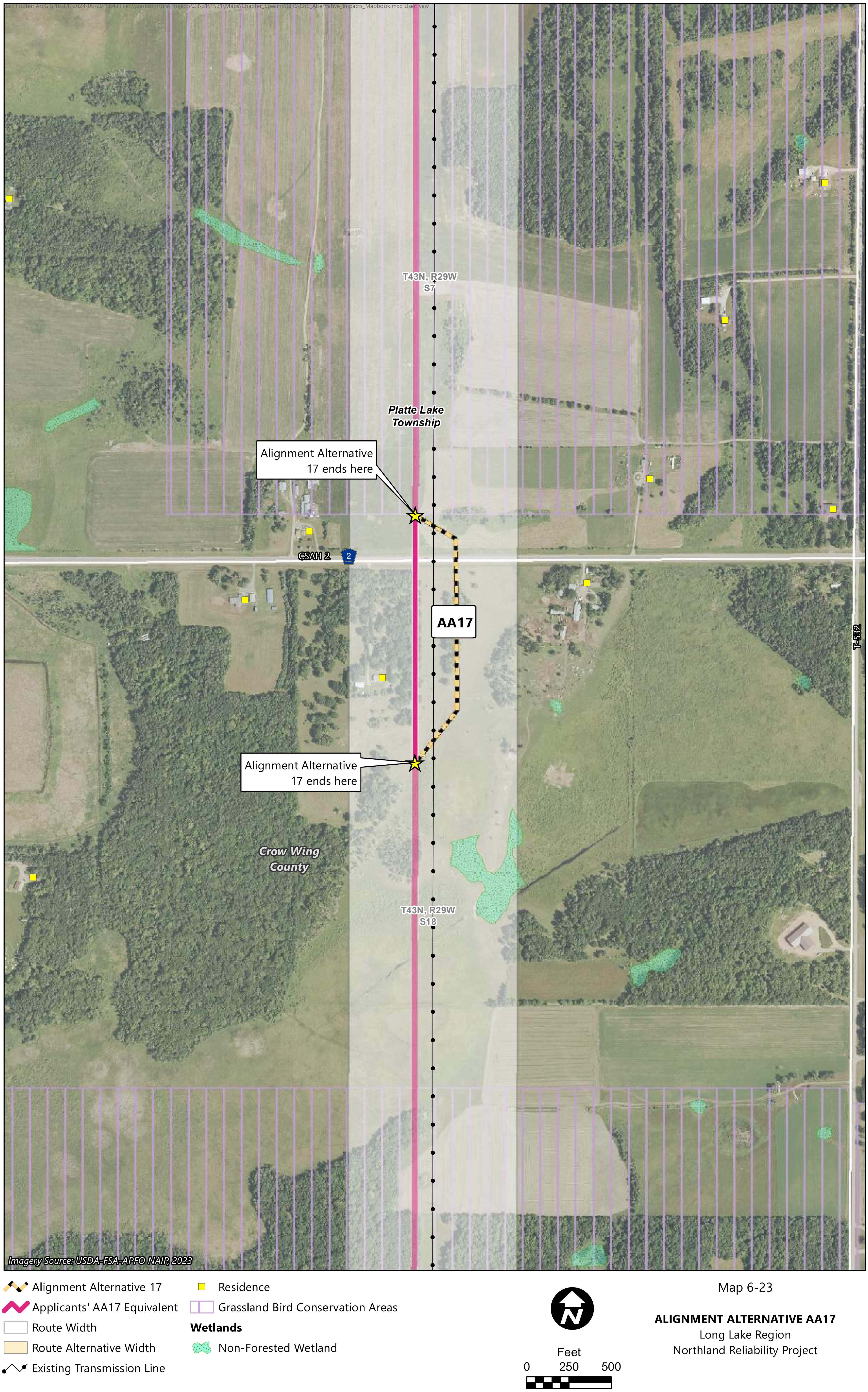
Alignment alternative AA17 provides an alternative placement of the applicants' proposed alignment in the southern part of the Long Lake region. Alignment alternative AA17 is shifted east to avoid residential property. It does not include any transmission line ROW sharing, paralleling, or double-circuiting. Potential impacts of alignment alternative AA17 and the applicants' equivalent are summarized in Table 6-120 and shown on Map 6-23.

Table 6-120 Human and Environmental Impacts – Alignment Alternative AA17, Long Lake Region

Resource	Element	Alignment Alternative AA17	Applicants' Equivalent
Length (miles)		0.3	0.3
Human Settlement	Residences within 0-75 feet (count)	0	0
	Residences within 75-250 feet (count)	0	1
	Residences within 250-500 feet (count)	1	0
	Residences within 500–1,000 feet (count)	2	1
Land-Based Economies	Agricultural land in 150-foot ROW	6	4
Water Resources	Total wetlands in 150-foot ROW (acres)	<1	0
	Forested wetlands in 150-foot ROW (acres)	0	0
Vegetation	Forested landcover in 150-foot ROW (acres)	0.5[1]	1
Rare and Unique Natural Resources	Federal- or state-protected species documented in 150-foot ROW (count)	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	0.19 (60)	0.28 (99)
	Roadway (miles, percent)	0 (0)	0 (0)
	Field, parcel, or section lines (miles, percent)	0 (0)	0.28 (99)
	Total ROW sharing and paralleling (miles, percent)	0.19 (60)	0.28 (99)
Reliability	Crossing of existing transmission lines (count)	2	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$7[2]	$1.4

1 The NLCD does not indicate that forested vegetation is present in the ROW of AA17; however, aerial photographs clearly show the presence of forested vegetation.

2 Two specialty structures would be needed to cross an existing transmission line for an estimated additional cost of approximately $4 million. In addition, two heavy-angle structures would be needed for an additional cost of approximately $740,000 per structure ($1.5 million base cost).



Map 6-23

ALIGNMENT ALTERNATIVE AA17

Long Lake Region

Northland Reliability Project

6.4.7.1 Human Settlements

Potential project impacts on human settlements are assessed through an evaluation of several elements. For some of the human settlement elements of human settlements, project impacts from the project are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources include cultural values, displacement, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.4.7.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to alignment alternative AA17 are shown in Table 6-121, while ROW paralleling and sharing are shown in Table 6-122.

Alignment alternative AA17 would be near a similar number of residences as the applicants' equivalent, though the applicants' equivalent has one residence in closer proximity. The applicants' equivalent would follow existing transmission line ROW for nearly all of its length, minimizing overall aesthetic impacts when compared to alignment alternative AA17.

Table 6-121 Long Lake Region Proximity of Residences to Alignment Alternative AA17

Residences, Distance from Anticipated Alignment	Alignment Alternative AA17	Applicants' Equivalent
Residences within 0-75 feet	0	0
Residences within 75-250 feet	0	1
Residences within 250-500 feet	1	0
Residences within 500-1,000 feet	2	1
Total Residences within 1,000 feet	3	2

Table 6-122 Long Lake Region ROW Sharing and Paralleling of Alignment Alternative AA17

Infrastructure	Alignment Alternative AA17 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)
Follows Existing Roads	0 (0)	0 (0)
Follows Existing Transmission Line	0.19 (60)	0.28 (99)
Total – Follows Transmission Line, Road, or Railroad	0.19 (60)	0.28 (99)
Follows Field, Parcel, or Section Lines	0 (0)	0.28 (99)
Total – ROW Paralleling and Sharing	0.19 (60)	0.28 (99)
Total Length	0.32	0.28

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.4.7.2 Land-Based Economies

Potential impacts to land-based economies are assessed through an evaluation of several elements. There are no forestry resources or active mining operations within the ROW of alignment alternative AA17 or the ROW of the applicants' equivalent. Additionally, there are few recreation and tourism opportunities, and these opportunities do not differ between alignment alternative AA17 or the applicants' equivalent. As a result, potential impacts to forestry, mining, and recreation and tourism would be minimal and independent of the route selected.

6.4.7.2.1 Agriculture

Agricultural impacts differ between alternative alignment AA17 and the applicants' equivalent. Alignment alternative AA17 has slightly more agricultural land (6 acres) in its ROW compared to the applicants' equivalent (5 acres).

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of alternative alignment AA17 or the applicants' equivalent.

6.4.7.3 Archaeological and Historic Resources

There are no documented archaeological or historic architectural resources within the 1,000-foot route width of alignment alternative AA17 or the applicants' equivalent. As a result, impacts to cultural resources are anticipated to be minimal and independent of the route selected.

6.4.7.4 Natural Environment

6.4.7.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This routing alternative comparison discussion addresses watercourses and waterbodies, and wetlands. Map 6-23 shows the water resources along alignment alternative AA17 and the applicants' equivalent.

6.4.7.4.1.1 Watercourses and Waterbodies

Alignment alternative AA17 and the applicants' equivalent would not cross any watercourses or waterbodies.

6.4.7.4.1.2 Wetlands

Table 6-121 identifies the acreage of wetlands crossed by alignment alternative AA17 (less than 1 acre) and the applicants' equivalent (none). Neither alternative has forested wetland in its ROW. Wetlands in the ROW of alignment alternative AA17 are small enough to be spanned.

6.4.7.4.2 Vegetation

The applicants' equivalent would impact slightly more forested vegetation (1 acre) than alignment alternative AA17 (none). While the NLCD dataset indicates that no forested vegetation is present in the ROW of AA17, based on review of aerial photography, there is about half as much forested vegetation as the applicants' equivalent. Both alignments would parallel an existing transmission line ROW where tree removal would occur.

6.4.7.4.3 Wildlife

Alignment alternative AA17 and the applicants' equivalent would have similar impacts to wildlife and associated habitat given that they would impact similar amounts of forested vegetation and would follow an existing transmission line ROW. However, alignment alternative AA17 would also require two perpendicular crossings of the existing transmission line, which could increase the potential for impacts to avian species. However, as discussed in Chapter 5.10.5.2, avian impacts can be minimized through use of bird flight diverters.

6.4.7.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federal- or state-protected species or state special concern species have been documented within 1 mile of alignment alternative AA17 or the applicants' equivalent. Neither alternative would traverse sensitive ecological resources. Potential impacts to rare and unique natural resources would be comparable for both alignments.

6.4.7.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. In addition, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

Alignment alternative AA17 would require two transmission line crossings, thereby introducing an increased reliability concern. The applicants' equivalent would require no transmission line crossings.

6.4.7.7 Cost

Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-120). Alignment alternative AA17 would require two specialty structures to cross an existing transmission line in two separate locations. They would also each require two heavy-angle structures, which cost more than three times that of a tangent structure. As a result, the applicants' equivalent (approximately $1 million) is less expensive than alignment alternative AA17 (approximately $7 million).

6.5 Morrison County Region

The Morrison County region is located in the south-central part of the project, in Crow Wing, Morrison, and Benton counties (Figure 6-14, Map Book 3A). This region only includes the applicants' proposed route; no route alternatives or alignment alternatives are analyzed in this region. Chapter 6.5.1 summarizes the potential impacts resulting from construction and operation of the applicants' proposed route in the Morrison County region.

6.5.1 Applicants' Proposed Route – Morrison County Region

Potential impacts of the applicants' proposed route in the Morrison County region are summarized in Table 6-123 and discussed in Chapters 6.5.1.1 through 6.5.1.5.

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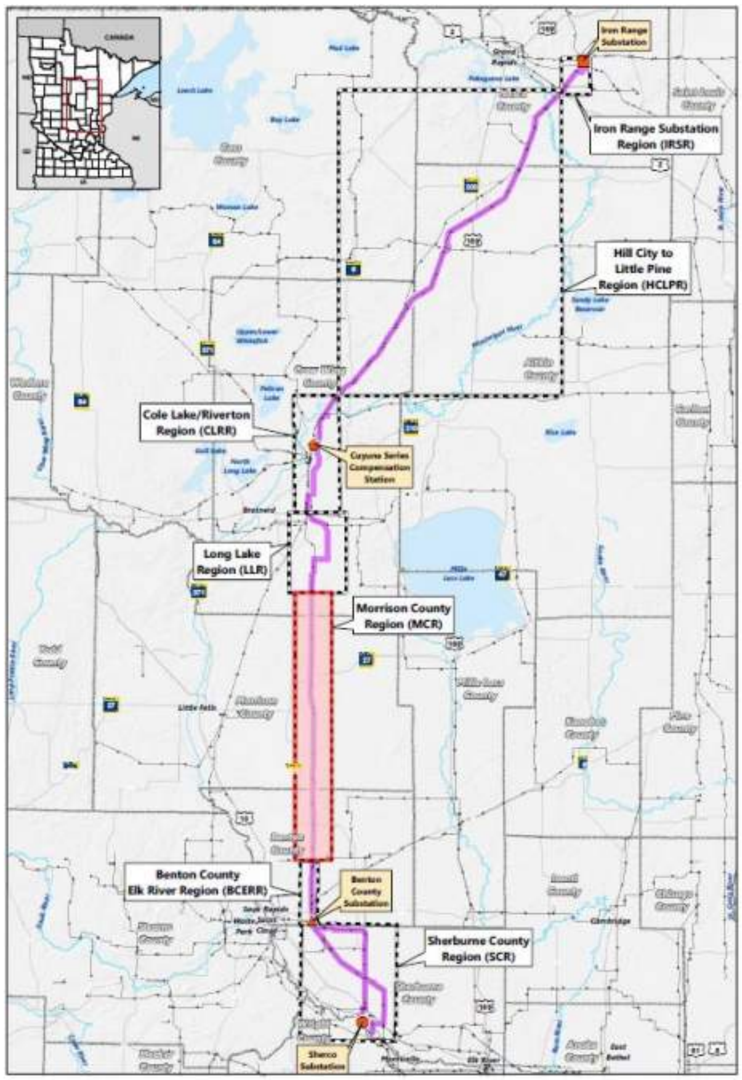


Table 6-123 Human and Environmental Impacts – Applicants' Proposed Route, Morrison County Region

Resource	Element	Applicants' Proposed Route
Length (miles)		38.5
Human Settlement	Residences within 0-75 feet (count)	0
	Residences within 75-250 feet (count)	3
	Residences within 250-500 feet (count)	14
	Residences within 500–1,000 feet (count)	27
Land-Based Economies	Agricultural land in 150-ft ROW	538
Water Resources	Total wetlands in 150-foot ROW (acres)	143
	Forested wetlands in 150-ft ROW (acres)	10
Vegetation	Forested landcover in 150-foot ROW (acres)	61
Wildlife	Grassland Bird Conservation Area in 150-foot ROW (acres)	559
Rare and Unique Natural Resources	Federal- or state-protected species documented in 150-foot ROW (count)	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	38.5 (100)
	Roadway (miles, percent)	0 (0)
	Field, parcel, or section lines (miles, percent)	10.7 (28)
	Total ROW sharing and paralleling (miles, percent)	38.5 (100)
Estimated Cost	Total estimated cost (2022 dollars in millions)	$190.7

6.5.1.1 Human Settlements

As discussed in Chapter 5.3, potential human settlement impacts are assessed by looking at several human settlement elements: aesthetics, displacement, noise, property values, zoning and land-use compatibility, electronic interference, and cultural values. Proximity to homes, schools, and other human settlement features and the extent of ROW sharing with existing infrastructure are the primary indicators of potential impacts to human settlements. Impacts to human settlements are minimized by routes that are located away from homes and that share ROW with existing infrastructure.

For some of the human settlement elements in the Morrison County region, project impacts are anticipated to be minimal and independent of the route selected. For the Morrison County region, aesthetics, displacement, and socioeconomics and EJCs are the only human settlement elements for which impacts may be non-minimal.

6.5.1.1.1 Aesthetics

Aesthetic impacts are assessed through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed route alternative would change these aesthetic attributes. Determining the relative scenic value or visual importance in any given area depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure ROW. The proximity of residential buildings is shown in Table 6-124. The applicants' proposed route in the Morrison County Region would follow existing transmission line ROW for the entirety of its length, as shown in Table 6-125.

Table 6-124 Morrison County Region Proximity of Residences to Applicants' Route

Residences, Distance from Anticipated Alignment	Applicants' Proposed Route
Residences within 0-75 feet	0
Residences within 75-250 feet	3
Residences within 250-500 feet	14
Residences within 500-1000 feet	27
Total Residences within 1,000 feet	44

Table 6-125 Morrison County Region ROW Sharing and Paralleling of Applicants' Route

Infrastructure	Applicants' Proposed Route miles (percent)
Follows Existing Railroad	0 (0)
Follows Existing Roads	0 (0)
Follows Existing Transmission Line	38.5 (100)
Total – Follows Transmission Line, Road, or Railroad	38.5 (100)
Follows Field, Parcel, or Section Lines	10.7 (28)
Total – ROW Paralleling and Sharing	38.5 (100)
Total Length	38.5

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.5.1.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW, due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no permanent residences, churches, childcare centers, or schools located within the 150-foot ROW for the applicants' proposed route. However, there is one non-residential building located within the 150-foot ROW of the applicants' proposed route.

This non-residential building may or may not be displaced as a result of the project for the applicants' proposed route. Though buildings are generally not allowed with the ROW of a transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For each the building noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.5.1.1.3 Socioeconomics and Environmental Justice

Socioeconomic factors provide an indication of how economic activity affects and is shaped by social processes. Socioeconomic measures indicate how societies progress, stagnate, or regress because of the actions and interactions within and between the local, regional, or global economic scale. Transmission line projects can contribute to growth and progress at the local level over time, but generally do not have a long-term significant socioeconomic impact.

The project would improve the socioeconomics of the region through the creation of jobs, generation of tax revenue, and providing more reliable electrical service to the surrounding communities. The applicants' proposed route intersects with Harding Township which was identified as an EJC. No adverse or permanent impacts to the identified EJC are anticipated. While the applicants' proposed route does intersect an EJC, this community is not anticipated to experience disproportionately adverse impacts as a result of the project.

6.5.1.2 Land-Based Economies

As discussed in Chapter 5.8, impacts on land-based economies are assessed by considering four elements: agriculture, forestry, mining, and recreation and tourism. For some of these elements in the Morrison County region, impacts from the project are anticipated to be minimal.

For the Morrison County region, agriculture and recreation and tourism are the only elements of land-based economies for which impacts are anticipated to be non-minimal. There are no forestry resources or active mining operations within the ROW of the applicants' proposed route. As a result, no impacts to forestry and mining are anticipated.

6.5.1.2.1 Agriculture

Project impacts to agriculture within the Morrison County region were evaluated through land use and soil types within the 150-foot ROW of the applicants proposed route. Map Book 5C provides an overview of land cover types crossed by the applicants' proposed route. Approximately 538 acres of the applicants' proposed route ROW (77 percent of the 150-foot ROW in this region) consists of agricultural land. This land is comprised primarily of cultivated crops and hay/pasture lands.

According to the MDA Organic Farm Directory, no registered organic producers are within the 150-foot ROW (reference (105)) of the applicants' proposed route. No apiaries are located within the ROW according to the Minnesota Apiary Registry (reference (106)). In addition, no agricultural lands are enrolled in the USDA FSA CREP within the 150-foot ROW (reference (107)) of the applicants' proposed route.

Potential construction and operation-related impacts to agricultural land are summarized in Chapter 5.8.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to agricultural land, as described in Chapter 5.8.1.1.

6.5.1.2.2 Recreation and Tourism

Recreation and tourism activities within the Morrison County region consist primarily of trail usage, including off-road vehicle trails and snowmobile trails. Since transmission line construction and operation generally has minimal permanent and temporary impacts to trails, recreation, and tourism, project impacts in this region are expected to be minimal.

The applicants' proposed route has 17 trail crossings, which include off-road vehicle trail crossings and snowmobile trail crossings (Map Book 5E). The applicants' proposed route parallels an existing transmission line ROW for the entirety of the route, reducing introduction of new permanent impacts which include operational noise and reduced aesthetic values (Chapter 5.8.4.1). Additionally, temporary impacts including trail closings during construction would occur but are expected to have a minimal impact on recreation.

6.5.1.3 Archaeological and Historic Resources

Archaeological and historic architectural resource impacts are assessed by determining the presence of these resources within the project route width (Chapter 5.1.1). Map Book 5F provides an overview of archaeological and historic architectural resources in the Morrison County region.

There are four documented historic architectural resources within the route width (1,000-foot) of the applicants' proposed route in the Morrison County region (Table 6-126). As discussed in Chapter 5.9.3, impacts to these resources would mainly consists of changes in the resource's setting due to placement of the transmission line in proximity.

Table 6-126 Cultural Resources within the Route Width of the Applicants' Proposed Route, Morrison County Region

Resource Number	Resource Type	NRHP Eligibility
BN-GRM-00005	Bridge 05501	Not evaluated
MO-GRN-00003	Culvert 93169 over Skunk River	Not eligible
XX-ROD-00113	Trunk Highway 25	Not evaluated
XX-ROD-00180	Trunk Highway 28	Not eligible

The applicants' proposed route would cross resources XX-ROD-00113 and XX-ROD-00180 within an existing transmission line ROW. Similarly, resources BN-GRM-00005 and MO-GRN-00003, though within the route width, are adjacent to an existing transmission line. Because this transmission line ROW is existing, no changes in setting are anticipated in relation to these resources as a result of the project; therefore, the project would not adversely affect them.

6.5.1.4 Natural Environment

6.5.1.4.1 Water Resources

Potential project impacts on water resources are examined by evaluating locations and conditions of watercourses and waterbodies, floodplains, wetlands, and groundwater. Project proximity to water bodies, watercourses, floodplains, wetlands, and groundwater wells and the necessity of crossing these features are the primary indicators of potential water resource impacts. Impacts to two elements of water resources, floodplains and groundwater, are anticipated to be minimal.

There are two elements of water resources for which impacts could be non-minimal: watercourses and waterbodies and wetlands. This discussion focuses on those elements that are within the ROW or are crossed by the routing alternatives. The number of surface water and wetland crossings is an important consideration when evaluating routes, even though there may be no direct impacts associated with these crossings. The crossings are important because of the potential indirect impacts associated with them (i.e., clearing of vegetation, soil movement). The amount of forested wetland within the ROW is also an important consideration when evaluating routes. Since large-growing woody vegetation would be cleared from the ROW, forested wetlands would be converted to other wetland types, resulting in permanent impacts.

6.5.1.4.1.1 Watercourses and Waterbodies

According to the NHD the applicants' proposed route would cross 50 watercourses in the Morrison County region, including 18 public water watercourses, and two impaired streams: Hillman Creek and the Platte River. The applicants' proposed route would also cross seven NHD waterbodies, one of which is classified as impaired. The applicants proposed route would not cross any public water basins or impaired lakes in the Morrison County region.

It is anticipated that the watercourse and waterbodies would be spanned. Since no structures are anticipated to be placed within waterbodies and watercourses, no direct impacts to these resources are anticipated. Indirect impacts to these resources, such as increases in turbidity, could be minimized by using BMPs.

6.5.1.4.1.2 Wetlands

The ROW of the applicants' proposed route in the Morrison County region contains approximately 143 acres of NWI wetland. The NWI wetlands consist mainly of emergent wetlands (104 acres), shrub wetlands (24acres), and forested wetlands (10 acres). The remaining area consist of five acres of ponded and riverine wetlands. There no PWI wetlands in the ROW of the applicants' proposed route in the Morrison County region.

Although wetlands would be spanned to the extent possible, the applicants' proposed route would cross wetland areas wider than 1,000 feet, which may require one or more structures to be placed in a wetland. Placement of structures in a wetland would result in permanent impacts to that wetland. Permanent impacts to wetlands could also occur if wetlands in the ROW are forested. Forested wetlands would be converted to non-forested wetland types, as trees are not allowed within transmission line rights-of-way. Impacts associated with converting forested wetlands to non-forested wetland types could be minimized by selecting a route alternative with fewer forested wetlands in the ROW.

6.5.1.4.2 Vegetation

Vegetation impacts were evaluated by examining vegetative landcover within the 150-foot ROW (Chapter 5.10.4.1). Map Book 5C provides an overview of vegetative landcover in the Morrison County region and Table 6-127 summarizes the landcover types within the ROW of the applicants' proposed route within this region. The dominant vegetative landcover in the ROW of the applicants' proposed route in this region consists of agricultural land, which represents approximately 78 percent of the ROW.

Agricultural vegetation in the ROW of applicants' proposed route for this region is discussed in Chapter 6.5.1.2.1.

Table 6-127 Landcover Types in the 150-foot ROW of the Applicants' Proposed Route in the Morrison County Region

Landcover Type	Acres in ROW	Percent of ROW[1]
Agricultural (cultivated crops and hay/pasture)	538	78
Herbaceous (upland and wetland)	77	11
Forested (upland and wetland)	61	9
Developed (low-high intensity; open space)	12	2
Shrub/Scrub	<1	<1
Barren Land	2	<1

Source reference (110)
1 Totals may not sum to 100 percent due to rounding.

The ROW of the applicants' proposed route contains approximately 61 acres of forested vegetation. Forested vegetation types include forested wetlands and upland deciduous and mixed forest communities. As discussed in Chapter 5.10.4.1, the applicants would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation to minimize potential interference with the transmission line. The entirety of the applicants' proposed route in the Morrison County region would parallel an existing transmission line ROW where the forested areas have already been fragmented, thereby minimizing new impacts to forest vegetation in these areas.

Potential construction and operation-related impacts to vegetation are summarized in Chapter 5.10.4.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Chapter 5.10.4.1. Potential impacts to agricultural vegetation and wetlands are discussed Chapters 5.8.1 and 5.10.1.3, respectively.

6.5.1.4.3 Wildlife

Impacts to wildlife are primarily assessed by evaluating the presence of wildlife habitat, including areas that are preserved or managed for wildlife habitat, within the ROW (Chapter 5.10.5.1 and 5.10.5.2). The applicants' proposed route in the Morrison County region would parallel an existing transmission line ROW for its entire length. As such, the applicants' proposed route would occur adjacent to an area where wildlife habitat has been previously disturbed, thereby minimizing new impacts associated with habitat fragmentation.

As shown on Map Book 5H, the majority of the applicants' proposed route would traverse USFWS GBCA (approximately 559 acres). However, it would traverse these GBCA while paralleling an existing transmission line ROW, thereby minimizing the potential for new impacts associated with habitat fragmentation and impacts to avian species.

Potential construction and operation-related impacts to wildlife are summarized in Chapter 5.10.5. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife, as described in Chapter 5.10.5.

6.5.1.5 Rare and Unique Natural Resources

Impacts to rare and unique natural resources are primarily assessed by evaluating the presence of federal- and state-protected species within a 1-mile radius of the anticipated alignment and the presence of sensitive ecological resources within the 150-foot ROW (Chapter 5.10). Map Book 5I provides an overview of sensitive ecological resources within the Morrison County region; in order to protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

6.5.1.5.1 Protected Species

Using the NHIS database, it was determined that no federally protected species have been documented within 1 mile of the applicants' proposed route in the Morrison County region. One state protected species, the Blanding's turtle, has been identified within 1 mile of the applicants' proposed route in this region, but has not been documented within the ROW or route width (Appendix N). In addition, one state special concern species has been documented within 1 mile of the applicants' proposed route in this region (Appendix N).

Formal surveys for protected species have not been conducted for the project; as such, it is possible that protected species could be present where suitable habitat is available within the ROW. Potential impacts to protected species could occur should they be present within or near the ROW. While more mobile species would leave the area for nearby comparable habitats, non-mobile organisms, such as vascular plants or nesting birds, could be directly impacted.

Potential construction and operation-related impacts to protected species are summarized in Chapter 5.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species, as described in Chapter 5.11.1.3. In addition, the applicants may be required to conduct field surveys for protected species in coordination with the USFWS and/or DNR prior to construction.

6.5.1.5.2 Sensitive Ecological Resources

The ROW of the applicants' proposed route in the Morrison County region would not traverse any sensitive ecological resources; as such, impacts to sensitive ecological resources are not anticipated in the ROW of the applicants' proposed route in this region.

6.6 Benton County Elk River Region

The Benton County Elk River region is in the southern part of the project, in Benton County (Figure 6-15). The Benton County Substation represents the southern extent of the region. In addition to the applicants' proposed route, the region has three route alternatives (J1, J2, and J3); no alignment alternatives are analyzed in this region (Map Book 3A). Chapter 6.6.1 summarizes the potential impacts resulting from construction and operation of the applicants' proposed route in the Benton County Elk River region. Chapter 6.6.2 provides a comparison of the potential impacts resulting from construction and operation of route alternatives J1, J2, J3, and the applicants' equivalent.

6.6.1 Applicants' Proposed Route – Benton County Elk River Region

Potential impacts of the applicants' proposed route in the Benton County region are summarized in Table 6-128 and discussed in Chapters 6.6.1.1 through 6.6.1.5.

[redacted]

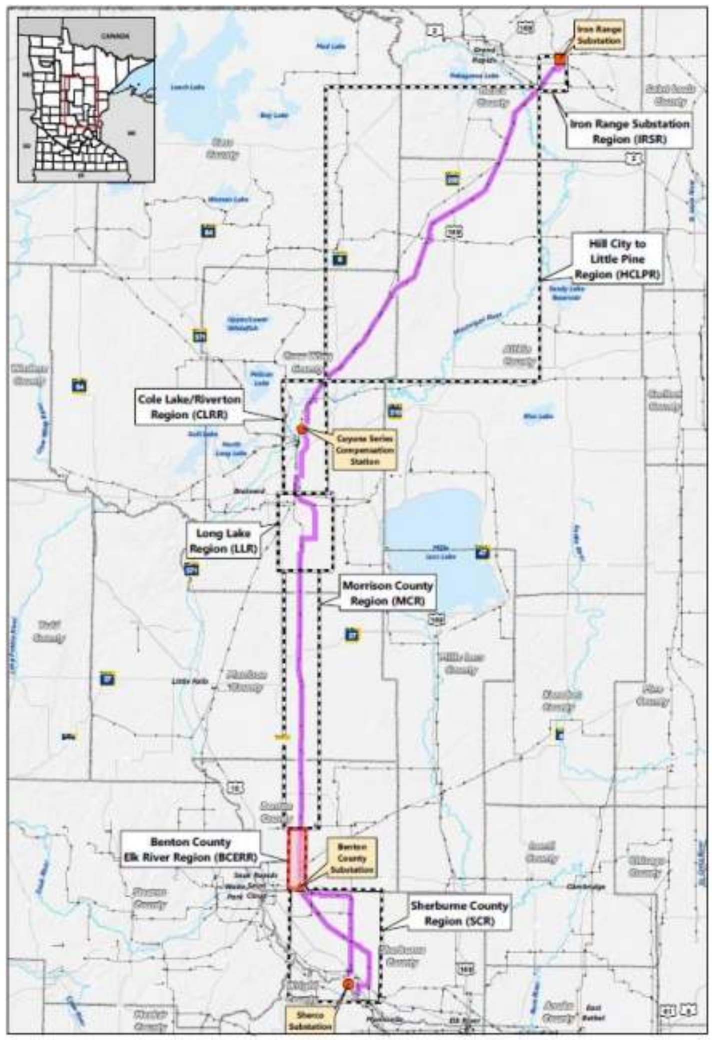


Table 6-128 Human and Environmental Impacts – Applicants' Proposed Route, Benton County Elk River Region

Resource	Element	Applicants' Proposed Route
Length (miles)		8.7
Human Settlement	Residences within 0-75 feet (count)	0
	Residences within 75-250 feet (count)	3
	Residences within 250-500 feet (count)	13
	Residences within 500–1,000 feet (count)	12
Land-Based Economies	Agricultural land in 150-ft ROW	100
Water Resources	Total wetlands in 150-foot ROW (acres)	39
	Forested wetlands in 150-ft ROW (acres)	19
Vegetation	Forested landcover in 150-foot ROW (acres)	39
Wildlife	Grassland Bird Conservation Area in 150-foot ROW (acres)	153
Rare and Unique Natural Resources	Federal- or state-protected species documented in 150-foot ROW (count)	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	8.3 (96)
	Roadway (miles, percent)	0 (0)
	Field, parcel, or section lines (miles, percent)	0.5 (6)
	Total ROW sharing and paralleling (miles, percent)	8.3 (96)
Estimated Cost	Total estimated cost (2022 dollars in millions)	$43.2

6.6.1.1 Human Settlements

As discussed in Chapter 5.3, potential human settlement impacts are assessed by looking at several human settlement elements: aesthetics, displacement, noise, property values, zoning and land-use compatibility, electronic interference, and cultural values. Proximity to homes, schools, and other human settlement features and the extent of ROW sharing with existing infrastructure are the primary indicators of potential impacts to human settlements. Impacts to human settlements are minimized by routes that are located aware from homes and that share ROW with existing infrastructure.

For some of the human settlements elements in the Benton County Elk River region, project impacts are anticipated to be minimal. For the Benton County Elk River region, aesthetics and displacement are the only human settlement elements for which impacts are anticipated to be non-minimal.

6.6.1.1.1 Aesthetics

Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed route alternative would change these aesthetic attributes (Chapter 5.3.1). Determining the relative scenic value or visual importance in any given area depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure ROW. The proximity of residential buildings is shown in Table 6-129. Approximately 96 percent of the applicants' proposed route in the Benton County Elk River region would parallel existing transmission line ROW, as shown in Table 6-130. This ROW paralleling helps to minimize aesthetic impacts.

Table 6-129 Benton County Elk River Region Proximity of Residences to Applicants' Route

Residences, Distance from Anticipated Alignment	Applicants' Proposed Route
Residences within 0-75 feet	0
Residences within 75-250 feet	3
Residences within 250-500 feet	13
Residences within 500-1,000 feet	12
Total Residences within 1,000 feet	28

Table 6-130 Benton County Elk River Region ROW Sharing and Paralleling of Applicants' Route

Infrastructure	Applicants' Proposed Route miles (percent)
Follows Existing Railroad	0 (0)
Follows Existing Roads	0 (0)
Follows Existing Transmission Line	8.3 (96)
Total – Follows Transmission Line, Road, or Railroad	8.3 (96)
Follows Field, Parcel, or Section Lines	0.5 (6)
Total – ROW Paralleling and Sharing	8.3 (96)
Total Length of Route Alternative	8.7

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.6.1.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW, due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no permanent residences, churches, childcare centers, or schools located within the 150-foot ROW for the applicants' proposed route. However, there are two non-residential buildings located within the 150-foot ROW of the applicants' proposed route.

These non-residential buildings may or may not be displaced as a result of the project. Though buildings are generally not allowed with the ROW of a transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For each of the buildings noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.6.1.2 Land-Based Economies

As discussed in Chapter 5.8, impacts on land-based economies are assessed by considering four elements: agriculture, forestry, mining, and recreation and tourism. For some of the elements of land-based economies in the Benton County Elk River region, impacts from the project are anticipated to be minimal.

For the Benton County Elk River region, agriculture and mining are the only elements of land-based economies for which impacts are anticipated to be non-minimal. There are no forestry resources within the ROW of the applicants' proposed route. There are few recreation and tourism opportunities. As a result, potential impacts to forestry and recreation and tourism would be minimal.

6.6.1.2.1 Agriculture

Project impacts to agriculture within the Benton County Elk River region were evaluated through land use and soil types within the 150-foot ROW of the applicants proposed route. Map Book 5C provides an overview of land cover types crossed by the applicants' proposed route. Approximately 100 acres of the 150-foot ROW of the applicants' proposed route in this region consists of agricultural land (Table 6-128). This land is comprised primarily of cultivated crops and hay/pasture lands.

According to the MDA Organic Farm Directory, no registered organic producers are within the ROW (reference (105)). No apiaries are located within the ROW according to the Minnesota Apiary Registry (reference (106)). In addition, no agricultural lands are enrolled in the USDA FSA CREP within the ROW (reference (107)).

Potential construction and operation-related impacts to agricultural land are summarized in Chapter 5.8.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to agricultural land, as described in Chapter 5.8.1.1.

6.6.1.2.2 Mining

Potential impacts on mining operations are likely to occur if the construction or operation of a transmission line prevents access to and recovery of resources. The construction of a transmission line could limit the ability to mine these resources, depending on the proximity of the resources to the route selected for the project.

There is one active aggregate mine, AM-1578, within the 150-foot ROW of the applicants' proposed route in the Benton County Elk River region. The ROW of the applicants' route passes along the eastern edge of this mine. As discussed in Chapter 5.8.3.1, construction of a transmission line could affect future mining operations if structures interfere with access to mineable resources or the recovery of those resources. These impacts could be either temporary or permanent depending on the location of the resource. Based on aerial imagery, the ROW of the applicants' route passes through the eastern edge of the mine, which may result in fewer impacts than crossing through a more central portion of it. Further, the applicants' route parallels an existing transmission line that, to date, has apparently not interfered with mining operations.

6.6.1.3 Archaeological and Historic Resources

Archaeological and historic architectural resource impacts are assessed by determining the presence of these resources within the project route width (Chapter 5.1.1). Map Book 5F provides an overview of archaeological and historic architectural resources in the Benton County Elk River Region.

Two documented archaeological sites and three documented historic architectural resources are located within the 1,000-ft route width of the applicants' proposed route (Table 6-131). Historic architectural resources XX-ROD-00021 (Trunk Highway 95), XX-ROD-00152 (Trunk Highway 23), and XX-ROD-00155 (MN State Hwy 23 from Paynesville to Mission Creek), have been previously determined not eligible for the NRHP. Because these resources are "not eligible", they cannot be adversely affected by the project and no additional work regarding these resources would be necessary.

Archaeological sites 21BN0013 and 21BN0016 may be impacted if either is present within the footprint of ground disturbance and if they cannot be avoided by the project. The primary means to minimize impacts to archaeological resources is prudent routing or structure placement (i.e., avoiding known archaeological resources). If they cannot be avoided, impacts to these resources could be mitigated by measures developed in consultation with the SHPO prior to construction.

Table 6-131 Cultural Resources within the Route Width of the Applicants' Proposed Route, Benton County Elk River Region

Resource Number	Resource Type	NRHP Eligibility
21BN0013	Precontact artifact scatter	Not evaluated
21BN0016	Precontact lithic scatter	Not evaluated
XX-ROD-00021	Trunk Highway 95	Not eligible
XX-ROD-00152	Trunk Highway 23	Not eligible
XX-ROD-00155	MN State Hwy 23 from Paynesville to Mission Creek	Not eligible

6.6.1.4 Natural Environment

6.6.1.4.1 Water Resources

Potential impacts on water resources are evaluated by assessing impacts to watercourses and waterbodies, floodplains, wetlands, and groundwater. Proximity of the project to waterbodies, watercourses, floodplains, wetlands, and groundwater wells and the necessity of crossing these features are the primary indicators of potential impacts on water resources. Impacts to two elements of water resources, floodplains and groundwater, are anticipated to be minimal in this region.

Thus, there are two elements of water resources for which impacts could be non-minimal: watercourses and waterbodies and wetlands. This discussion focuses on those elements that are within the ROW or are crossed by the route alternatives. The number of surface water and wetland crossings is an important consideration when evaluating routes, even though there may be no direct impacts associated with these crossings. The crossings are important because of the potential indirect impacts associated with them (i.e., clearing of vegetation, soil movement). The amount of forested wetland within the ROW is also an important consideration when evaluating routes. Since large-growing woody vegetation would be cleared from the ROW, forested wetlands would be converted to other wetland types, resulting in permanent impacts.

6.6.1.4.1.1 Watercourses and Waterbodies

According to the NHD the applicants' proposed route would cross 30 watercourses in the Benton County Elk River region, including 26 public water watercourses, and one impaired stream: the Elk River. The applicants' proposed route would also cross one NHD waterbody. The applicants' proposed route would not cross any public water basins or impaired lakes in the Benton County Elk River region.

It is anticipated that the watercourse and waterbodies would be spanned. Since no structures are anticipated to be placed within waterbodies and watercourses, no direct impacts to these resources are anticipated. Indirect impacts to these resources, such as increases in turbidity, could be minimized by using BMPs and by choosing a route alternative that has relatively fewer crossings of waterbodies and watercourses.

6.6.1.4.1.2 Wetlands

The applicants' proposed route cross approximately 39 acres of NWI wetlands in the Benton County Elk River region. These NWI wetlands consist mainly of forested wetlands (19 acres), emergent wetlands (13 acres), and riverine wetlands (5 acres). The remaining areas consist of ponded and scrub/shrub wetlands. There is one PWI wetland along the applicants' proposed route in the Benton County Elk River region.

Although wetlands would be spanned to the extent possible, the applicants' proposed route would cross wetland areas wider than 1,000 feet, which may require one or more structures to be placed in a wetland. Placement of structures in a wetland would result in permanent impacts to that wetland. Permanent impacts to wetlands could also occur if wetlands in the ROW are forested. Forested wetlands would be converted to non-forested wetland types, as trees are not allowed within transmission line rights-of-way. Impacts associated with converting forested wetlands to non-forested wetland types could be minimized by selecting a route alternative with fewer forested wetlands in the ROW.

6.6.1.4.2 Vegetation

Vegetation impacts were evaluated by examining vegetative landcover within the 150-foot ROW (Chapter 5.10.4.1). Map Book 5C provides an overview of vegetative landcover in the Benton County Elk River region, and Table 6-132 summarizes the landcover types within the ROW of the applicants' proposed route within this region. The dominant vegetative landcover in the ROW of the applicants' proposed route in this region consists of agricultural land, which represents approximately 65 percent of the ROW. Agricultural vegetation in the ROW of applicants' proposed route for this region is discussed in Chapter 6.6.1.2.1.

Table 6-132 Landcover Types in the 150-foot ROW of the Applicants' Proposed Route in the Benton County Elk River Region

Landcover Type	Acres in ROW	Percent of ROW[1]
Agricultural (cultivated crops and hay/pasture)	100	65
Forested (upland and wetland)	39	26
Herbaceous (upland and wetland)	10	6
Developed (low-high intensity; open space)	4	3
Barren Land	<1	<1

Source: reference (110)
1 Totals may not sum to 100 percent due to rounding.

The ROW of the applicants' proposed route contains approximately 39 acres of forested vegetation. Forested vegetation types include forested wetlands and upland deciduous and mixed forest communities. As discussed in Chapter 5.10.4.1, the applicants would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation to minimize potential interference with the transmission line. The entirety of the applicants' proposed route in the Benton County Elk River region would parallel an existing transmission line ROW where the forested areas have already been fragmented, thereby minimizing forest fragmentation in these areas.

Potential construction and operation-related impacts to vegetation are summarized in Chapter 5.10.4.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Chapter 5.10.4.1. Potential impacts to agricultural vegetation and wetlands are discussed Chapters 5.8.1 and 5.10.1.3, respectively.

6.6.1.4.3 Wildlife

Impacts to wildlife are primarily assessed by evaluating the presence of wildlife habitat, including areas that are preserved or managed for wildlife habitat, within the ROW (Chapter 5.10.5.1 and 5.10.5.2). The applicants' proposed route in the Benton County Elk River region would parallel an existing transmission line ROW for its entire length. As such, the applicants' proposed route would occur adjacent to an area where wildlife habitat has been previously disturbed, thereby minimizing new impacts associated with habitat fragmentation.

As shown on Map Book 5H, the entirety of the ROW for the applicants' proposed route in this region would traverse USFWS GBCA. However, it would traverse the GBCA while paralleling an existing transmission line ROW, thereby minimizing the potential for new impacts associated with habitat fragmentation and impacts to avian species.

Potential construction and operation-related impacts to wildlife are summarized in Chapter 5.10.5. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife, as described in Chapter 5.10.5.

6.6.1.5 Rare and Unique Natural Resources

Impacts to rare and unique natural resources are primarily assessed by evaluating the presence of federal- and state-protected species within a 1-mile radius of the anticipated alignment and the presence of sensitive ecological resources within the 150-foot ROW (Chapter 5.10). Map Book 5I provides an overview of sensitive ecological resources within the Benton County Elk River region; in order to protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

6.6.1.5.1 Protected Species

Using the NHIS database, it was determined that no federally protected species have been documented within 1 mile of the applicants' proposed route in the Benton County to Elk River region. As summarized in Table 6-133, three state protected species have been documented within 1 mile of the applicants' proposed route in this region. One state special concern mussel species has been documented within the ROW of the applicants' proposed route in this region (Appendix N).

Table 6-133 State Protected Species Documented in the Natural Heritage Information System Database – Applicants' Proposed Route in the Benton County Elk River Region

Scientific Name	Common Name	Type	State Status	Documented Records within ROW, Route Width, or 1 Mile
Lanius ludovicianus	Loggerhead shrike	Bird	Endangered	1 Mile
Emydoidea blandingii	Blanding's turtle	Turtle	Threatened	1 Mile
Platanthera flava var. herbiola	Tubercled rein orchid	Vascular plant	Threatened	1 Mile

None of the state-protected species identified in Table 6-133 have been documented within the ROW or route width of the applicants' proposed route. Formal surveys for protected species have not been conducted for the project; as such, it is possible that these species or additional protected species could be present where suitable habitat is available within the ROW. Potential impacts to protected species could occur should they be present within or near the ROW. While more mobile species would leave the area for nearby comparable habitats, non-mobile organisms, such as vascular plants or nesting birds, could be directly impacted.

Potential construction and operation-related impacts to protected species are summarized in Chapter 5.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species, as described in Chapter 5.11.1.3. In addition, the applicants may be required to conduct field surveys for protected species in coordination with the USFWS and/or DNR prior to construction.

6.6.1.5.2 Sensitive Ecological Resources

The ROW of the applicants' proposed route in the Benton County Elk River region would not traverse any sensitive ecological resources; as such, impacts to sensitive ecological resources are not anticipated in the ROW of the applicants' proposed route in this region.

6.6.2 Route Alternatives J1 through J3 – Benton County Elk River Region

Route alternatives J1 through J3 provide options to the applicants' proposed route in the southern part of the Benton County Elk River region. Route alternatives J1 was shifted from the applicants' proposed route to avoid Elk River crossings and multiple pole structures in the Elk River's 100-year floodplain, pivot irrigation systems, and to parallel existing roads. Route alternative J1 does not include any transmission line ROW sharing or paralleling, or double-circuiting. Route alternatives J2 and J3 were shifted from the applicants' proposed route to reduce the number of river crossings and avoid impacts to floodplains. The last 0.5-mile of route alternative J2 would parallel existing transmission line ROW; however, the remaining 7.9 miles of the route alternative does not include transmission line ROW sharing or paralleling, or double-circuiting. Route alternative J3 would parallel an existing transportation corridor for the first 0.75-mile and would parallel existing transmission line ROW for the last 0.5-mile of the proposed route. Potential impacts of the route alternatives and the applicants' equivalent are summarized in Table 6-134 and shown on Map 6-24.

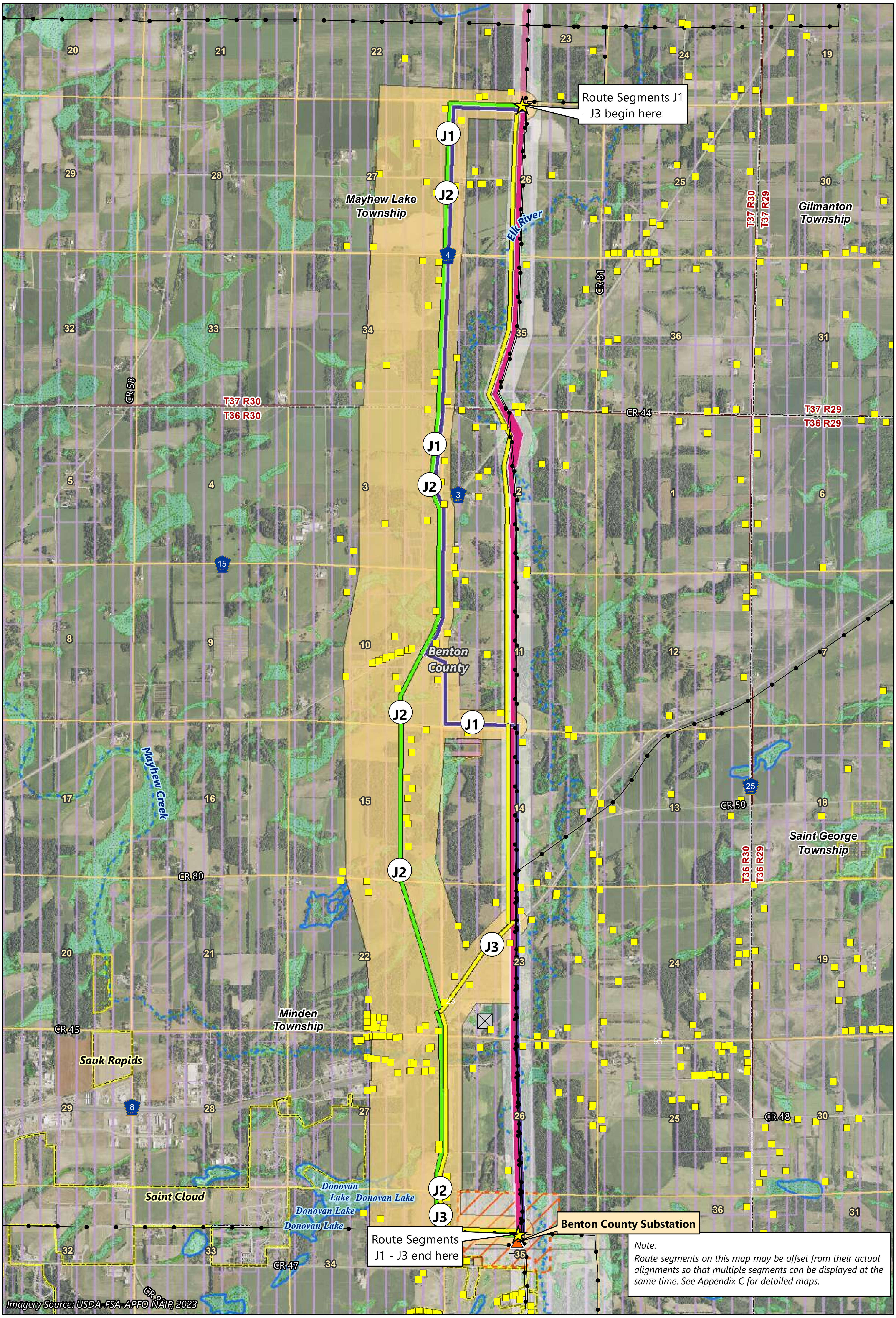
Table 6-134 Human and Environmental Impacts – Route Alternatives J1 through J3, Benton County Elk River Region

Resource	Element	Route Alternative J1	Route Alternative J2	Route Alternative J3	Applicants' Equivalent
Length (miles)		8.4	8.4	8.0	8.1
Human Settlement	Residences within 0-75 feet (count)	0	0	1	0
	Residences within 75-250 feet (count)	10	21	11	3
	Residences within 250-500 feet (count)	24	26	14	12
	Residences within 500–1,000 feet (count)	20	24	19	13
Land-Based Economies	Agricultural land in 150-ft ROW	112	105	105	93
Water Resources	Total wetlands in 150-foot ROW (acres)	18	8	21	38
	Forested wetlands in 150-ft ROW (acres)	7	0	10	19
Vegetation	Forested landcover in 150-foot ROW (acres)	22	20	20	35
Wildlife	Grassland Bird Conservation Area in 150-foot ROW (acres)	153	154	147	141
Rare and Unique Natural Resources	Federal- or state-protected species documented in 150-foot ROW (count)	0	0	0	0
ROW Sharing and Paralleling	Transmission line (miles, percent)	3.3 (39)	0.5 (6)	5.9 (73)	7.7 (95)
	Roadway (miles, percent)	4.1 (49)	6.1 (73)	2.6 (32)	0 (0)
	Field, parcel, or section lines (miles, percent)	4.7 (56)	6.4 (76)	2.6 (32)	0.5 (6)
	Total ROW sharing and paralleling (miles, percent)	7.5 (90)	6.4 (76)	7.9 (99)	7.7 (95)
Reliability	Crossing of existing transmission lines (count)	0	0	0	0
Estimated Cost	Total estimated cost (2022 dollars in millions)	$45.9[1]	$46.2[2]	$42.7[3]	$40

1 Six heavy-angle structures would be needed for an additional cost of approximately $740,000 per structure ($41.4 million base cost). In addition, this route alternative may require residential displacement. There is no way to estimate the displacement cost at this time.

2 Six heavy-angle structures would be needed for an additional cost of approximately $740,000 per structure ($41.7 million base cost). In addition, this route alternative may require residential displacement. There is no way to estimate the displacement cost at this time.

3 Four heavy-angle structures would be needed for an additional cost of approximately $740,000 per structure ($39,796,169 base cost). In addition, this route alternative may require residential displacement. There is no way to estimate the displacement cost at this time.



Route Segment J1
Route Segment J2
Route Segment J3
Applicants' Route J Equivalent
Route Width
Route Alternative Width
Existing Transmission Line
Benton County Substation
Substation Siting Area
Residence
Active Aggregate Mine
PWI Watercourse
PWI Waterbody
Shallow Wildlife Lake
Native Plant Community
Grassland Bird Conservation Areas
State Conservation Easement
Municipal Boundary

Wetlands

Non-Forested Wetland

Site of Biodiversity Significance

High Significance

Feet

0 1,500 3,000

Map 6-24

ROUTE ALTERNATIVES J1 - J3

Benton County Elk River Region

Northland Reliability Project

6.6.2.1 Human Settlements

Potential impacts on human settlements are assessed through an evaluation of several elements. For some of these, project impacts are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. These resources include cultural values, displacement, electronic interference, noise, property values, socioeconomics and EJCs, and zoning and land use.

6.6.2.1.1 Aesthetics

Aesthetic impacts differ by routing alternative. Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to route alternatives J1 through J3 are shown in Table 6-135, while ROW paralleling and sharing are shown in Table 6-136.

Route alternative J2 has the greatest number of residences within 1,000 feet of its anticipated alignment, while the applicants' equivalent has the least. Route alternatives J1 and J3 have a similar number of residences within 1,000 feet; both have more residences than the applicants' equivalent.

The applicants' equivalent follows existing transmission line ROW for approximately 95 percent of its length. Route alternative J3 and the applicants' equivalent follow the greatest amount of existing infrastructure ROW.

On whole, the applicants' equivalent best minimizes aesthetic impacts by placing the line away from residences and by following the greatest amount of existing transmission line ROW.

Table 6-135 Benton County Elk River Region Proximity of Residences to Route Alternatives J1 through J3

Residences, Distance from Anticipated Alignment	Route Alternative J1	Route Alternative J2	Route Alternative J3	Applicants' Equivalent
Residences within 0-75 feet	0	0	1	0
Residences within 75-250 feet	10	21	11	3
Residences within 250-500 feet	24	26	14	12
Residences within 500-1,000 feet	20	24	19	13
Total Residences within 1,000 feet	54	71	45	28

Table 6-136 Benton County Elk River Region ROW Sharing and Paralleling of Route Alternatives J1 through J3

Infrastructure	Route Alternative J1 miles (percent)	Route Alternative J2 miles (percent)	Route Alternative J3 miles (percent)	Applicants' Equivalent miles (percent)
Follows Existing Railroad	0 (0)	0 (0)	0 (0)	0 (0)
Follows Existing Roads	4.1 (49)	6.1 (73)	2.6 (32)	0 (0)
Follows Existing Transmission Line	3.3 (39)	0.5 (6)	5.9 (73)	7.7 (95)
Total – Follows Transmission Line, Road, or Railroad	7.4 (88)	6.1 (73)	7.9 (99)	7.7 (95)
Follows Field, Parcel, or Section Lines	4.7 (56)	6.4 (76)	2.6 (32)	0.5 (6)
Total – ROW Paralleling and Sharing	7.5 (90)	6.4 (76)	7.9 (99)	7.7 (95)
Total Length	8.4	8.4	8.0	8.1

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line, and therefore, the sum may be greater than 100 percent.

6.6.2.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW, due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no permanent residences, churches, childcare centers, or schools located within the 150-foot ROW for the applicants' equivalent or route alternatives J1 and J2. Route alternative J3 has one permanent residence and one non-residential building located within its ROW. Route alternative J1, and the applicants' equivalent have two non-residential buildings located within this route alternative's 150-foot ROW.

The project may potentially displace a residential building located within the 150-foot ROW of alternative J3; similarly, non-residential buildings may or may not be displaced. Though buildings are generally not allowed with the ROW of a transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For each of the buildings noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.6.2.2 Land-Based Economies

Potential project impacts to land-based economies are assessed through an evaluation of several elements. There are no forestry resources within the ROW of route alternatives J1 through J3 or the ROW of the applicants' equivalent. There are few recreation and tourism opportunities, and they do not differ between the route alternatives. Therefore, potential impacts to forestry and recreation and tourism would be minimal and independent of the route selected.

6.6.2.2.1 Agriculture

Impacts to agricultural land in the 150-foot ROW of route alternatives J1 through J3 and the applicants' equivalent are relatively similar. The applicants' equivalent has the least amount of agricultural land (93 acres) in the ROW. Route alternative J1 has the most amount of agricultural land (112 acres) in the ROW.

According to the USDA FSA (reference (107)), MDA Organic Farm Directory (reference (105)), and MDA Apiary Registry (reference (106)), there are no CREP enrolled lands, registered organic producers, or apiaries within the 150-foot ROW of the route alternatives or the applicants' equivalent.

6.6.2.2.2 Mining

Potential impacts on mining operations are likely to occur if the construction or operation of a transmission line prevents access to and retrieval of resources. The construction of a transmission line could limit the ability to mine these resources, depending on the proximity of the resources to the route selected for the project.

There is one active aggregate mine, AM-1578, within the 150-foot ROW of route alternatives J1, J2, J3, and the applicants' equivalent in the Benton County Elk River region. The ROW of route alternative J1 and the applicants' equivalent passes along the eastern edge of this mine, while the ROW of route alternatives J2 and J3 pass along the western edge of the mine. As discussed in Chapter 5.8.3, construction of a transmission line could affect future mining operations if structures interfere with access to mineable resources or the retrieval of those resources. These impacts could be either temporary or permanent depending on the location the resource. Since the routing alternatives pass through the mine site at its edges, impacts may be reduced compared to crossing through a more central portion of it.

6.6.2.3 Archaeological and Historic Resources

Multiple previously documented cultural resources are located within the 1,000-foot route width of route alternatives J1, J2, J3, and the applicants' equivalent (Table 6-137), as shown on Map Book 5F.

Table 6-137 Cultural Resources within the Route Width of Route Alternatives J1 through J3 and the Applicants' Equivalent

Resource Number	Resource Type	NRHP Eligibility	Location
21BN0013	Precontact artifact scatter	Not evaluated	route alternative J1, applicants' equivalent
21BN0014	Precontact lithic scatter	Not evaluated	route alternative J2 route alternative J3
21BN0016	Precontact lithic scatter	Not evaluated	route alternative J1, route alternative J3, applicants' equivalent
BN-MIN-00002	District No. 44 School	Not evaluated	route alternative J1, route alternative J2
BN-MIN-00026	Bridge No. L5807 over Mayhew Creek	Not eligible	route alternative J2, route alternative J3
BN-MIN-00035	Culvert 97591 over Mayhew Creek	Not eligible	route alternative J2, route alternative J3
XX-ROD-00021	Trunk Highway 95	Not eligible	route alternative J1, route alternative J2, route alternative J3, applicants' equivalent
XX-ROD-00152	Trunk Highway 23	Not eligible	route alternative J1, route alternative J2, route alternative J3, applicants' equivalent
XX-ROD-00155	MN State Hwy 23 from Paynesville to Mission Creek	Not eligible	route alternative J1, route alternative J2, route alternative J3, applicants' equivalent

Historic architectural resources BN-MIN-00026 (bridge over Mayhew Creek), BN-MIN-00035 (culvert over Mayhew Creek), XX-ROD-00021 (Trunk Highway 95), XX-ROD-00152 (Trunk Highway 23), and XX-ROD-00155 (MN State Hwy 23 from Paynesville to Mission Creek) have been previously determined not eligible for the NRHP. Because these resources are "not eligible", they cannot be adversely affected by the project and no additional work regarding these resources would be necessary.

Archaeological sites 21BN0013, 21BN0014, and 21BN0016 may be impacted by the project if any of these sites are present within the footprint of ground disturbance. Ground disturbing activities resulting from the project have the potential to impact these resources if they cannot be avoided by the project.

The primary means to minimize impacts to archaeological and historic architectural resources is prudent routing or structure placement – i.e., avoiding known archaeological and historic resources. If they cannot be avoided, impacts to these resources could be mitigated by measures developed in consultation with the SHPO prior to construction.

6.6.2.4 Natural Environment

6.6.2.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This route alternative comparison discussion addresses watercourses and waterbodies, and wetlands. Map 6-24 shows the water resources along route alternatives J1 through J3.

6.6.2.4.1.1 Watercourses and Waterbodies

Table 6-138 identifies the watercourses and waterbodies crossed by route alternatives J1 through J3 and the applicants' equivalent. Route J2 would reduce the watercourse crossings by avoiding crossing the Elk River, a PWI and also an impaired watercourse. Route alternatives J1, J3, and the applicants' equivalent would cross the Elk River at multiple locations.

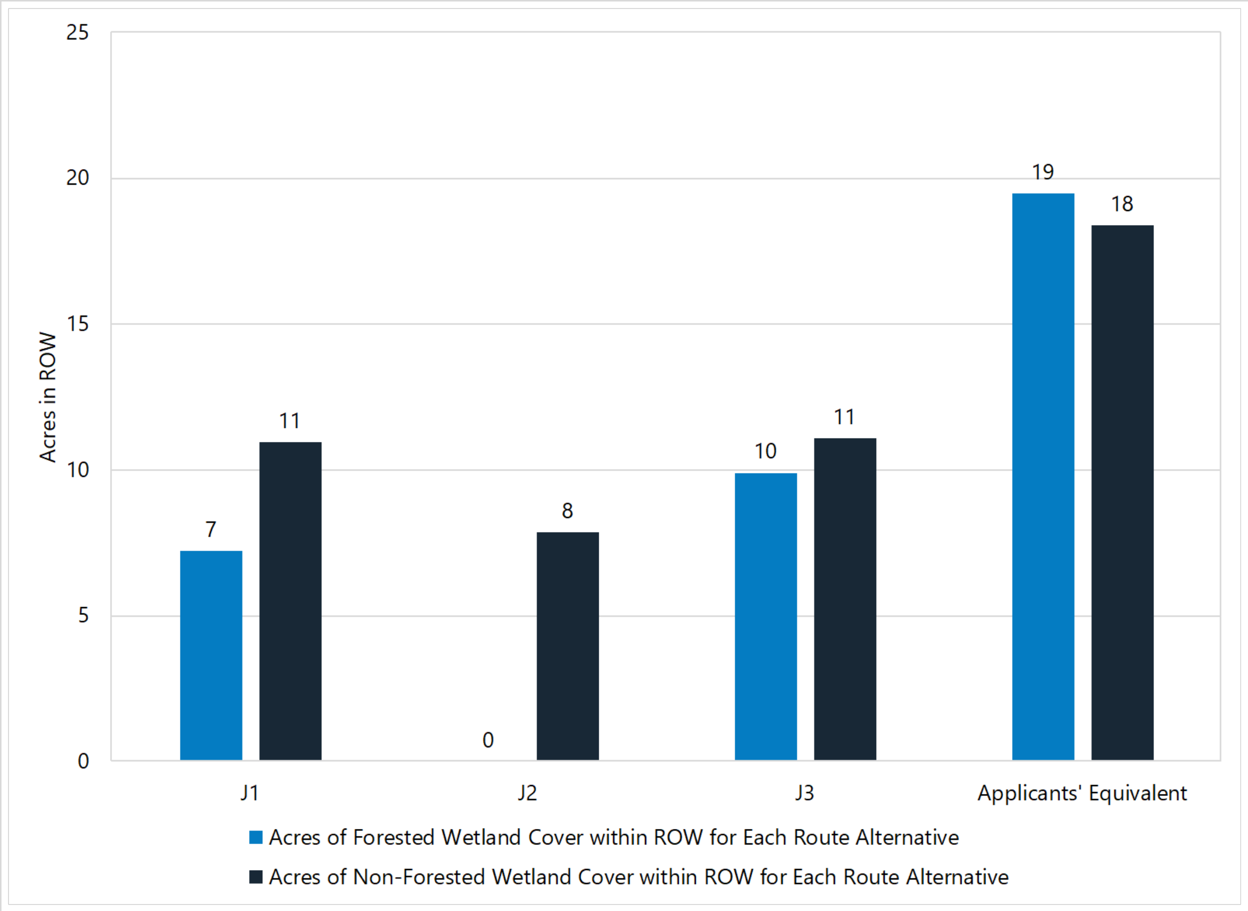
Table 6-138 Watercourses and Waterbodies Crossed by Route Alternatives J1 Through J3 and the Applicants' Equivalent

Resources	Route Alternative J1	Route Alternative J2	Route Alternative J3	Applicants' Equivalent
Number of NHD stream crossings	14	6	18	29
Number of impaired stream crossings	8	1	15	26
Number PWI stream crossings	8	1	15	26
Number of NHD lake crossings	4	3	0	1
Number of impaired lake crossings	0	0	0	0
Number of PWI basin crossings	0	0	0	0
Number of PWI wetland crossings	0	0	0	0

6.6.2.4.1.2 Wetlands

Figure 6-16 identifies the acreage of wetlands crossed by route alternatives J1 through J3 and the applicants' equivalent. The applicants' equivalent would cross the most forested and non-forested wetlands. Route alternative J2 would cross no forested wetlands and the least amount of non-forested wetlands. Similarly, the applicants' equivalent would have the most wetland crossings over 1,000 feet and may require the placement of one or more structures in wetlands. Route alternative J2 would not have any wetland crossings over 1,000 feet and would avoid placement of structures in wetlands.

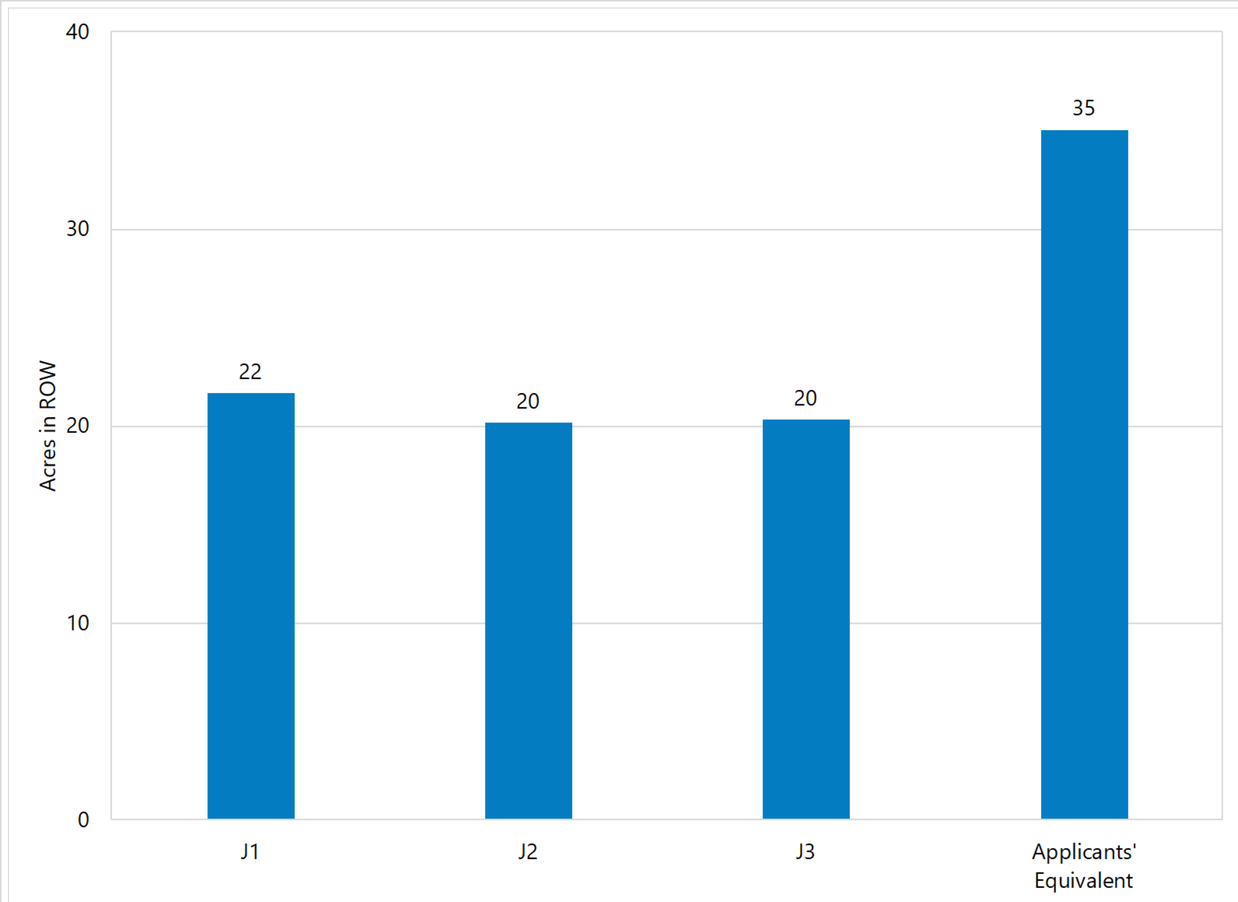
Figure 6-16 Acres of Wetlands Crossed by Route Alternatives J1 Through J3 and the Applicants' Equivalent



6.6.2.4.2 Vegetation

Route alternatives J1, J2, J3, and the applicants' equivalent would all impact forested vegetation, with the applicants' equivalent impacting the most vegetation (Figure 6-17). All route alternatives and the applicants' equivalent would minimize impacts associated with forest fragmentation, to varying extents, by paralleling existing transmission line or road ROW for 73 to 99 percent of their lengths.

Figure 6-17 Forested Vegetation in the 150-foot ROW of Route Alternatives J1, J2, J3, and the Applicants' Equivalent



6.6.2.4.3 *Wildlife*

Impacts to wildlife habitat would occur for route alternatives J1, J2, J3, and the applicants' equivalent. Route alternatives J1, J2, J3, and the applicants' equivalent would minimize impacts associated with habitat fragmentation, to varying extents, by paralleling existing transmission line or road ROW; the applicants' equivalent and route alternative J3 would parallel the greatest amount of ROW. The entire ROW of each route alternative and the applicants' equivalent would traverse a Grassland Bird Conservation Area (Map 6-24). The applicants' equivalent and route alterative J3 would minimize impacts to avian species associated with the Grassland Bird Conservation Area by paralleling an existing transmission line ROW for 95 percent and 73 percent of their lengths, respectively.

Route alternatives J1, J2 and J3 minimize impacts to wildlife by minimizing the loss of forested vegetation. The applicants' equivalent and route alternative J3 minimize impacts to wildlife due to fragmentation by paralleling the greatest amount of existing ROW.

6.6.2.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined that no federally protected species have been documented within 1 mile of route alternatives J1, J2, J3, and the applicants' equivalent. Three state protected species have been documented within 1 mile of all route alternatives and the applicants' equivalent (Appendix N).

None of these species has been documented within the ROW of any route alternative or the applicants' equivalent; however, one state threatened species, the tubercled rein orchid, has been documented within the route width of route alternative J1 (Appendix N). One state special concern species has been documented within 1 mile of all route alternatives and the applicants' equivalent (Appendix N). Route alternatives J1, J2, J3, or the applicants' equivalent would not traverse designated sensitive ecological resources.

6.6.2.6 Reliability

When one transmission line crosses another, reliability risks increase because the failure of one line can unexpectedly de-energize the other. Additionally, there is increased risk that if one transmission line falls, it can bring down the other transmission line, resulting in two, rather than one, line failures. Furthermore, performing maintenance at the transmission line crossing creates a safety risk, as under normal operating conditions one line must remain energized while work is occurring on the other line. Therefore, where practical, new lines are typically designed to minimize transmission line crossings.

No transmission line crossings are required for these route alternatives.

6.6.2.7 Cost

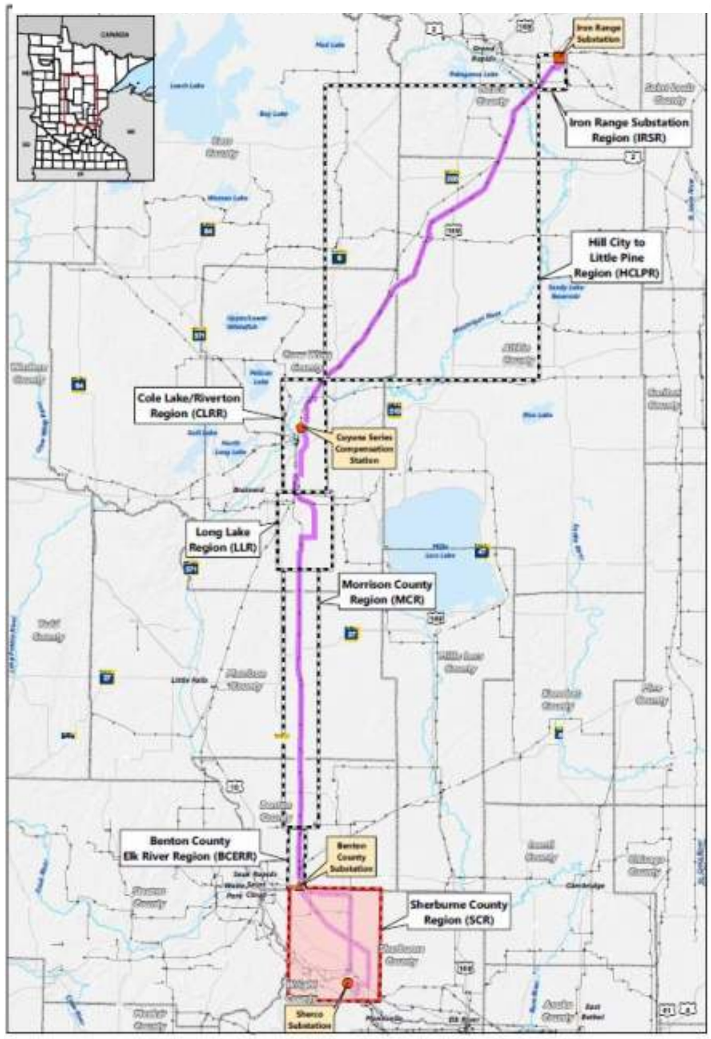
Costs of the route alternatives are generally proportional to length and take into account the need for specialty and heavy-angle structures, which are more expensive than standard and/or tangent structures (Table 6-134). Route alternative J1 (approximately $45.9 million) would require six heavy-angle structures, each of which costs more than three times that of a tangent structure. Route alternative J2 (approximately $46.1 million) would also require six heavy-angle structures, while route alternative J3 (approximately $42.7 million) would require four heavy-angle structures. As a result, the applicants' equivalent is the least expensive routing alternative in this region (approximately $40 million).

6.7 Sherburne County Region

The Sherburne County region is the southernmost region of the project (Figure 6-18). The majority of the region is contained within Sherburne County, with small portions located in Wright and Stearns counties. This region only includes the applicants' proposed route; no route alternatives or alignment alternatives are analyzed in this region (Map Book 3A). Chapter 6.7.1 summarizes the potential impacts resulting from construction and operation of the applicants' proposed route in the Sherburne County region.

The existing transmission line infrastructure for both the MR Line and the GRE-BS Line will be upgraded with larger, double-circuit capable structures. New structures will be located on these existing transmission line centerlines; however, the new structures will not be placed within the same footprint of the structures being removed (i.e., this portion of the project would not be replacement “in kind”). The existing piers and footings would be removed to approximately 4-6 feet below grade, and the existing poles and structures would be removed. The existing MR Line contains wooden H-frame structures, while the existing GRE-BS Line contains steel monopoles or lattice towers. Steel structures would be recycled, while the wood poles would be scrapped or given to the landowner, should they wish to keep them. Preliminary engineering estimates for the new structures indicate that the foundations will range from 8 feet to 12 feet in diameter and would be drilled to a depth of between 25 and 42 feet below surface.

Figure 6-18 Sherburne County Region



6.7.1 Applicants’ Proposed Route – Sherburne County Region

The applicants’ proposed route consists mainly of upgrading two existing transmission lines: GRE’s 230 kV MR Line and their 345 kV CRE-BS Line. The applicants’ proposed route follows, and would upgrade, these two existing transmission lines entirely within the existing transmission line ROW, with the exception of approximately 1.5 miles of proposed new transmission line that would connect to the future Big Oaks Substation. The 1.5 miles of new transmission line would parallel an existing road. Potential impacts of the applicants’ proposed route, which applies to both of the lines being upgraded in the Sherburne County region, are summarized in Table 6-139 and discussed in Chapters 6.7.1.1 through 6.7.1.6.

Table 6-139 Human and Environmental Impacts – Applicants' Proposed Route, Sherburne County Region

Resource	Element	Applicants' Proposed Route
Length (miles)		41.9
Human Settlement	Residences within 0-75 feet (count)	2
	Residences within 75-250 feet (count)	91
	Residences within 250-500 feet (count)	116
	Residences within 500–1,000 feet (count)	257
Transportation	Airports within 1 mile (count)	1
Land-Based Economies	Agricultural land in 150-ft ROW	457
Water Resources	Total wetlands in 150-foot ROW (acres)	190
	Forested wetlands in 150-ft ROW (acres)	7
Vegetation	Forested landcover in 150-foot ROW (acres)	68[1]
Wildlife	Grassland Bird Conservation Area in 150-foot ROW (acres)	455
Rare and Unique Natural Resources	Sites of Biodiversity Significance in 150-foot ROW (acres)	38
	Native Plant Communities in 150-foot ROW (acres)	21
	Federal- or state-protected species documented in 150-foot ROW (count)	2
ROW Sharing and Paralleling	Transmission line (miles, percent)	39.8 (95)
	Roadway (miles, percent)	3.9 (9)
	Field, parcel, or section lines (miles, percent)	23.5 (56)
	Total ROW sharing and paralleling (miles, percent)	41.3 (99)
Estimated Cost	Total estimated cost (2022 dollars in millions)	$225.9

1 The NLCD indicates forested vegetation is in the ROW; however, the ROW is an existing transmission line ROW that has been cleared and is routinely maintained.

6.7.1.1 Human Settlements

As discussed in Chapter 5.3, potential human settlement impacts are assessed by looking at several human settlement elements: aesthetics, displacement, noise, property values, zoning and land-use compatibility, electronic interference, and cultural values. Proximity to homes, schools, and other human settlement features and the extent of ROW sharing with existing infrastructure are the primary indicators of potential impacts to human settlements. Impacts to human settlements are minimized by routes that are located aware from homes and that share ROW with existing infrastructure.

For some of the human settlement elements in the Sherburne County region, project impacts are anticipated to be minimal. For the Sherburne County region, aesthetics and displacement are the only human settlement elements for which impacts are anticipated to be non-minimal.

6.7.1.1.1 Aesthetics

Aesthetic impacts are assessed through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed route alternative would change these aesthetic attributes (Chapter 5.3.1). Determining the relative scenic value or visual importance in any given area depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure ROW. The proximity of residences to the applicants' proposed route is shown in Table 6-140. Compared with other regions of the project, the number of residences within 1,000 feet of the anticipated alignment is relatively high. This is due, in part, to the fact that residences have been constructed over time near the 230 kV MR line and the 345 kV CRE-BS Line.

Nearly all of the applicants' proposed route in the Sherburne County region would be located in existing transmission line ROW (Table 6-141). Following existing transmission ROW minimizes aesthetic impacts.

Table 6-140 Sherburne County Region Proximity of Residences to Applicants' Route

Residences, Distance from Anticipated Alignment	Applicants' Proposed Route
Residences within 0-75 feet	2
Residences within 75-250 feet	91
Residences within 250-500 feet	116
Residences within 500-1,000 feet	257
Total Residences within 1,000 feet	466

Table 6-141 Sherburne County Region ROW Sharing and Paralleling of Applicants' Route

Infrastructure	Applicants' Proposed Route miles (percent)
Follows Existing Railroad	1.0 (2)
Follows Existing Roads	3.9 (9)
Follows Existing Transmission Line	39.8 (95)
Total – Follows Transmission Line, Road, or Railroad	41.3 (99)
Follows Field, Parcel, or Section Lines	23.5 (56)
Total – ROW Paralleling and Sharing	41.3 (99)
Total Length	41.9

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line and therefore the sum may be greater than 100 percent.

6.7.1.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW, due to electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are generally removed or displaced.

There are no churches, childcare centers, or schools located within the applicants' proposed route ROW. However, there are two permanent residences and two non-residential buildings located within the applicants proposed route ROW.

The permanent residences located within the applicants' proposed route ROW may potentially be displaced as a result of the project; similarly, the project may or may not displace non-residential buildings. Though buildings are generally not allowed with the transmission line ROW, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line (e.g., storage, animal production, etc.). For each of the buildings noted here, the applicants would need to conduct a site-specific analysis to determine if the building would need to be displaced.

6.7.1.2 Transportation

Potential transportation impacts are assessed by looking at various elements of transportation and public services as outlined in Chapter 5.4. In general, impacts to transportation services are anticipated to be minimal in this region.

6.7.1.2.1 Airports

One private airport is located within 1 mile of the applicants' proposed route. The Schroeder Airport is a private landing strip located in Becker Township, approximately 0.75-mi west of the applicants' proposed route. The Schroeder Airport is privately-owned and is not subject to public airport zoning ordinances. In addition, the applicants' proposed route in this region would consist of rebuilding two existing transmission lines; therefore, no new impacts to this airport are anticipated.

6.7.1.3 Land-Based Economies

As discussed in Chapter 5.8, impacts on land-based economies are assessed by considering four elements: agriculture, forestry, mining, and recreation and tourism. For the Sherburne County region, agriculture is the only element of land-based economies for which impacts are anticipated to be non-minimal. There are no active mining operations within ROW of the applicants' proposed route. There are very few recreation and tourism opportunities and these do not differ between the route alternatives. As a result, potential impacts to forestry, mining, and recreation and tourism are anticipated to be minimal.

6.7.1.3.1 Agriculture

Project impacts to agriculture within the Sherburne County region were evaluated through land use and soil types within the 150-foot ROW of the applicants' proposed route. Map Book 5C provides an overview of land cover types crossed by the applicants' proposed route. Approximately 457 acres of the applicants' proposed route ROW (61 percent of the 150-foot ROW in this region) consists of agricultural land. This land is comprised primarily of cultivated crops and hay/pasture lands.

According to the MDA Organic Farm Directory, no registered organic producers are within the 150-foot ROW (reference (105)). According to the Minnesota Apiary Registry, no apiaries are located within the

ROW (reference (106)). However, there are 4 acres of marginal agricultural lands enrolled in the USDA FSA CREP within the 150-foot ROW (reference (107)).

Potential construction and operation-related impacts to agricultural land are summarized in Chapter 5.8.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to agricultural land, as described in Chapter 5.8.1.1.

6.7.1.3.1 Forestry

Forestry impacts in the Sherburne County region were primarily assessed by evaluating the designated forestry resources within the 150-foot ROW. The applicants' proposed route through the Sherburne County region consists almost entirely of existing transmission line ROW; therefore, no new impacts to forestry resources are anticipated. Nevertheless, the applicants' proposed route would cross approximately 10 acres of land within the SFIA program.

As shown in Table 6-17, the designated forestry resources consist of DNR state forests, Minnesota School Trust Land, Forest for the Future land, and SFIA land, which is a conservation program administered by the DNR that provides annual incentive payments to encourage private landowners to keep their wooded areas undeveloped (reference (109)). Because the applicants' proposed route follows existing transmission line ROW through the SFIA land, no impacts to this forestry resource are anticipated.

6.7.1.4 Archaeological and Historic Resources

Archaeological and historic resource impacts are assessed by determining the presence of these resources within the project route width (Chapter 5.1.1). Map Book 5F provides an overview of archaeological and historic architectural resources in the Sherburne County region.

There are 17 documented cultural resources within the route width (1,000 feet) of the applicants' proposed route in the Sherburne County region (Table 6-142). These include six archaeological sites and eleven historic architectural resources. However, this portion of the applicants' proposed route consists of rebuilding two existing transmission lines. As a result, no new impacts to cultural resources are anticipated, because no new ROW would be acquired, nor will new visual or other impacts be introduced as a result of the project. Impacts to cultural resources are therefore minimized in the Sherburne County region.

Table 6-142 Cultural Resources within the Route Width of the Applicants' Proposed Route, Sherburne County Region

Resource Number	Resource Type	NRHP Eligibility
21SH0081	Precontact artifact scatter	Not evaluated
21SH0082	Precontact lithic scatter	Not evaluated
21SH0084	Precontact lithic scatter	Not evaluated
21SH0086	Post contact artifact scatter, farmstead ruins	Not evaluated
21SH0090	Precontact lithic scatter	Not eligible
21SHbe	Precontact artifact scatter	Not evaluated
SH-BKC-00012	Herbert Maximilian Fox House	NRHP-listed
SH-CLT-00011	Fort Ripley Military Road: Clear Lake Twp. Segment	Not evaluated
XX-ROD-00034	Trunk Highway 25	Not eligible
XX-ROD-00035	Trunk Highway 10: Anoka to St. Cloud	Not eligible
XX-ROD-00037	Trunk Highway 10: Anoka to Little Falls Segment	Not eligible
XX-ROD-00040	Trunk Highway 10	Not eligible
XX-ROD-00113	Trunk Highway 25	Not eligible
XX-RRD-00001	St. Paul and Pacific Railroad Corridor	Eligible
XX-RRD-NPR022	St. Paul and Northern Pacific Railway Company/Northern Pacific Railway Company: Staples to St. Paul	Not eligible
XX-RRD-NPR024	St. Paul and Northern Pacific Railway Company/Northern Pacific Railway Company: Brainerd to St. Paul	Not eligible
XX-RRD-NPR026	St. Paul and Northern Pacific Railway Company/Northern Pacific Railway Company: Sauk Rapids to Minneapolis	Not eligible

6.7.1.5 Natural Environment

6.7.1.5.1 Water Resources

Potential project impacts on water resources are examined by evaluating locations and conditions of watercourses and waterbodies, floodplains, wetlands, and groundwater. Project proximity to water bodies, watercourses, floodplains, wetlands, and groundwater wells and the necessity of crossing these features are the primary indicators of potential water resource impacts. Impacts to two elements of water resources, floodplains and groundwater, are anticipated to be minimal in this region.

There are two elements of water resources for which impacts could be non-minimal: watercourses and waterbodies, and wetlands. This discussion focuses on those elements that are within the ROW or are crossed by the applicants' proposed route. The number of surface water and wetland crossings is an important consideration when evaluating routes, even though there may be no direct impacts associated with these crossings. The crossings are important because of the potential indirect impacts associated with them (i.e., clearing of vegetation, soil movement). The amount of forested wetland within the ROW is also an important consideration when evaluating routes. Since large-growing woody vegetation would be cleared from the ROW, forested wetlands would be converted to other wetland types, resulting in permanent impacts.

6.7.1.5.1.1 Watercourses and Waterbodies

The work occurring within the Sherburne County region would be limited to upgrades and/or changes to two existing transmission lines. There would be no new watercourse or waterbodies crossings within this region.

6.7.1.5.1.2 Wetlands

The work occurring within the Sherburne County region would be limited to upgrades and/or changes to two existing transmission lines. It is anticipated that wetland impacts within this region can be avoided.

6.7.1.5.2 Vegetation

Vegetation impacts were evaluated by examining vegetative landcover within the 150-foot ROW (Chapter 5.10.4.1). Map Book 5C provides an overview of vegetative landcover in the Sherburne County region and Table 6-143 summarizes the landcover types within the ROW of the applicants' proposed route within this region. The dominant vegetative landcover in the ROW of the applicants' proposed route in this region consists of agricultural land, which represents approximately 61 percent of the ROW. Agricultural vegetation in the ROW of applicants' proposed route for this region is discussed in Chapter 6.7.1.2.

Table 6-143 Landcover Types in the 150-foot ROW of the Applicants' Proposed Route in the Sherburne County Region

Landcover Type	Acres in ROW	Percent of ROW[1]
Agricultural (cultivated crops and hay/pasture)	457	61
Herbaceous (upland and wetland)	146	19
Developed (low-high intensity; open space)	70	9
Forested (upland and wetland)	68[2]	9
Open water	8	1
Shrub/Scrub	3	<1

Source reference (110)

1 Totals may not sum to 100 percent due to rounding.

2 The NLCD indicates forested vegetation is in the ROW; however, the ROW is an existing transmission line ROW that has been cleared and is routinely maintained.

Although the NLCD indicates that forested vegetation is present in the ROW of the applicants' proposed route, it has been cleared to accommodate the existing transmission line ROW. Because the applicants' proposed route consists of rebuilding two existing transmission lines in the existing ROW, no new impacts to forested vegetation are anticipated. Vegetation in the existing ROW has already been cleared and is routinely maintained. As such, impacts to vegetation in the ROW is anticipated to be minimal.

Potential construction and operation-related impacts to vegetation are summarized in Chapter 5.10.4.1. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Chapter 5.10.4.1. Potential impacts to agricultural vegetation and wetlands are discussed Chapters 5.8.1 and 5.10.1.3, respectively.

6.7.1.5.3 Wildlife

Impacts to wildlife are primarily assessed by evaluating the presence of wildlife habitat, including areas that are preserved or managed for wildlife habitat, within the ROW. The applicants' proposed route in the Sherburne County region consists of rebuilding two existing transmission lines within the existing ROW. As such, the applicants' proposed route would occur in an area where wildlife habitat has been previously disturbed; thus, impacts to wildlife habitat are anticipated to be minimal. Additionally, potential new impacts associated with habitat fragmentation are anticipated to be minimal.

As shown on Map Book 5H, the entirety of the ROW for the applicants' proposed route in this region would traverse USFWS GBCA. However, it would traverse these GBCA in the existing transmission line ROW, thereby minimizing the potential for new impacts associated with habitat fragmentation and impacts to avian species.

Potential construction and operation-related impacts to wildlife are summarized in Chapter 5.10.5. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife, as described in Chapter 5.10.5.

6.7.1.6 Rare and Unique Natural Resources

Impacts to rare and unique natural resources are primarily assessed by evaluating the presence of federal- and state-protected species within a 1-mile radius of the anticipated alignment and the presence of sensitive ecological resources within the 150-foot ROW (Chapter 5.10). Map Book 5I provides an overview of sensitive ecological resources within the Sherburne County region; in order to protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

6.7.1.6.1 Protected Species

Using the NHIS database, it was determined that no federally protected species have been documented within 1 mile of the applicants' proposed route in the Sherburne County region. As summarized in Table 6-144, five state protected species have been documented within 1 mile of the applicants' proposed route in this region. In addition, several state special concern species have been documented within the ROW of the applicants' proposed route in this region (Appendix M).

Table 6-144 State Protected Species Documented in the Natural Heritage Information System Database – Applicants' Proposed Route in the Sherburne County Region

Scientific Name	Common Name	Type	State Status	Documented Records within ROW, Route Width, or 1 Mile
Lanius ludovicianus	Loggerhead shrike	Bird	Endangered	ROW
Aristida tuberculosa	Seaside three-awn	Vascular plant	Threatened	1 Mile
Emydoidea blandingii	Blanding's turtle	Turtle	Threatened	1 Mile
Hudsonia tomentosa	Beach heather	Vascular plant	Threatened	1 Mile
Minuartia dawsonesis	Rock sandwort	Vascular plant	Threatened	ROW

Two of the state protected species identified in Table 6-144 have been documented within the ROW of the applicants' proposed route; however, the ROW is routinely disturbed for maintenance activities associated with the existing transmission lines. Formal surveys for protected species have not been conducted for the project; as such, it is possible that these species or additional protected species could be present where suitable habitat is available within the ROW. Potential impacts to protected species could occur should they be present within or near the ROW. While more mobile species would leave the area for nearby comparable habitats, non-mobile organisms, such as vascular plants or nesting birds, could be directly impacted.

Potential construction and operation-related impacts to protected species are summarized in Chapter 5.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species, as described in Chapter 5.11.1.3. In addition, the applicants may be required to conduct field surveys for protected species in coordination with the USFWS and/or DNR prior to construction.

6.7.1.6.2 Sensitive Ecological Resources

The ROW of the applicants' proposed route in the Sherburne County region would traverse several sensitive ecological resources, including SBS and native plant communities (Table 6-145; Map Book 5I). As discussed above, this portion of the applicants' proposed route consists of rebuilding two existing transmission lines. Impacts to these sensitive ecological resources would be minimized because the rebuilds would occupy the existing ROW, which has been previously disturbed and is routinely maintained.

Table 6-145 Sensitive Ecological Resources in the 150-foot ROW of the Applicants' Proposed Route – Sherburne County Region

Sensitive Ecological Resource	Area within ROW of Applicants' Proposed Route
Sites of Biodiversity Significance	38 total acres; 10 acres ranked outstanding; 9 acres ranked high; 2 acres ranked moderate; 17 acres ranked below
Native Plant Communities	21 total acres; 3 acres have a conservation status of S1 or S2; conservation status of remaining acres is S3-S5

Potential construction and operation-related impacts to sensitive ecological resources are summarized in Chapter 5.11.2.15.11.1.3. Several measures could be implemented to avoid, minimize, or mitigate impacts to sensitive ecological resources, as described in Chapter 5.11.2.1. In addition, the applicants may be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species within sensitive ecological resources that cannot be avoided.

7 Relative Merits of the Project as a Whole

The Commission is charged with locating transmission lines in a manner that is "compatible with environmental preservation and the efficient use of resources" and that minimizes "adverse human and environmental impact(s)" while ensuring electric power reliability (Minn. Statute 216E.02). Minn. Statute 216E.03, subdivision 7(b) identifies considerations that the Commission must consider when designating transmission lines routes.

Minn. Rule 7850.4100 lists 14 factors for the Commission to consider in its route permitting decisions, including impacts on human settlements, land-based economies, and the natural environment (see Factors Considered by the Commission for Transmission Line Route Permits sidebar). Through an analysis of the routing factors, this chapter presents the merits of the applicant's proposed route and other example, full route options.

Many of the project impacts relative to the applicable routing factors are anticipated to be avoided or minimized by the (1) route selection, (2) general and special conditions in the Commission's route permit, (3) prudent transmission structure placement and placement of the alignment within the permitted route, and (4) the requirements of "downstream" permits such as the construction stormwater permit.

The discussion here focuses on the first 12 routing factors (See Minn. Rule 7850.4100, factors A through L). Routing factors M and N— the unavoidable and irreversible impacts of the project—are discussed at the end of this chapter.

Routing factor G ("mitigate adverse environmental impacts") has several parts and speaks generally to environmental impacts. For purposes of discussion here, and with respect to routing factor G, it is assumed that all routing alternatives are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (e.g., effects on vegetation and wildlife, routing factor E).

Routing factor I, the use of existing large electric power generating plant sites, is not relevant to this project and is not discussed further.

Finally, routing factors H and J address similar issues, the use or paralleling of existing rights-of-way. Routing factor H relates to the use or paralleling of existing rights-of-way, but also includes items

Factors Considered by the Commission for Transmission Line Route Permits

To determine whether to issue a route permit for a high-voltage transmission line, the Commission shall consider the following factors of Minnesota Rules, part 7850.4100:

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

B. Effects on public health and safety.

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

D. Effects on archaeological and historic resources.

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

F. Effects on rare and unique natural resources.

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

H. Use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries.

I. Use of existing large electric power generating plant sites.

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

K. Electrical system reliability.

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

M. Adverse human and natural environmental effects which cannot be avoided.

N. Irreversible and irretrievable commitments of resources.

that do not have a ROW, such as survey lines, natural division lines, and agricultural field boundaries. Routing factor J relates to the use of existing transportation, pipeline, and electrical transmission rights-of-way. Within this chapter, these factors are considered similarly—the use or paralleling of existing rights-of-way, where there is infrastructure that has a ROW. However, the discussion here emphasizes existing transmission line ROW usage as opposed to other infrastructure ROW.

7.1 Applicants' Proposed Routes and Example Full Route Options

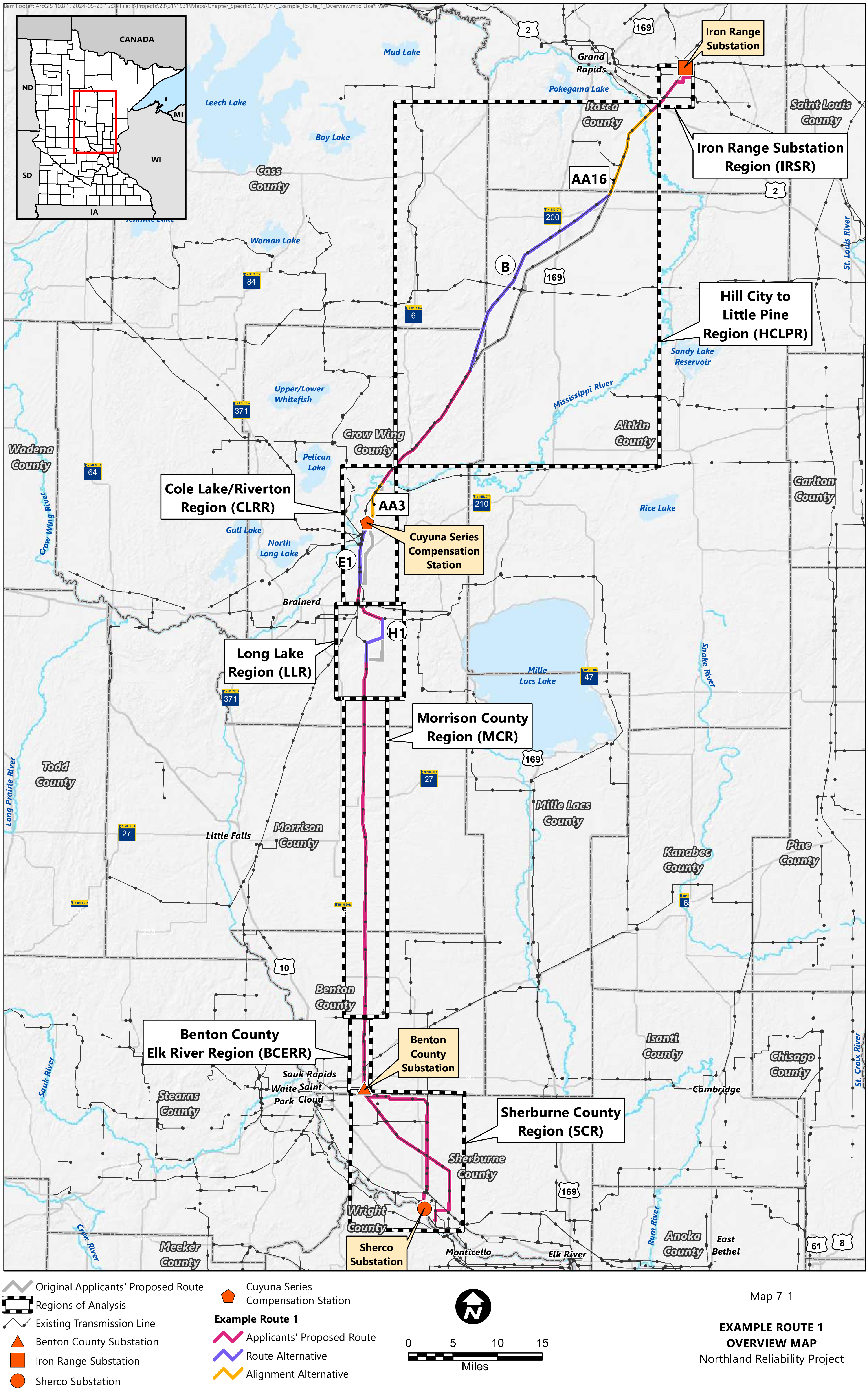
Four full route options (i.e., end-to-end routes from the Iron Range Substation to the Sherco and Big Oaks Substations) are discussed here. These full route options are:

- **The applicants' proposed route**. This is the route proposed by the applicants in their CN and route permit application.
- **The applicants' proposed route with modifications**. This route includes modifications proposed by the applicants in response to public comments and includes routing alternatives that would further consolidate the proposed new double-circuit 345 kV transmission line with existing transmission lines, particularly in the Cole Lake-Riverton Region. This route includes alignment alternatives AA3, AA9, and route alternative E1.
- **Example Route Option 1**. This route includes portions of the applicants' proposed route, including some modifications proposed by the applicants, and routing alternatives proposed during the EA scoping comment period. This route includes route alternatives B, E1, H1 and alignment alternatives AA3 and AA16 (Table 7-1; Map 7-1).
- **Example Route Option 2**. Similar to Route 1, this route includes portions of the applicants' proposed route, including some modifications proposed by the applicants, and routing alternatives proposed during the EA scoping comment period. This route includes route alternatives A2, B, C, E1, H1, J1 and alignment alternatives AA3 and AA16 (Table 7-1; Map 7-2).

These full route options are not meant to represent the only Northland Reliability Project routing possibilities. Rather, they are examples of route options that could be assembled for the project. They are meant to illustrate how various routing alternatives could be selected to build a full project route. Analyzing these four full route options against each other provides the opportunity to understand what impacts might look like if one of these full routes, or a similar route, were selected by the Commission for the project.

The full route options were compiled by selecting route alternatives or alignment alternatives within each region that could be feasibly connected to each another to create a full transmission line route between the existing Iron Range Substation, a new Cuyuna Series Compensation Substation, the existing Benton County Substation, the existing Sherco Substation, and the new Big Oaks Substation (Map Book 7A).

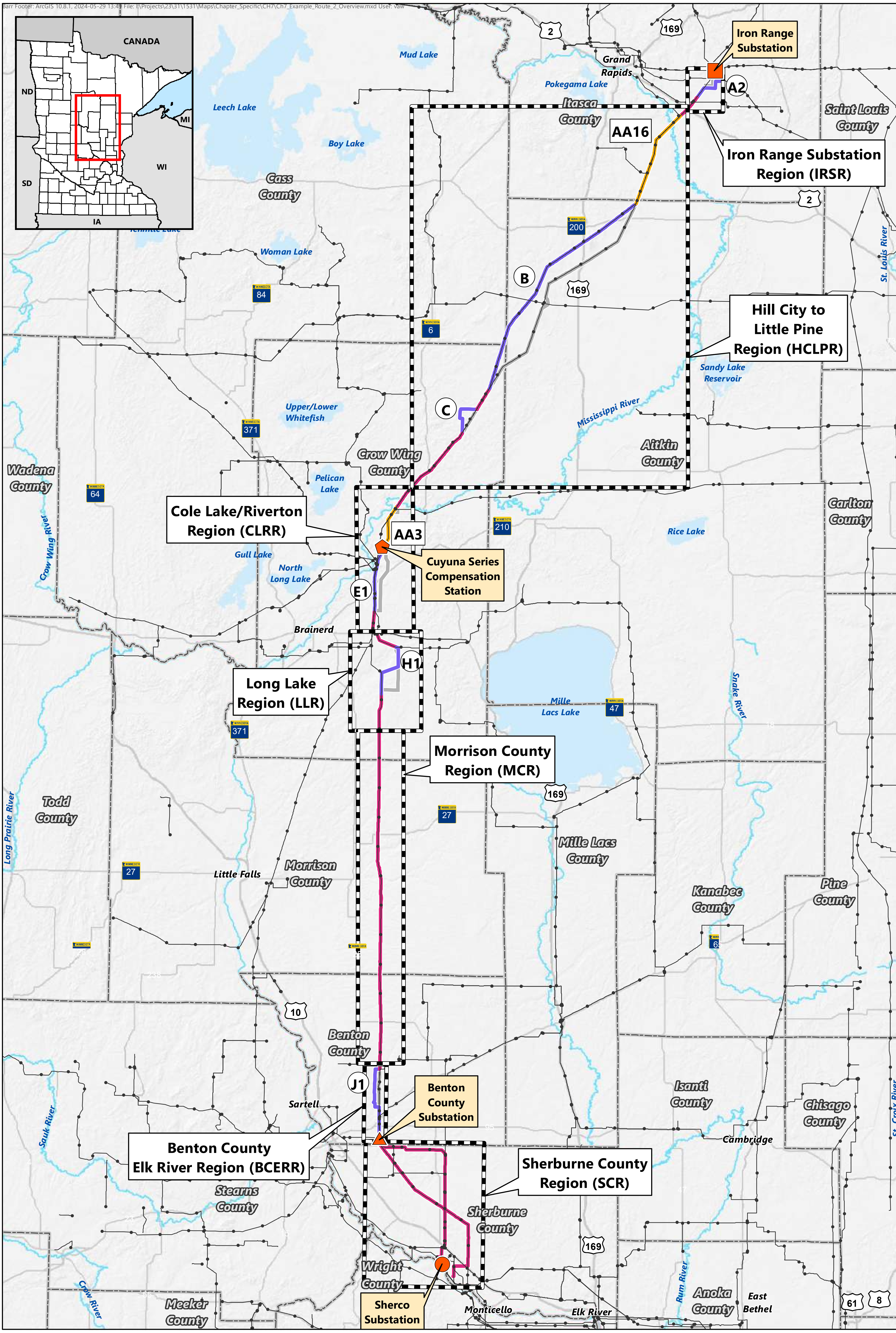
These full route options are simply examples for comparison; other full routes may be developed by combining route alternatives and alignment alternatives that could create a full transmission line route connecting the relevant features noted above. No option is meant to represent a "best case scenario" or to be "least impactful overall." Instead, the example routing options are meant to help the reader understand how the impacts of one routing option compares to another for the entirety of the line.



Map 7-1

EXAMPLE ROUTE 1 OVERVIEW MAP

Northland Reliability Project



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

Example Route 2

Applicants' Proposed Route
Route Alternative
Alignment Alternative

0 5 10 15
Miles

Map 7-2

EXAMPLE ROUTE 2 OVERVIEW MAP
Northland Reliability Project

Table 7-1 Example Full Route Option Features

Region and Route Alternative Choices	Example Route Option 1	Example Route Option 1 Features	Example Route Option 2	Example Route Option 2 Features
Iron Range Substation Region – A1, A2, A3, A4, and applicants' equivalent	Applicants' Equivalent	• Maximizes the paralleling of existing transmission line ROW; • Minimizes impacts to residences and non-residential structures; • Avoids impacts to cultural resources; and • Balances impacts to natural environment (not the highest or lowest for impacts to agriculture, wetlands, or forested land cover).	A2	• Route alternatives A1 and A2 are comparable options in that they both maximize use of paralleling existing transmission line and road rights-of-way and minimize impacts to the natural environment. However, route alternative A2 minimizes impacts to residences more than route alternative A1. • Route alternative A3 would place a residence between two transmission lines, within 200 feet of each line. • Route alternative A4 is the longest and while minimizing impacts to residences, it would have the most impact on the natural environment and does not make use of any existing transmission line ROW.
Iron Range Substation Region – AA15 and applicants' equivalent	Applicants' Equivalent	• These two routing alternatives are similar with respect to the routing factors. However, alignment alternative AA15 would require two perpendicular crossings of an existing transmission line, which raises constructability and reliability concerns and costs. In contrast. the applicants' equivalent would parallel an existing transmission line for its entire length.	Applicants' Equivalent	• These two routing alternatives are similar with respect to the routing factors. However, alignment alternative AA15 would require two perpendicular crossings of an existing transmission line, which raises constructability and reliability concerns. In contrast. the applicants' equivalent would parallel an existing transmission line for its entire length.

Region and Route Alternative Choices	Example Route Option 1	Example Route Option 1 Features	Example Route Option 2	Example Route Option 2 Features
Hill City to Little Pine Region – B and applicants' equivalent	B	• Maximizes paralleling existing transmission line ROW more than the applicants' equivalent; • Minimizes impacts to residences within 250 feet; • Is located within 1,300 feet of the runway of the Hill City/Quadna Mountain Airport; however, parallels an existing transmission line in this location; • Minimizes impacts to cultural resources; and • While route alternative B would impact more forested vegetation native plant communities and candidate old growth, the applicants' equivalent would impact more Sites of Biodiversity Significance and native plant communities, as well as traverse a Wildlife Management Area.	B	• Maximizes paralleling existing transmission line ROW more than the applicants' equivalent; • Minimizes impacts to residences within 250 feet; • Is located within 1,300 feet of the runway of the Hill City/Quadna Mountain Airport; however, parallels an existing transmission line in this location; • Minimizes impacts to cultural resources; and • While route alternative B would impact more forested vegetation native plant communities and candidate old growth, the applicants' equivalent would impact more Sites of Biodiversity Significance and native plant communities, as well as traverse a Wildlife Management Area.
Hill City to Little Pine Region – C and applicants' equivalent	Applicants' Equivalent	• Is 1.5 miles shorter and maximizes the paralleling of existing transmission line ROW; • Avoids residences and non-residential structures in the ROW; and • Minimizes impacts to forested vegetation but would impact slightly more wetlands, Sites of Biodiversity Significance, and native plant communities. It would also have a few more stream crossings; however, it would traverse all of these resources while paralleling an existing transmission line ROW.	C	• Minimizes impacts to wetlands, Sites of Biodiversity Significance, and native plant communities but would impact more forested vegetation; and • Minimizes stream crossings; however, the crossings that would occur, would be new crossings, as they would occur where an existing transmission line ROW is not currently present.
Hill City to Little Pine Region – AA1, AA2, and applicants' equivalent	Applicants' Equivalent	• These three routing alternatives are similar with respect to the routing factors. However, alignment alternatives AA1 and AA2 would require perpendicular crossings of an existing transmission line, which raises constructability and reliability concerns. In contrast. the applicants' equivalent would parallel an existing transmission line for its entire length.	Applicants' Equivalent	• These three routing alternatives are similar with respect to the routing factors. However, alignment alternatives AA1 and AA2 would require perpendicular crossings of an existing transmission line, which raises constructability and reliability concerns. In contrast. the applicants' equivalent would parallel an existing transmission line for its entire length.

Region and Route Alternative Choices	Example Route Option 1	Example Route Option 1 Features	Example Route Option 2	Example Route Option 2 Features
Hill City to Little Pine Region – AA16 and applicants' equivalent	AA16	• Minimizes impacts by reconfiguring an existing transmission line to use that line's ROW; and • Minimizes impacts to residences and the natural environment by constructing in an existing, previously disturbed ROW.	AA16	• Minimizes impacts by reconfiguring an existing transmission line to use that line's ROW; and • Minimizes impacts to residences and the natural environment by constructing in an existing, previously disturbed ROW.
Cole Lake-Riverton Region – AA3 and applicants' equivalent[1]	AA3	• Minimizes impacts by reconfiguring an existing transmission line to use that line's ROW; and • Minimizes impacts to residences and the natural environment by constructing in an existing, previously disturbed ROW.	AA3	• Minimizes impacts by reconfiguring an existing transmission line to use that line's ROW; and • Minimizes impacts to residences and the natural environment by constructing in an existing, previously disturbed ROW.
Cole Lake-Riverton Region – E1, E2, E3, #4, E5, and applicants' equivalent[2]	E1	• Maximizes the paralleling of existing transmission line ROW and is the only route alternative to parallel one for its entire length; • Minimizes impacts to residences and non-residential structures; and • Minimizes impacts to wetlands, forested vegetation, and Sites of Biodiversity Significance. It would traverse the edge of a Lake of Biological Significance but would do so while paralleling an existing transmission line ROW.	E1	• Maximizes the paralleling of existing transmission line ROW and is the only route alternative to parallel one for its entire length; • Minimizes impacts to residences and non-residential structures; and • Minimizes impacts to wetlands, forested vegetation, and Sites of Biodiversity Significance. It would traverse the edge of a Lake of Biological Significance but would do so while paralleling an existing transmission line ROW.
Cole Lake-Riverton Region – G and applicants' equivalent	Applicants' Equivalent	• Is almost 2 miles shorter than route alternative G; • Although it has two more residences within 250-500 feet, it does not have a non-residential structure in the ROW like route alternative G and • Minimizes impacts to agricultural and forested vegetation.	Applicants' Equivalent	• Minimizes length by being almost 2 miles shorter than route alternative G; • Although it has two more residences within 250-500 feet, it does not have a non-residential structure in the ROW like route alternative G; and • Minimizes impacts to agricultural and forested vegetation.
Long Lake Region – H1, H2, H3, H4, H5, H6, H7, and applicants' equivalent[3]	H1	• More paralleling of existing transmission line ROW than the other routing alternatives; and • Minimizes impacts to wetlands, forested vegetation, Sites of Biodiversity Significance, and Grassland Bird Conservation Areas.	H1	• More paralleling of existing transmission line ROW than the other routing alternatives; and • Minimizes impacts to wetlands, forested vegetation, Sites of Biodiversity Significance, and Grassland Bird Conservation Areas.

Region and Route Alternative Choices	Example Route Option 1	Example Route Option 1 Features	Example Route Option 2	Example Route Option 2 Features
Long Lake Region – K and applicants' equivalent	Applicants' Equivalent	• Minimizes impacts to residences and non-residential structures in the ROW and total residences within 1,000 feet; • Minimizes impacts to agricultural vegetation; and • Minimizes impacts to cultural resources.	Applicants' Equivalent	• Minimizes impacts to residences and non-residential structures in the ROW and total residences within 1,000 feet; • Minimizes impacts to agricultural vegetation; and • Minimizes impacts to cultural resources.
Long Lake Region – AA17 and applicants' equivalent	Applicants' Equivalent	• Maximizes the paralleling of existing transmission line ROW; and • Alignment alternative AA17 would require two perpendicular crossings of an existing transmission line, which raises constructability and reliability concerns.	Applicants' Equivalent	• Maximizes the paralleling of existing transmission line ROW; and • Alignment alternative AA17 would require two perpendicular crossings of an existing transmission line, which raises constructability and reliability concerns.
Benton County Elk River Region – J1, J2, J3, and applicants' equivalent	Applicants' Equivalent	• Maximizes the paralleling of existing transmission line ROW; • Minimizes impacts to residences; • Minimizes impacts to agricultural land; and • Minimizes impacts to Grassland Bird Conservation Area.	J1	• Avoids multiple crossings of the Elk River in the northern part of this region; and • Minimizes impacts to forested vegetation.

1 Because AA3 was selected here, route alternatives D3, AA4, AA6, and the applicants' equivalent are not viable options; these are alternatives to the applicants' proposed route in this area. The applicants' proposed route would be used just north of where AA3 ends.

2 Because E1 was selected here, route alternative F and alignment alternatives AA7, AA8, AA9, and AA10 are not viable options; these are alternatives to the applicants' proposed route in this area.

3 Because H1 was selected here, alignment alternatives AA12, AA13, and AA14 are not viable options; these are alternatives to the applicants' proposed route in this area.

7.2 Applicants' Proposed Routes and Example Full Route Option Impacts

Potential impacts of the applicants' proposed routes and full route options are summarized in Table 7-2 and described further in Chapters 7.2.1 through 7.2.5.

Table 7-2 Human and Environmental Impacts for the Applicants' Proposed Routes and Example Full Route Options

Resource	Element	Applicants' Proposed Route	Applicants' Proposed Route with Modifications	Example Route Option 1	Example Route Option 2
Length (miles)		182.3	180.5	177.6	179.6
Human Settlement	Residences within 0-75 feet (count)	3	3	2	3
	Residences within 75-250 feet (count)	102	111	109	117
	Residences within 250-500 feet (count)	164	172	194	209
	Residences within 500-1,000 feet (count)	380	377	385	396
Environmental Justice Concerns (EJC)	Communities of EJ concern crossed by the 150-ft ROW (count)	6	5	7	7
Land-Based Economies	Agricultural land in 150-ft ROW (acres)	1,260	1,302	1,298	1,325
Archaeology and Historic Architecture	Archaeological sites and historic architectural resources in 1,000-foot route width (count)	42	43	41	37
Water Resources	NHD stream crossings (count)	151	150	150	134
	PWI stream crossings (count)	82	79	79	59
	Impaired stream crossings (count)	46	46	46	28
	NHD lake crossings (count)	20	15	18	21
	Impaired lake crossings (count)	0	1	1	1
	PWI basin crossings (count)	9	14	16	15
	PWI wetland crossings (count)	10	7	7	6
	Total wetlands in 150-foot ROW (acres)	986	957	968	926
	Forested wetlands in 150-ft ROW (acres)	235	223	233	218
	Wetland crossings greater than 1,000 feet (count)	67	64	65	62

Resource	Element	Applicants' Proposed Route	Applicants' Proposed Route with Modifications	Example Route Option 1	Example Route Option 2
Vegetation	Forested landcover in 150-foot ROW (acres)	590	551	472	476
Wildlife	Wildlife Management Areas in 150-foot ROW (acres)	14	18	5	5
	Grassland Bird Conservation Areas in 150-foot ROW (acres)	1,241	1,241	1,241	1,252
	Shallow Wildlife Lake in 150-foot ROW (acres)	6	6	6	6
Rare and Unique Natural Resources	Sites of Biodiversity in 150-foot ROW (ranked moderate, high, or outstanding; acres)	954	914	743	735
	Native plant communities in 150-foot ROW (acres)	293	275	276	271
	High Conservation Value Forest in 150-foot ROW (acres)	124	124	33	33
	Lake of Biological Significance in 150-foot ROW (acres)	2	5	5	5
	Federal- or state-protected species documented in 150-foot ROW (count)	3	3	3	3
ROW Sharing and Paralleling	Transmission line (miles, percent)	159.3 (87)	166.7 (92)	167.8 (95)	160.0 (89)
	Roadway (miles, percent)	4.0 (2)	4.0 (2)	3.9 (2)	13.3 (7)
	Field, parcel, or section lines (miles, percent)	55.0 (30)	48.1 (27)	44.4 (25)	52.7 (29)
	Total ROW sharing and paralleling (miles, percent)	176.4 (97)	177.0 (98)	174.2 (98)	175.0 (98)
Estimated Cost	Total estimated cost (2022 dollars in millions)	$963.7	$980.4	$1,013 to $1,053	$1,035 to $1,075

7.2.1 Human Settlements

Potential impacts on human settlements are assessed through an evaluation of several elements (see Chapter 7, Factors Considered by the Commission for Transmission Line Route Permits sidebar). For some of the human settlement elements, project impacts are anticipated to be minimal and independent of the route selected and are therefore not analyzed or discussed here. Analysis of impacts to human settlements here focuses on those elements that vary with the route selected – aesthetics, displacement, and communities of EJ concern.

7.2.1.1 Aesthetics

Aesthetic impacts differ only slightly among the full route options; impacts can be minimized by placing the transmission line away from residences and by following existing infrastructure and ROW. Proximity of residences to the applicants' proposed routes and full route options are shown in Table 7-3 and depicted graphically in Figure 7-1, while ROW paralleling and sharing are shown in Table 7-4 and depicted graphically in Figure 7-2.

Each of the four full routes would have similar aesthetic impacts based on the project's proximity to residences. The applicants' proposed route is near the fewest number of residences; example route option 2 is near the greatest number of residences (Table 7-3; Figure 7-1). Each of the full route options minimizes aesthetic impacts by paralleling and/or sharing existing ROW for between 97 and 98 percent of the route (Table 7-4; Figure 7-2). However, when considering the amount that each route would follow existing transmission lines, example route option 1 best minimizes aesthetic impacts with 95 percent of this route following existing transmission line ROW.

Table 7-3 Proximity of Residences to Applicants' Proposed Routes and Example Full Route Options

Residences, Distance from Anticipated Alignment	Applicants' Proposed Route	Applicants' Proposed Route with Modifications	Example Route Option 1	Example Route Option 2
Residences within 0-75 feet	3	3	2	3
Residences within 75-250 feet	102	111	109	117
Residences within 250-500 feet	164	172	194	209
Residences within 500-1,000 feet	380	377	385	396
Total Residences within 1,000 feet	649	662	690	725

Figure 7-1 Proximity of Residences to the Applicants' Proposed Routes and Example Full Route Options

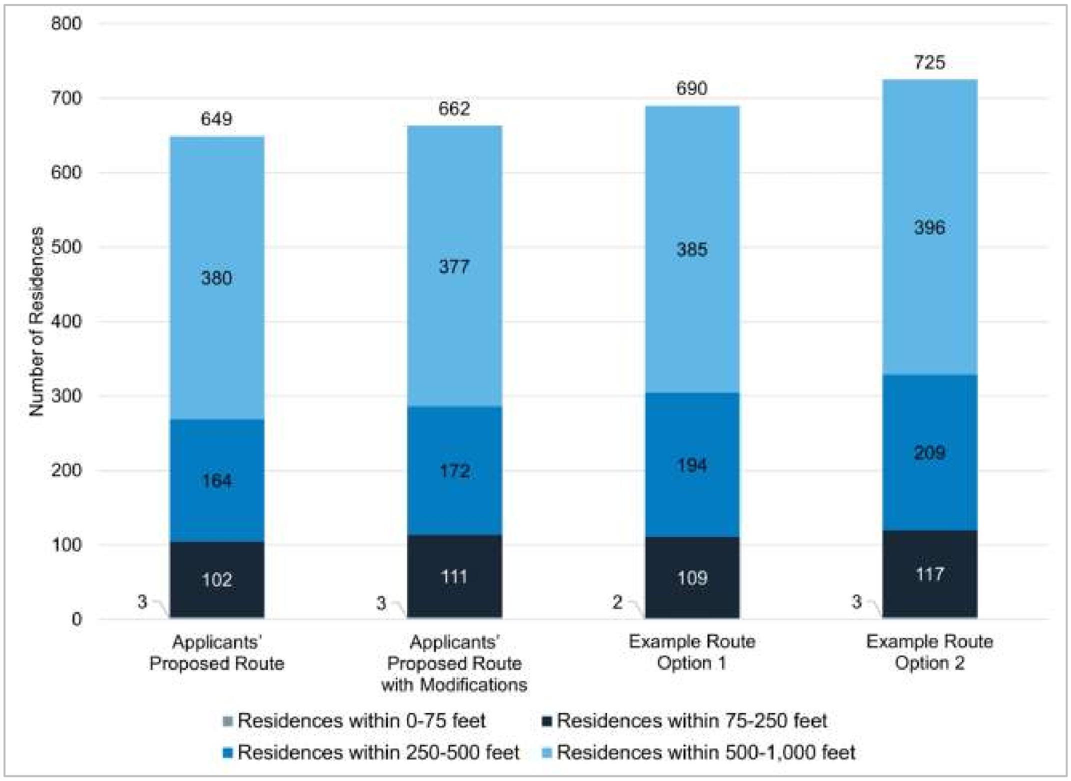
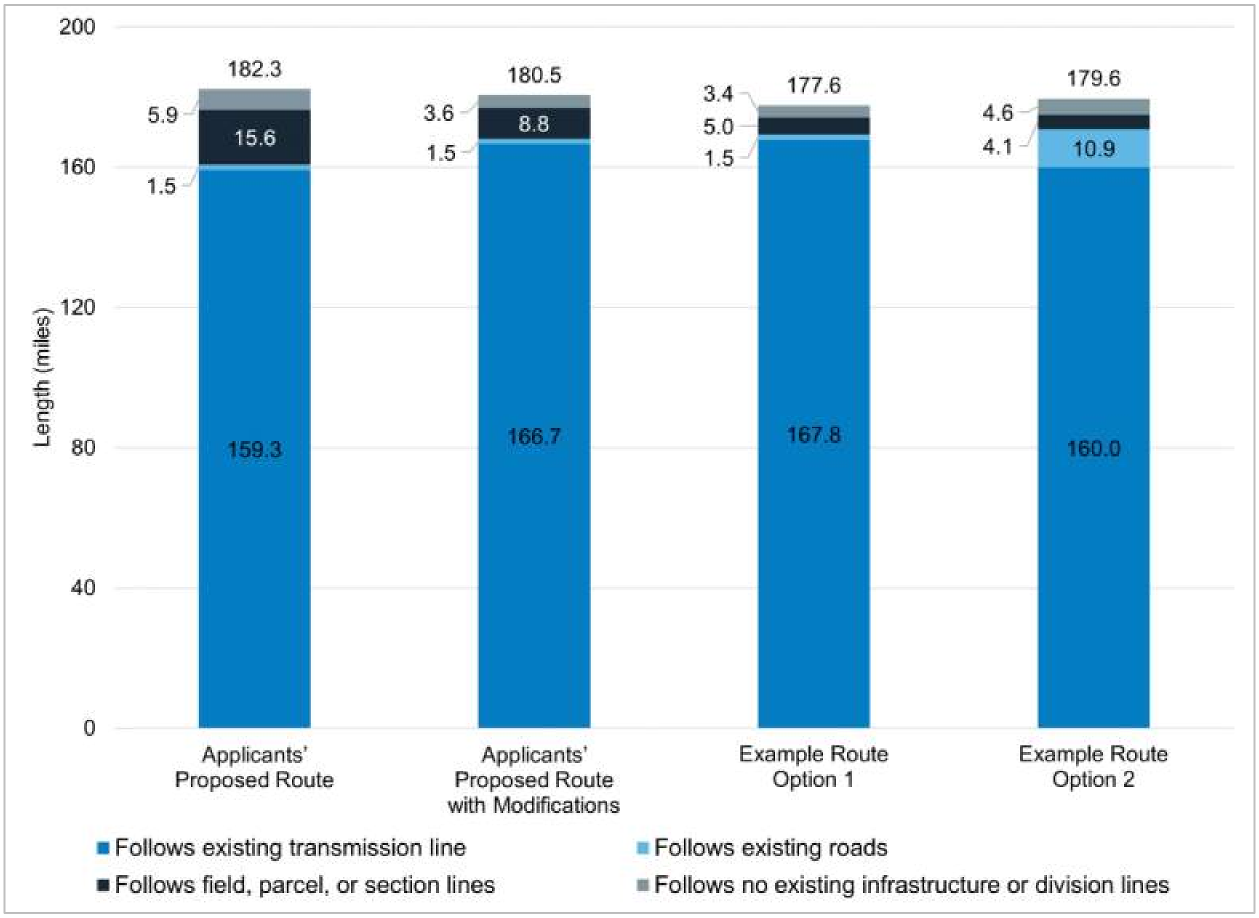


Table 7-4 ROW Paralleling and Sharing of Applicants' Proposed Routes and Example Full Route Options

Infrastructure	Applicants' Proposed Route miles (percent)	Applicants' Proposed Route with Modifications miles (percent)	Example Route Option 1 miles (percent)	Example Route Option 2 miles (percent)
Follows Existing Railroad	1.0 (1)	1.0 (1)	1.0 (1)	1.0 (1)
Follows Existing Roads	4.0 (2)	4.0 (2)	3.9 (2)	13.3 (7)
Follows Existing Transmission Line	159.3 (87)	166.7 (92)	167.8 (95)	160.0 (89)
Total – Follows Transmission Line, Road, or Railroad	160.8 (88)	168.2 (93)	169.2 (95)	170.9 (95)
Follows Field, Parcel, or Section Lines	55.0 (30.2)	48.1 (26.6)	44.4 (25)	52.7 (29)
Total – ROW Paralleling and Sharing	176.4 (97)	177.0 (98)	174.2 (98)	175.0 (98)
Total Length of Route Alternative	182.3	180.5	177.6	179.6

Portions may share or parallel more than one type of infrastructure ROW or division/boundary line; therefore, the sum may be greater than 100 percent.

Figure 7-2 ROW Sharing and Paralleling - Applicants' Proposed Routes and Example Full Route Options



7.2.1.2 Displacement

Residences or other buildings are typically not allowed within the transmission line ROW for electrical safety code and maintenance reasons. Any residences or other buildings located within a proposed ROW are therefore generally removed or displaced.

The applicants' proposed route, proposed route with modifications, and example route option 2 may each result in the potential displacement of three residences, while example route option 1 may result in the potential displacement of two residences. In addition, each of these full routes could result in the displacement of several non-residential buildings located within the 150-foot ROW (Table 7-5).

Table 7-5 Proximity of Residences and Non-Residences to Applicants' Proposed Routes and Example Full Route Options

Residences and Non-Residences, Distance from Anticipated Alignment	Applicants' Proposed Route	Applicants' Proposed Route with Modifications	Example Route Option 1	Example Route Option 2
Residences within 0-75 feet	3	3	2	3
Non-Residences within 0-75 feet	14	13	11	14
Total Residences and Non-Residences within 0-75 feet	17	16	13	17

Residential and non-residential buildings within the 150-foot ROW may or may not be displaced as a result of the project. Though buildings are generally not allowed within the ROW of a transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line. For each of the buildings in the ROW, the applicants would need to conduct a site-specific analysis to determine if the building would need to be removed or relocated.

7.2.1.3 Environmental Justice

As indicated in Chapter 5.3.9, utility infrastructure can adversely impact low-income, minority, or tribal populations (communities of environmental justice [EJ] concern). Each of the full route options analyzed in this chapter would cross several communities of EJC. The applicants' proposed route would cross six communities of EJC, the applicants' proposed route with modifications would cross five communities of EJC, and example route options 1 and 2 would each cross seven communities of EJC (Table 7-2).

However, no adverse or permanent impacts to the identified EJC are anticipated. While each of the full routes included in this analysis intersect environmental justice communities, they are not anticipated to experience disproportionately adverse impacts as a result of the project, particularly because the transmission line will parallel and/or share existing ROW for the majority of these route options (97 to 98 percent).

7.2.2 Land-Based Economies

Potential impacts to land-based economies are assessed through several elements. This Chapter addresses those elements of land-based economies that vary with the route selected – agricultural, forestry, mining, and recreation and tourism resources.

7.2.2.1 Agriculture

Impacts to agricultural land in the 150-foot ROW of the full route options would be relatively similar (Table 7-2). The applicants' proposed route has the least amount of agricultural land within the ROW, totaling 1,260 acres (38 percent) (Table 7-2). In contrast, route option 2 has the most agricultural land within the ROW, with 1,325 acres (41 percent), representing a difference of approximately 65 acres (Table 7-2).

7.2.2.2 Forestry

Impacts to designated forestry resources in the 150-foot ROW of the full route options would be relatively similar (Table 7-2). Forestry land within the ROWs of these options ranges between 472 acres (route option 1) to 590 acres (applicants' proposed route).

There are designated forestry resources in the form of DNR state forest, Minnesota School Trust Land, Forests for the Future land, and SFIA land within the ROW of the full route options (Table 7-6). The ROW of full route option 2 contains the fewest designated forestry resources (376 acres), while the applicants' proposed route with modifications contains the most (427 acres).

Table 7-6 Designated Forestry Resources Within the 150-foot ROW of Applicants' Proposed Routes and Example Full Route Options

Forestry Acreage	Applicants' Proposed Route	Applicants' Proposed Route with Modifications	Example Route Option 1	Example Route Option 2
Acres of DNR state forest within 150-foot ROW	258	264	206	188
Acres of Minnesota School Trust Land[1] within 150-foot ROW	137	144	123	104
Acres of Forests for the Future[2] land within 150-foot ROW	19	19	32	36
Acres of Sustainable Forest Incentive Act[3] land within 150-foot ROW	0	0	42	48
Total Acreage	414	427	403	376

In some cases, multiple state land classifications are located within the same section. Therefore, features may be duplicated and the analysis results may over-represent potential impacts.
Data Sources: references (3); (4)

1 Minnesota School Trust Lands are DNR-administered lands that are set aside to provide a continual source of funding for public education (reference (4).

2 Minnesota's Forests for the Future Program is a conservation program administered by the DNR to encourage the protection of privately-owned forest lands through conservation easements or land purchases (reference (5)).

3 Minnesota's Sustainable Forest Incentive Act is a conservation program administered by the DNR that provides annual incentive payments to encourage private landowners to keep their wooded areas undeveloped (reference (109)).

New transmission line construction through forested lands would be required for all full route options; however, route option 1 likely minimizes forestry impacts the most by having the least amount of forested lands in its ROW (Table 7-2). Route option 1 also shares the most ROW with existing roadway and transmission line infrastructure (97 percent) (Table 7-2, Table 7-4). In areas of ROW paralleling and sharing, impacts to forestry resource lands have already occurred. Placement of transmission infrastructure in these locations may increase areas of forestry impact but would not introduce new impacts to an otherwise undisturbed forested setting.

7.2.2.3 Mining

Potential effects on mining operations are likely to occur if the construction or operation of a transmission line prevents access to and recovery of resources. The construction of a transmission line could limit the ability to mine these resources, depending on proximity of the resources to the route selected for the project.

There are no mining resources in the vicinity of the applicants' proposed route or the applicants' proposed route with modifications; as such, these route alternatives best minimize potential impacts to mining resources. Route options 1 and 2 each have the same two aggregate mines located in their ROW, though both routes would follow an existing transmission line ROW through one of these aggregate mines, minimizing introduction of new impacts (see Chapter Mining6.3.4.2.3).

7.2.2.4 Recreation and Tourism

Recreation and tourism opportunities in the project area primarily consist of scenic byways, state forests, WMAs, off-road vehicle trails, snowmobile trails, and water trails. Each of the full route options contain recreation and tourism opportunities. Compared to full route options 1 and 2, the applicants' proposed route and applicants' proposed route with modifications have the following additional recreational resources in their rights-of-way: two scenic byways, two state forests, two WMAs, eight off-road vehicle trails, one snowmobile trail, and one water trail (Table 7-7).

Table 7-7 Recreational Resources Crossed by the 150-foot ROW of Applicants' Proposed Routes and Example Full Route Options

Route	Applicants' Proposed Route	Applicants' Proposed Route with Modifications	Example Route Option 1	Example Route Option 2
Scenic byways crossings (count)	4	4	2	2
State forest crossings (count)	6	6	4	4
WMA crossings (count)	2	2	0	0
Off-road vehicle trail crossings (count)	13	13	5	5
Snowmobile trail crossings (count)	8	8	7	7
Water trail crossings (count)	2	2	1	1

Full route options 1 and 2 as well as the applicants' proposed route with modifications would each cross through a portion of the Cuyuna Country State Recreation Area. However, full route options 1 and 2 would cross this recreation area within existing transmission line ROW in an area of double-circuiting. An additional 80 feet of ROW from within the Cuyuna Country State Recreation Area would be needed to accommodate the double-circuiting and placement of the route through this area. As a result, minimal impacts to the Cuyuna Country State Recreation Area are anticipated. The applicants' proposed route with modifications would cross this recreation area parallel to existing road ROW at the far eastern edge of the recreation area and outside of the area used for recreation (Photo 7-1).

Photo 7-1 View of Applicants' Proposed Route with Modifications in the Vicinity of the Cuyuna Country State Recreation Area

Photograph looking south, Cuyuna Country State Recreation Area is located on the right side of the photo

Because transmission line construction and operation generally has minimal permanent and temporary impacts to trails and introduction of new impacts would be minimized to the extent possible by ROW sharing and paralleling, recreation and tourism impacts as a result of the project are expected to be minimal. Overall, route options 1 and 2 likely best minimize impacts to recreation and tourism in the project area.

7.2.3 Archaeological and Historic Resources

Between 37 and 43 archaeological and historic resources are located within the 1,000-foot route width of the full route options (Table 7-2). These resources are further classified in Table 7-8. Most of these cultural resources have been previously determined not eligible for the NRHP and therefore no additional work related to these cultural resources would be required for the project to proceed, regardless of which route is selected. However, the project has the potential to adversely affect those cultural resources that have not been evaluated for the NRHP, or which are listed on or have been determined eligible for listing on the NRHP (i.e., significant cultural resources).

Table 7-8 Summary of Archaeological and Historic Architectural Resources within the 1,000-foot Route Width of Applicants' Proposed Route and Example Full Route Options

	Applicants' Proposed Route	Applicants' Proposed Route with Modifications	Example Route Option 1	Example Route Option 2
Count of NRHP-listed or -eligible Resources	5	5	6	6
Count of Unevaluated Cultural Resources	19	19	16	15
Count of Resources Previously Determined Not Eligible for NRHP	18	19	19	16

Although the overall counts of cultural resource types are similar among the full route options, both route options 1 and 2 are less impactful to archaeological and historic architectural resources. This is due to their use of existing infrastructure ROW in proximity to significant cultural resources.

Of the significant cultural resources located within the route width of the applicants' proposed route and the applicants' proposed route with modifications, three NRHP-listed/-eligible historic architectural resources (XX-RRD-NPR007/ XX-RRD-NPR021, and CW-XXX-00001) have the potential to be impacted by the project. The applicants' proposed route would cross each of these resources in a brand-new location, which may alter these resource's setting, feeling, appearance, and/or association. However, where route options 1 and 2 cross these resources, the crossing occurs where an existing transmission line is present. Due to paralleling an existing transmission line, route options 1 and 2 do not have the potential to introduce new impacts to the resources' setting, feeling, appearance, and/or association.

SH-BK-00012 (listed in the NRHP) and XX-RRD-00001 (eligible for the NRHP) would not be adversely affected by the project regardless of the route selected because these resources are located in an area that consists of double-circuiting on an existing transmission line. As a result, no new impacts to these cultural resources are anticipated because no new ROW would be acquired, nor would new visual or other impacts be introduced as a result of the project because the transmission line in proximity to these resources is existing.

Archaeological sites that are not evaluated or are listed in or eligible for the NRHP may also be impacted by the project if any of these sites are present within the footprint of ground disturbance. Ground disturbing activities have the potential to impact these resources if they cannot be avoided by the project. The primary means to minimize impacts to archaeological and historic architectural resources is prudent routing or structure placement (i.e., avoiding known archaeological and historic resources). If they cannot be avoided, impacts to these resources could be mitigated by measures developed in consultation with SHPO prior to construction.

7.2.4 Natural Environment

Potential impacts to the natural environment are assessed by looking at several specific elements. For some of the elements of the natural environment, impacts from the project are anticipated to be minimal and independent of the route selected and therefore are not discussed in this Chapter. This Chapter addresses those elements that do vary with the route selected – water resources, vegetation, and wildlife.

7.2.4.1 Water Resources

Impacts to floodplains and groundwater are anticipated to be minimal and independent of the route selected for the project. This discussion here addresses watercourses and waterbodies, and wetlands.

Watercourses and Waterbodies

Each of the full route options would cross streams and waterbodies, as summarized in Table 7-2. Route option 2 minimizes stream crossings, including NHD streams, impaired streams, and PWI streams. The difference in stream crossings between route option 2 and the other three full route options stems from the J1 route alternative in the Benton County Elk River region (which is part of route option 2). The J1 route alternative is located in a new transmission line ROW west of the Elk River, while the other three full routes would use the applicants' equivalent to parallel an existing transmission line ROW while crossing the Elk River multiple times.

The applicants' equivalent in the Benton County Elk River region would cross the Elk River 26 times, as shown in the Map Book 5G; this count is relatively high due to the meandering nature of the Elk River. Waterbody crossings would be relatively comparable across each of the full route options. However, the applicants' proposed route with modifications would have fewer NHD lake crossings than the other three routes. The applicants' proposed route would have fewer PWI basin crossings but more PWI wetland crossings than the other three routes.

Wetlands

Wetlands within the rights-of-way of the full route options consist of emergent wetlands, forested wetlands, and shrub-dominated wetlands. The applicants' proposed route has the most acres of wetland (986 acres) and forested wetland (235 acres) within its 150-foot ROW, while route option 2 has the least acres of wetland (926 acres) and forested wetland (218 acres) (Table 7-2). Although wetlands would be spanned to the extent possible, each of the full route options would cross between 62 (route option 2) and 67 (applicants' proposed route) wetland areas wider than 1,000 feet, which may require one or more structures to be placed in a wetland (Table 7-2).

7.2.4.2 Vegetation

Each of the full route options would impact forested vegetation within their 150-foot ROW. Impacts to forested vegetation would be minimized with route option 1 (472 acres) and route option 2 (476 acres; Table 7-2). The applicants' proposed route would impact 590 acres of forested vegetation in its ROW, while the applicants' proposed route with modifications would impact 551 acres of forested vegetation in its ROW (Table 7-2). Each of the full route options would minimize impacts associated with forest fragmentation by following existing transmission line and/or road ROW for the majority of their length (Table 7-2).

7.2.4.3 Wildlife

Impacts to wildlife habitat would be relatively comparable for the full route options in that they would all cross WMAs, GBCA, and a DNR-identified shallow wildlife lake. The applicants' proposed route and the applicants' proposed route with modifications would cross the edge of the Birchdale and Moose Willow WMAs, while route options 1 and 2 would cross solely the edge of the Birchdale WMA. Route option 2 would cross slightly more acres of GBCA than the other routes (Table 7-2). Each of the full route options would minimize impacts associated with habitat fragmentation by following existing transmission line and/or road ROW for the majority of their length (Table 7-2).

7.2.5 Rare and Unique Natural Resources

Using the NHIS database, it was determined there are no differences among the full route options with respect to documented federal- or state-protected species. Each of the full route options have one documented federally protected species (the northern long eared bat) and the same 15 state protected species documented within 1 mile of them; these are summarized in Appendix N. In addition, three of the 15 state protected species, including the loggerhead shrike, Blanding's turtle, and rock sandwort, have also been documented within the 150-foot ROW of each full route option. As discussed in Chapter 5.11.1.3, potential impacts to these species can be mitigated by incorporating species-specific BMPs.

Each of the full route options would intersect several DNR SBS, with route options 1 and 2 intersecting approximately 200 acres less than the applicants' proposed route and the applicants' proposed route with modifications (Table 7-2). Each of the full route options would intersect native plant communities, with the applicants' proposed route intersecting slightly more than the other routes (Table 7-2). Each of the full route options would also intersect High Conservation Value Forest, with routes options 1 and 2 intersecting approximately 90 fewer acres. All four full route options would intersect Lakes of Biological Significance while paralleling an existing transmission line ROW. The applicants' proposed route would traverse approximately two acres of one Lake of Biological Significance, while the other three routes would traverse approximately five acres of two Lakes of Biological Significance (Table 7-2; Map Book 5I).

7.3 Relative Merits Summary

The discussion here uses text and a color graphic to describe the relative merits of the full route options (Table 7-9). The color graphic and related notes for a specific routing factor or element are not meant to be indicative of the best route for the project, but are provided as a relative comparison to be evaluated together with all other routing factors. For example, routes that are "red" for a particular factor or element are not meant to indicate a fatal flaw with a specific full route option.

For routing factors where impacts are anticipated to vary with the full route options, the graphic represents the magnitude of anticipated difference between these anticipated impacts and compares them across the four full route options. For routing factors that express the state of Minnesota's interest in the efficient use of resources (e.g., the use and paralleling of existing rights-of-way), the graphic represents the consistency of the full route options with these interests and compares them to each other.

Table 7-9 Guide to Relative Merits of the Applicants' Proposed Routes and Example Full Route Options

Anticipated Impacts or Consistency with Routing Factor	Symbol
Minimal: Impacts are anticipated to be minimal with mitigation – OR – route option is very consistent with this routing factor.	
Moderate: Impacts are anticipated to be minimal to moderate with mitigation; special permit conditions may be required for mitigation – OR – route alternative is very consistent with the routing factor, but less so than other route alternatives. Indicates that this route option may not be the least impactful with respect to this routing factor.	
Significant: Impacts are anticipated to be moderate to significant and likely unable to be mitigated – OR – route alternative is not consistent with the routing factor or consistent only in part. Indicates that this route option has notably more impacts with respect to this routing factor than other route options.	

7.3.1 Routing Factors for Which Impacts Are Not Anticipated to Vary Among Applicants' Proposed Routes and Example Full Route Options

Potential impacts are anticipated to be minimal and not vary significantly among the full route options for the following routing factors and elements:

- Impacts on human settlements (factor A)—noise, property values, electronic interference, cultural values, zoning and land-use compatibility, and public services.
- Impacts on public health and safety (factor B)—EMF, implantable medical devices, stray voltage, induced voltage, and air quality.
- Impacts on rare and unique natural resources (factor F) – federal- and state-protected species.
- Impacts on electric system reliability (factor K).

7.3.2 Routing Factors for Which Impacts Are Anticipated to Vary among Applicants' Proposed Routes and Example Full Route Options

Potential impacts are anticipated to vary among the full route options for the following routing factors and elements:

- Impacts on human settlements (factor A)—aesthetics, displacement, and environmental justice communities.
- Impacts on land-based economies (factor C)—agriculture, forestry, mining, and recreation and tourism.
- Impacts on archaeological and historic resources (factor D).
- Impacts on the natural environment (factor E) - water resources, vegetation (flora), and wildlife (fauna).
- Impacts on rare and unique natural resources (factor F) - sensitive ecological resources.
- Use or paralleling of existing rights-of-way (factors H and J).
- Costs that are dependent on design and route (factor L).

Relative merits of the full route options for all routing factors / elements for which impacts are anticipated to vary among route options are shown and discussed in Table 7-10.

Table 7-10 Relative Merits of Applicants' Proposed Routes and Example Full Route Options

Routing Factor/Resource	Applicants' Proposed Route	Applicants' Proposed Route with Modifications	Example Route Option 1	Example Route Option 2	Summary
Human Settlement – Aesthetics	◒	●	●	◒	Each of the four full routes would have similar aesthetic impacts based on proximity to residences. The applicants' proposed route is near the fewest number of residences; example route option 2 is near the greatest number of residences. Route option 1 uses the most existing transmission line ROW (95 percent), while the applicants' proposed route with modifications is second with 92 percent. Route option 2 and the applicants' proposed route each use less than 90 percent of existing transmission line ROW (89 percent and 87 percent, respectively).
Human Settlement – Displacement	◒	◒	●	◒	Route option 1 has the fewest residences and non-residences within the 150-foot ROW (2 residences and 11 non-residences). The other three full route options each have 3 residences and between 13 and 14 non-residences within the 150-foot ROW.
Human Settlement – Environmental Justice	◒	●	◒	◒	The applicants' proposed route with modifications would only cross five communities of EJ concern, where the other route options would cross six to seven communities of EJ concern. However, since these full route examples mostly follow existing transmission line ROW, these communities of EJ concern should not be adversely or disproportionately affected by the project and differences are marginal.
Land-Based Economies – Agriculture	◒	◒	◒	◒	There is only a difference of approximately 65 acres of agricultural land between each of the full route options. Impacts would be similar regardless of the route selected.
Land-Based Economies – Forestry	◒	◒	●	◒	Route option 1 minimizes forestry impacts by having the least amount of forested lands in its ROW and by sharing the most ROW with existing roadway and transmission line infrastructure (97 percent).

Routing Factor/Resource	Applicants' Proposed Route	Applicants' Proposed Route with Modifications	Example Route Option 1	Example Route Option 2	Summary
Land-Based Economies – Mining	●	●	◒	◒	Route options 1 and 2 have two aggregate mines within their rights-of-way; the applicants' proposed route and the applicants' proposed route with modifications do not. Impacts to the aggregate mines likely can be mitigated; thus, differences between the route options are marginal.
Land-Based Economies – Recreation and Tourism	◒	◒	◒	◒	The applicants' proposed route and applicants' proposed route with modifications have the following additional recreational resources in their rights-of-way compared to the route options 1 and 2: two scenic byways, two state forests, two WMAs, eight off-road vehicle trails, one snowmobile trail, and one water trail. Example route options 1 and 2 would each require new ROW within the boundaries of the Cuyuna Country State Recreation Area.
Archaeological and Historic Architectural Resources	◒	◒	●	●	The applicants' proposed route and the applicants' proposed route with modifications would both cross significant cultural resources in an area of new ROW, where route options 1 and 2 would cross these same resources using existing transmission line ROW. Otherwise, counts of cultural resources are similar across each full route option.
Natural Environment – Watercourses and Waterbodies	◒	◒	◒	●	Route option 2 would have the least number of stream crossings. However, the difference in stream crossings between route option 2 and the other three route options stems from the J1 route alternative in the Benton County Elk River region (which is part of example route option 2) being located in a new transmission line ROW west of the Elk River. In contrast, the other three full route options would use the applicants' equivalent to parallel an existing transmission line ROW while crossing a meandering section of the Elk River multiple times. The applicants' proposed route would avoid crossing an impaired lake and would have the least number of PWI basin crossings but would have the most PWI wetland crossings.
Natural Environment – Wetlands	◒	◒	◒	●	The ROW of route option 2 has the least acres of wetland, including forested wetland.

Routing Factor/Resource	Applicants' Proposed Route	Applicants' Proposed Route with Modifications	Example Route Option 1	Example Route Option 2	Summary
Natural Environment – Vegetation	◒	◒	●	●	Route options 1 and 2 would have less impact on forested vegetation.
Natural Environment – Wildlife	◒	◒	●	◒	Route option 1 minimizes impacts to wildlife and associated habitat by avoiding the Moose Lake WMA.
Rare and Unique Natural Resources	◒	◒	●	●	Route options 1 and 2 minimize impacts to Sites of Biodiversity Significance and High Conservation Value Forests.
Use or Paralleling of Existing ROW	◒	●	●	◒	Total ROW paralleling and sharing is nearly equal across all route options. There is some variation in the paralleling of existing transmission line rights-of-way. Route option 1 uses the most existing transmission line ROW (95 percent), while the applicants' proposed route with modifications is second with 92 percent. Route option 2 and the applicants' proposed route each use less than 90 percent of existing transmission line rights-of-way (89 percent and 87 percent, respectively).
Costs Dependent on Design and Route (2022 dollars in millions)	$963	$980	$1,013 to $1,053	$1,035 to $1,075	The applicants' proposed route is the least expensive, while example route option 2 is the most expensive. Major factors affecting cost include double-circuiting long sections of transmission line in route options 1 and 2 as well as specialty structures that would be required near the Hill City/Quadna Mountain airport.

7.4 Unavoidable Impacts

Transmission lines are large infrastructure projects that can have adverse human and environmental impacts. Even with mitigation strategies, there are adverse project impacts that cannot be avoided. These impacts are anticipated to occur for all routing alternatives and to vary, if at all, as discussed above.

Aesthetic impacts cannot be avoided. The project would introduce new transmission line structures and conductors into project area viewsheds. These structures and conductors would be visible; therefore, they would have an adverse aesthetic impact. Temporary construction-related impacts also cannot be avoided. These include construction-related noise and dust generation and disruption of traffic near construction sites.

While the project would parallel existing transmission lines and other infrastructure to the extent practicable, impacts to agriculture cannot be completely avoided. The project requires the placement of concrete footings and the construction of transmission line structures in a project area that has sizeable areas of agricultural use. Potential impacts include loss of tillable acreage and constraints on the layout and management of field operations.

Finally, impacts to the natural environment cannot be avoided. Even if impacts can be limited to the transmission line's ROW, construction and operation of the transmission line would require tree removal and brush trimming, as well as clearing at structure sites. These are unavoidable impacts to vegetation. Unavoidable impacts to vegetation also include the removal or fragmentation of habitat and the creation of edge habitats. Transmission line conductors adversely affect avian species by creating opportunities for collisions with the conductors. These collisions could occur despite mitigation strategies such as the use of bird flight diverters.

7.5 Irreversible and Irretrievable Impacts

The commitment of a resource is irreversible when it is impossible or very difficult to redirect that resource for a different future use. An irretrievable commitment refers to the use or consumption of a resource such that it is not recoverable for later use by future generations. These types of commitments are anticipated to occur for all routing alternatives and not to vary significantly among alternatives.

The commitment of land for a transmission line ROW is likely an irreversible commitment. In general, lands in the rights-of-way for large infrastructure projects such as railroads, highways, and transmission lines remain committed to these projects for a relatively long period of time.

Even in instances where a ROW is abandoned, the land within the ROW is typically repurposed for a different infrastructure use, such as a rails-to-trails program, and is not returned to a previous land use. This said, transmission line rights-of-way can be returned to a previous use (e.g., row crop, pasture) by the removal of structures and structure foundations to a depth that supports this use, but this becomes more challenging in areas of ROW paralleling as it would rely on a commitment from more than one facility to return the land to previous use.

There are few commitments of resources associated with the project that are irretrievable. These commitments include the steel, concrete, and hydrocarbon resources committed to the project, though it is possible that the steel could be recycled at some point in the future. Labor and fiscal resources required for the project are also irretrievable commitments.

8 References

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